

Montana State University Design Guidelines



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Introduction

The Montana State University Campus Design Guidelines is a living document established to guide consultants through all phases of project development. It serves to consolidate and organize the range of institutional knowledge retained by the Campus Planning, Design & Construction Department. It is intended to be updated every two years, although more current individual sections or supplements may be distributed or posted on an as-needed basis.

Compliance with the Campus Design Guidelines is an obligation of Design Consultants retained under the university standard consultant's agreement. Responsibility for any non-compliant design and/or resulting installation falls within the respective Design Consultant's scope of services. It is important that this document be reviewed, understood and any exceptions noted prior to entering into any such agreements. The Design Consultant is expected to comprehend all aspects of the standards, including document preparation and review guidelines covering requirements for all submissions from schematic design through closeout requirements. In addition, dissemination of all pertinent sections of this manual to sub-consultants or appropriate members of the Design Consultant's team is the responsibility of the lead consultant under contract.

Please note that this document is not distributed directly to contractors. Therefore, items herein identified as part of Contractor or Construction Manager responsibility will only become known when shown on consultant's contract documents. The Design Consultant documents are to include information pertinent to the Contractor's scope of work (such as As-Built information) so that the standards may be consistently applied. Therefore, the Design Consultants' document coordination effort must include those items in the Campus Design Guidelines that impact a contractor's or construction manager's ability to conform as well. This requires that consultants include all such contractor requirements from this manual in respective Construction Specification Institute (CSI) specification sections and/or drawings prior to document release.

The format for all sections contained in the Campus Design Guidelines is consistently presented for ease of use. In addition to design and review guidelines, each topic or section contains appropriate references, as well as an appendix of further informational references pertinent to the topic.

The information contained within the Campus Design Guidelines is not intended to limit design expression or material selections, but rather guide Design Consultants in ways to expedite project completion within acceptable MSU standards. Exceptions to any design standard herein shall be discussed and modified if the Design Consultant obtains written approval through the Project Manager. This process must be initiated through the Project Manager to assure proper notification and review, as well as to assure accurate and timely updates to the manual.



Use of these Guidelines

The Montana State University Campus Design Guideline's intended goal is to provide Montana State University (MSU) and Design Consultants with a comprehensive campus standard for minimum design requirements for new and existing structures, and exterior open spaces. These guidelines are also intended to serve as a reference to many committees and advisory groups on campus in support of their charges regarding the built environment.

These Guidelines are organized from general to specific information, with Appendices including the most specific items. Each section includes a main body text accompanied with a written description of guideline objectives with a side bar including key points to be noted by the reader, additional reference material links, and example imagery. The Appendices to this document are intended to serve as an updatable standard and specification sections for items that may continue to develop or change to adapt to MSU's future needs.

MSU is committed to a current and comprehensive document that defines the process and minimum standards to guide future decision making based on current institutional knowledge and lessons-learned from past MSU projects. The Guidelines will serve to guide future planning for development on the MSU campuses.

This document is available online at www.montana.edu/us/committees/ufpb/documents_guidelines.php, and in hard copy at the Campus Planning, Design and Construction Office. Items may change without notice. The user is responsible for verifying that they have the most recent copy of the guidelines.

Montana State University Campus Planning, Design & Construction wishes to express its thanks to Princeton University for its permission to utilize the Princeton University Design Standards manual as a model for this document.

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1.0 General Administrative

1.1 University Facilities Organization

This document is a basic reference for those involved in the design and construction of new buildings, the modification of existing structures and systems, and the renovation of existing spaces at Montana State University. MSU was founded in 1893 as the Agricultural College of the State of Montana, a land grant institution under the Morrill Acts of 1862 and 1890. From modest beginnings the college has grown to become MSU, comprised of over 15,000 students on over 900 acres of campus property in Bozeman as well as campuses in Billings, Great Falls and Havre, and eight experiment stations throughout the State.

A companion to the University's Long Range Campus Development Plan, this manual was developed as a resource for Design Consultants, Contractors, and Suppliers who provide services to the University. The manual is also intended to provide guidance for University Project Managers, administration, and support staff.

It is understood that the basic minimum requirements described within these Guidelines are in addition to the applicable university, local and national codes and requirements.

Each division of the manual contains guidelines that establish the standards for design as well as the quality of materials and work appropriate for university projects. These Guidelines are not intended to limit or exclude input from Design Consultants. To the contrary, Design Consultants are to offer alternative solutions and/or materials when there are quality, cost or time benefits that do not compromise the integrity of the work to be performed. It is recognized that there are inevitable design considerations that require special treatment. Moreover, it is intended that this manual be evolutionary, changing and allow revisions as technologies and methodologies change.

1.1.1 Campus Planning Design & Construction

Campus Planning, Design & Construction (CPDC) is charged with the management of planning, design and construction efforts for new structures, renovations, major maintenance, and infrastructure projects for the University Facilities. CPDC consists of two functional elements, the Planning group and the Design & Construction group. Planning and Design & Construction work cooperatively to assist campus clients with the planning, design and approval processes involved in initiating and completing projects on campus.

Planning provides services that include long range campus and facilities planning, site assessments, space programming support and capital project planning. Planning is also responsible for oversight of the campus master plan, titled the Long Range Campus Development Plan (LRCDP, see Appendix 2.1).



Long Range Campus
Development Plan
See Appendix 2.1-1

Design & Construction is responsible for design, coordination and management of all construction projects on the MSU campus, both large and small. The university's long term interests in the quality and longevity of its buildings and infrastructure are safeguarded through the Campus Design and Construction Guidelines drafted and administered by the Design & Construction group.

As stewards of MSU's physical assets, CPDC's planners, designers and project managers are committed to approaches that enhance and preserve historic buildings, landscapes and cultural features. Carrying this stewardship into the future, CPDC focuses on a commitment to the pursuit of sustainable building and landscape designs, aware of the university's responsibility to be a model for not only its students but the larger community as well.

1.1.2 Definition of Project Roles

All university new construction and renovation projects are managed through CPDC. Within CPDC, typically, design and construction projects under a value of \$75,000 are typically handled by a Project Designer or Project Architect, and projects with a value in excess of \$75,000 are typically handled by Project Managers. The Project Designer, Project Architect or Project Manager is the university's designated representative for the project. The University Architect will serve as a resource and provide oversight and input as appropriate on every project.

Certain new construction and renovation projects receiving funding through the State of Montana Legislature also have a State Project Manager. On these projects Consultants and Contractors are under contract directly to the State and the State Project Manager will be the primary decision maker regarding issues of budget and schedule. The University Project Manager will remain the primary contact for the University Client Representatives or Building Committee (see below).

The key project entities and their roles are as follows:

1. Project Manager—the university's designated representative responsible for the entire project process, from initiation to close-out management, of all university construction and renovation projects with a value in excess of \$75,000. Tasks and duties include management of: the MSU Client Representative(s);
2. Design Consultant selection; Design Consultant tasks such as programming, budgeting, site analysis, preparation of construction documents, document review, schedule, construction administration, and close-out; project bidding and contractor selection; contractor services during construction; and project close-out and warranty. A Project Designer or Project Architect will perform the same role on projects with a value under \$75,000.

3. Client Representative—the appointed agent of the client (University Department or Building Committee) who actively represents the Client during all phases of a project. The Client Representative provides a direct communication link between CPDC and the Client with regard to progress or decisions crucial to the project. The Client Representative and Project Manager function as a team to facilitate timely and effective interaction between CPDC and the Client. On some projects the Client role may be fulfilled by the full Building Committee.
4. Building Committee—when considered necessary to the project, a Building Committee will be established to help draft the building project program and budget and evaluate how well the project program objectives are met by the project design. The committee also is involved in the decision process when deviations from the project program or budget are required. The Project Manager will coordinate the efforts of the Building Committee.
5. Design Consultant—The external professional individual or organization(s), under contract to the university, that perform the design and prepare plans and specifications depicting the work to be done, provide cost estimates for the project, and provide contract administration services during the construction and warranty phases of the project. The Design Consultant may be an architect, an engineer, or an organization that combines these professional services depending on the scope and complexity of the project.
6. Contractor—The person or organization, under contract to the university, that undertakes responsibility for the performance of the construction work, in accordance with plans, specifications, and Contract Documents. The Contractor provides the labor, material, and equipment to accomplish the work. Subcontractor—A person or entity that has a direct contract with the Contractor to perform a particular part of the work on the project.
7. Supplier—A person or entity that supplies materials or equipment for the work, including that fabricated to a special design, but who does not perform labor at the site.

1.1.3 Facilities Services

Facilities Services at MSU is the department charged with the maintenance and operation of all university buildings, grounds and infrastructure systems. Facilities Services comprises fifty six service management areas which include: Administrative and University Services, Environmental Services, Budget & IT, Campus Maintenance, Engineering & Utilities, and Campus Work Control. Facilities Services employs approximately 180 full time employees and supplements the permanent workforce with seasonal labor. Facilities Services works parallel to and closely in cooperation with Campus Planning, Design & Construction.

1.1.4 University Facilities Planning Board

The University Facilities Planning Board (UFPB) is the body that reviews and provides recommendations on all issues affecting the public realm of the university. As such, UFPB reviews all new building projects, renovation projects, and development or changes to the landscape and grounds of the University. UFPB serves in an advisory capacity to the University President. UFPB also develops, recommends and maintains policies related to the development and utilization of campus facilities and grounds. The board is comprised of members who represent a broad cross section of the university community. The board generally meets twice a month. For additional information on UFPB refer to the UFPB web site.

1.2 Campus Design Goals

The following information is a general discussion of MSU's goals for campus planning and design. This information is expanded upon in greater detail in later sections of this document, but this section serves to consolidate these planning and design goals into one central document.

1.2.1 Building Location and Design Goals

Generally follow the Long Range Campus Development Plan through the following:

1. Building Location
 - A. Protect and preserve the historic campus layout, spatial flow and architectural heritage.
 - B. Site buildings with the intention of expanding the network of clearly defined exterior spaces.
 - C. Locate buildings in close proximity to steam tunnel and infrastructure facilities.
 - D. Provide ADA-compliant access to all buildings and public spaces.

University Facilities
Planning Board
Website:
[www.montana.edu/
us/committees/ufpb](http://www.montana.edu/us/committees/ufpb)

Protect and preserve
historic campus layout

Clearly defined
exterior spaces



Buildings within the campus core must respect their immediate context

2. Building Design
 - A. Design buildings within the campus core to respect their immediate context in terms of existing buildings and infrastructure. Scale, massing, materials and fenestration of these buildings should respect existing buildings, especially when close to historic buildings.
 - The university desires that the design of construction, renovation and major maintenance projects consider the impacts and influence of such projects on historical elements of the campus, which can include buildings, landscape elements, pathways, sculpture, etc. Consideration of a structure's value as an historic element should include its authenticity, the economic viability of its continued existence, its structural integrity, its relationship to campus tradition, its prominence, how it is perceived by the campus community, alumni, and the surrounding community, etc. While it is understood that economic expediency will always be a factor, it is expressly desired that the preservation of historical elements not be subjugated to financial considerations as a matter of course. Consideration in the design of a project shall also be given as to the level of preservation an element may command. For example, if complete and accurate preservation is desirable, then repair and maintenance of the element's original materials may be required. If a significant element is structurally unsound, identical replacement may be considered. If adaptive reuse or an addition to an existing facility is planned, evaluate and identify significant elements that may command preservation or should be used to integrate a new addition. Examples:
 - i. The cupola for Montana Hall was replicated using modern materials but copied the size, shape and aesthetics of the original cupola.
 - ii. The window replacement on Lewis Hall, while energy efficient, is not sensitive to the original building design or fenestration.
 - iii. The vault added to Montana Hall is a good example of "what not to do" for an historically sensitive addition.
 2. Design buildings within the campus core to respect their immediate context in terms of existing buildings infrastructure. Scale, massing, materials and fenestration of these buildings should respect existing building especially when close to historic buildings.
 - A. New buildings shall be designed to permit future expansion and shall be capable of being adapted to new uses as the needs and priorities of the university change.
 - All new design projects should be adaptive and flexible for future growth of the campus. Where possible, expansion opportunities should be part of the original design planning so that growth of the building footprint is orderly. All new construction should be adaptable in design such that changing programs and users are easily accommodated in the future.

- B. Remodeling and/or addition projects must consider the entire building, not restricting initial examination only to a narrow project scope.
 - Elaboration: Renovation projects must be estimated and funded to include remediation of critical code violations. Perpetuation of code violations, when they could be remedied at reasonable cost with a project budget, is not appropriate. If a code problem must be remedied in order to accomplish a project, the project should bear the cost of the necessary fix, unless other readily available funds are identified.
- C. Design projects to be responsive to environmental impact and local climatic extremes.
 - Elaboration: Design elements that are attractive in other areas may not be economically viable when viewed in the context of long-term Operations and Maintenance (O&M). Response to MSU's setting with a local aesthetic for sense of place is desired. Create design elements which will protect people from ice and snow dangers and protect people from ice and snow slides from building roofs. Assure that all walks and building entries are safe distances from slide zones or that they are protected by porticos. Where possible design major walks and entries on the south sides of buildings to gain access to the sun.
- D. Develop projects with recognition for our ability to maintain the resulting facility, given a fundamental awareness of the institutional level of commitment to maintenance.
 - Elaboration: While each project should address its unique programmatic requirements and other unique qualities, O&M costs - while not the sole factor driving design decisions - must occupy a critical place in the planning and design of all projects. The level of design must reflect a corresponding level of maintenance - a level that we have a reasonable expectation will be met. Include consideration for the available level of grounds maintenance and snow removal for all exterior features.
- E. Consider life-cycle cost efficiency of buildings as a design parameter with regard to construction, process, materials selection, maintenance, and energy utilization.
 - Elaboration: Universities must construct facilities that are durable enough to provide the long service life expected by the institution, and these facilities must be maintained during that long life, in the face of steadily increasing labor, material and utility costs. O&M costs over the lifespan of a facility can approach 4-8 times the first cost of construction. Therefore, it is extremely important and appropriate that life-cycle considerations be made during the design phase.
- F. Plan for snow removal routes and snow storage areas in all new projects.
 - Elaboration: Seasonal heavy snowfall is expected at MSU. All new buildings, related parking areas, and walkways shall be planned with logical snow removal and snow storage contingencies shown on the plans. Appropriate clearance and set-backs from snow removal routes are required.



New cupola on
Montana Hall

Design new buildings
to permit future
Design new buildings
and remodelings
to withstand local
New construction
must be designed to
be maintainable
Plan for snow removal



Design all projects to be fully accessible

Campus Noise Guidelines See Appendix 5.7-1

Preserve and enhance outdoor spaces

- G. Noise and fumes from building systems should not be allowed to intrude on adjacent interior or exterior public spaces.
- Elaboration: Noise-generating activities should be located within the building which should be designed to protect users in other buildings or in public open spaces. Buildings should not be permitted to emit unacceptably noxious or otherwise unpleasant fumes or gasses. Delivery vehicles and service loading areas should be planned so that vehicular fumes do not enter the building.
- H. Provide ADA-compliant access to all buildings and public spaces.
- Elaboration: In accordance with the Rehabilitation Act of 1974, no qualified handicapped person shall be denied the benefits of, be excluded from participation in, or be otherwise subjected to discrimination under any program or activity because a recipient's facilities are inaccessible or unusable. When applied to existing facilities (those existing before June 3, 1977), this regulation requires that activities operated in that facility must, when viewed in their entirety, be readily accessible. The standard does not require that every facility or every part of that facility be accessible, so long as the program as a whole is accessible. The regulation requires, however, that all new construction, as well as alterations which could affect access to and use of existing facilities, must be designed and constructed so as to make facilities accessible and usable by handicapped persons. Subsequent to the passage of the Americans With Disabilities Act in 1990, the ADA Accessibility Guidelines (ADAAG) for buildings and facilities became the standard for disability access compliance for non-government facilities and provided government facilities such as MSU with an alternative set of regulations to follow. Montana State University is committed to providing ADA compliant access to its facilities and encourages designers to exceed, where readily achievable, ADAAG and UFAS standards so that no barriers to access to any part of a facility are designed or constructed. In concert with decision-making regarding designated handicapped entrances/exits, a set of automatic doors must be provided for wheelchair users and others with mobility impairments. Serious planning consideration must be given to designing these doors in such a manner that overall visual effect "fits" with the entire building design/theme. These doors should not appear as simple "add-ons" to the building.
 - Elaboration: Montana's mountains and valleys represent one of our most important and "imageable" features. View corridors should be protected to the Bridgers, Hyalites, Tobacco Roots, Spanish Peaks and Sourdough Ridge.

I. Circulation

- Create a recognizable and logical hierarchy of campus circulation with minimal conflicts for public vehicle, service vehicle, bicycle and pedestrian users such that:
 - i. Pedestrian patterns should be dominant.
 - Elaboration: The majority of intra-campus circulation is pedestrian or bicycle-oriented. Walking and the use of bicycles is to be encouraged over the use of automobiles within the campus by design and by policy. This policy is environmentally sound, consistent with the Montana outdoor lifestyle, and can enhance pedestrian safety. Connect all portions of the expanding campus by a hierarchy of pedestrian friendly walks and pathways. Avoid impediments to wheelchairs in paving design. Good design strives to produce a sense of harmony and beauty which is consistent with function and practicality. Interior pedestrian routes should link with exterior routes to provide logical connections through buildings. However, the continuity of exterior pedestrian routes should not be compromised when buildings are closed.
 - Within the campus, first priority should be given to the most vulnerable and desirable system of circulation, the pedestrian. On-campus use of alternate modes of personal transportation such as bicycles should also be encouraged, but a logical circulation system for these faster moving modes of human-powered transit will be required to avoid pedestrian conflicts. Access and egress to parking areas should be designed and/or modified where possible to avoid directing large numbers of automobiles onto campus streets which have heavy flows of pedestrian cross-traffic.
 - ii. Necessary service vehicle circulation in primary pedestrian sectors is on pedestrian-appearing lanes.
 - Elaboration: Access drives should penetrate academic blocks and provide access for service, pick-up and delivery, and trash removal. Because vehicles will use these routes only occasionally, the surface should project a pedestrian character in primarily pedestrian sectors. Major pedestrian paths within the pedestrian precinct will be required to accommodate emergency vehicles and very occasional service vehicles. The requirement for vehicles on these paths should not change their design image, which should clearly express their primary pedestrian function in pedestrian cores and not their occasional vehicular function.
 - iii. Minimize private vehicle use through design by encouraging car-pool, mass transit, bicycle and alternative modes of circulation.

Pedestrian patterns should be dominant

Service drive and delivery area



Minimize private
vehicle use

Vehicle storage and
circulation on campus
perimeter

Clear access from
parking areas to public
buildings

Construction Impacts
on Parking
See Section 2.4.4
See Appendix 2.4-2

- iv. Traffic speeds should be kept low.
 - Elaboration: Traffic calming measures should be considered along heavily used inner campus roads to reduce speeds and increase pedestrian safety. These could include: narrowed streets, rumble strip, and/or colored and textured cross zone delineation.
- v. Public vehicle circulation and storage are on the perimeter of campus. Construct parking facilities that are permanent, durable and maintainable; but accommodate the continued progression of parking surfaces based on level of use.
 - Elaboration: Permanent parking lots shall have concrete curb/gutter as edges, proper lighting, asphalt surfacing, be striped, have adequate signage, landscaping, irrigation systems, proper storm water retention areas, appropriate access walks, etc. Durable pavement requires proper structural base, adequate asphalt thickness, proper slope for run-off, etc. Maintainable lots require no impediments interior to lots (except signage/lighting) such as curb islands or landscaping. Adequate snow storage areas within the lot to minimize damage to surrounding landscaping promote annual surface maintenance and regular cleaning.
- vi. Create reasonable standards to limit the size of contiguous parking lots to soften the visual impact of large lots on campus streetscapes.
 - Elaboration: Maximum size should be viewed with regard to location, surroundings, topography, etc. 400 to 450 vehicles should be the target maximum. However, flexibility is encouraged in consideration for designs that incorporate enhanced setbacks, landscaping and other desirable, enhanced design features as trade-offs for special circumstances that require larger than normal lots.
- vii. Achieve a clarity of access from parking areas to public buildings.
 - Elaboration: Create a balance between pedestrian-oriented open space, buildings and landscape. The configuration, scale and location of future buildings can help overcome the image and reality of a once green campus which is fast disappearing under the automobile. Connect all portions of our expanding campus with a comprehensible pedestrian-oriented network of outdoor spaces which organize buildings and other activities. As we grow, an organized network becomes even more critical than it was early on.
- viii. Major construction projects must account for impacts to the parking system.
 - Elaboration: Some projects displace existing parking facilities. Other projects heavily impact the parking system even though they do not directly displace existing parking. The impacts to the parking system in both situations should be addressed through the project planning process for each building project, not deferred to become immediate problems for the parking system, and the costs should be borne by the project budget.

- To do otherwise would not only result in the parking budget subsidizing the construction of building space, but would also reduce the funds available to construct and maintain a well-designed, visually pleasing and efficient parking system.
- ix. Control bicycle circulation at center of academic core. Bicycle flow and storage shall be carefully planned. Provide adequate, hard-surfaced bicycle parking areas that are conveniently located.
 - Elaboration: The university will cooperate with the City in providing a network of bicycle paths to, from and on the campus. Adequate bicycle parking will be provided in convenient locations on campus, but not in a manner which would promote unnecessary intra-campus bicycle travel. In general, bicycles should share the roads and be treated as vehicles, and be discouraged from the pedestrian precinct. Street reconstruction should include signage and striping for bike lanes. Success of the central campus walk/push zone can be enhanced by conveniently located, permanent bike parking areas at the perimeter of the zone. Bike parking areas should be standardized with regard to types of racks, concrete surfacing, etc. Bike rack areas cannot be kept free of snow in the winter and in some cases may actually provide snow storage area themselves. Bicycle storage shelters should be considered on the periphery of the pedestrian precinct, and undercover bicycle racks should be located near building entrances. Lockers for bicycle storage and safety should be considered in the vicinity of shower facilities at the Marga Hosaeus Fitness Center or Romney Gym for students and employees who wish to commute by bicycle.
- x. Accommodate safe, well-lighted access as well as convenient handicapped access.



Plan for bicycle circulation

Safe, well-lighted access to all campus

1.2.2 Landscape Planning and Design Goals

Generally follow the Campus Landscape Master Plan through the following:

1. Design and maintain individual positive open spaces in a manner appropriate to their intended uses
 - Elaboration: Campus open spaces must include organized activity spaces, spontaneous activity spaces, formalized spaces, major and minor circulation spaces; yet spaces which are primarily sensory, perceptual and of aesthetic value have always been of equal importance to a Montana campus. Spatial subsets should include such ancillary uses as smoking spaces, lunch spots and waiting spaces. Special outdoor spaces for ceremonial use or for concerts should be developed as appropriate.
2. All new buildings shall be designed with appropriate site development and landscaping.
 - Elaboration: All new building projects should incorporate total site development of the adjacent grounds which may include plaza space, seating and other street furniture, lighting, grading and drainage, retaining walls, irrigation systems, service delivery access, and parking as necessary. Landscape planting design with care given to spatial definition, balance, and long-term management of plant growth is required.



- The environmental stress and extended time frame required for replacements of existing trees to grow to maturity demands proceeding with caution. Whenever mature or dying landscaping must be sacrificed, trade-offs such as enhanced restoration or other landscape amenities should be employed.
- 3. Balance campus spaces and buildings with appropriate placement of trees and shrubs.
 - Elaboration: Campus landscaping should be respected as a major element which binds together and unifies many diverse campus facilities. The MSU Landscape Master Plan provides a framework for these unifying elements.
- 4. Delineate the campus boundaries with unifying street trees.
 - Elaboration: Streets, especially those which serve as pedestrian-ways and bikeways, should be planted to create a pedestrian-oriented campus setting rather than the appearance and experience of a poorly planned retail parking lot. Formally plant the perimeter of the campus with unifying street trees to identify the campus edge.
- 5. Be responsive to Bozeman's climate in the placement and selection of plants.
 - Elaboration: Hardiness and survival of plants shall be major criteria in plant selection. Montana's climate extremes greatly reduce species selection. Montana is in an area of frequent drought. Indigenous vegetation which is more easily acclimatized and requires a minimum of long-term watering and maintenance should be utilized for both environmental and budgetary reasons. Planting of shade trees and tall evergreens shall be determined by shade and shadow patterns as they relate to human comfort and safety.
- 6. Reinforce the teaching and research value of the plant collection.
 - Elaboration: Over-planting of individual species should be avoided. In order to maximize teaching values, plant groupings should follow logical association such as geography, environment, historic association, taxonomic relationships and micro-climatic opportunities. Donations through memorials to the Campus Nursery are encouraged for the benefit of the total campus landscape.
- 7. Evaluate the existing landscape prior to alteration or removal.
 - Make the adjacent improvements part of the construction package and included in the project budget and financing.
- 8. Incorporate street furniture at appropriate locations to enhance outdoor interaction.
 - Elaboration: Site furnishings such as lighting, benches, trash cans, and signs will generally conform to established campus standards to act as unifying elements in the campus fabric. Outdoor seating areas should be created which will enhance places for people to congregate.
- 9. Design elements so that they will discourage unintended uses.
 - Elaboration: Avoid creating attractive public nuisances. Design curbs, steps and handrails to discourage unsafe or unintended uses such as skateboarding by use of textures, patterns and/or materials which disrupt the regularity of the edges.

10. Incorporate sculpture and other appropriate focal points for visual interest.
 - Elaboration: Sculpture, interpretive signage, and other features should be prominently displayed to add enlightenment and discovery to the academic core. It should be carefully integrated into the campus setting and appropriately blended with the campus landscape.
11. Maximize technological advancements with minimal detrimental visual impact.
 - Elaboration: Functional elements such as utility boxes, satellite dishes, cellular antennas, and cameras should be carefully sited to minimize visual intrusion and should be appropriately screened with plantings.
12. Establish unifying visual elements for ceremony and celebration.
 - Elaboration: Banners attached to campus light poles can be used to announce special events, ceremonies and to further the impact of campus identity. They can also add to the visual unity of the campus core.

1.2.3 Safety and Informational Goals

1. Provide well lighted public spaces and corridors. Apply campus lighting standards uniformly to all primary access corridors.
 - Elaboration: Eliminate dark areas along the corridors between perimeter parking lots and the main campus without over-lighting landscaping or spilling undesirable light to surrounding areas. MSU is committed to “dark skies” design standards for all exterior building, landscape, sidewalk and street lighting.
2. Provide emergency notification devices and emergency vehicle access at critical locations.
 - Elaboration: Provide campus standard outdoor “blue light” emergency communication pylons in critical areas for convenience and safety. All exterior building and landscape areas should be jointly evaluated with MSU campus police and the campus fire marshal to confirm adequate access for security and emergency vehicles
3. Security of buildings and specific spaces within must be planned and coordinated at the time of programmatic review.
 - Elaboration: Offices, laboratories and other “private” or secure facilities should be separated from public areas of the building. Zones of the building requiring security should be securable without compromising the viability of public spaces or the continuity of public circulation routes.
4. Provide clear standardization of information using minimal number of signs.
 - Elaboration: Direct visitors to visitor information and visitor parking locations from the edge of campus using signage that is distinct from traffic/enforcement signage, yet easy to see, pleasant and unobtrusive. Consideration and design of all appropriate site and building signage should be a part of the project scope. Refer to MSU Wayfinding standards. Minimize signage while clearly communicating necessary



information and develop a hierarchy of visual continuity. Provide places for public notice to convey a dynamic collegial atmosphere. All exterior campus signage shall be reviewed and approved by UFPB prior to fabrication and installation.

1.2.4 Public Art Goals

Provide artistic and aesthetic focal points at appropriate locations in the landscape and in the buildings. Sculpture, interpretive signage, and other features should be prominently displayed to add enlightenment and discovery to the academic core. They should be carefully integrated into the campus setting and appropriately blended with the campus landscape. Further, they should act as unifying elements that integrate into the campus fabric. All proposed public art must be presented to the Public Art Committee for review and approval.

A. Public art should meet one of these three criteria for existence:

- i. Artistic expression
- ii. Conveyance of historical message
- iii. Site development/enhancement

B. Public art should meet the following design criteria:

- i. Must be made of weather-resistant and durable materials, if located outside
- ii. Color palette should consider and be sensitive to the existing campus palette
- iii. Must be independently stable and permanently anchored

1.3 General Administrative Procedures for Design Consultants

This manual is intended to provide Design Consultants with the guidelines and procedures required to provide professional services for new construction and remodeling projects on the MSU campus. The design, construction and materials standards and recommendations contained in this manual are the product of many years of collective wisdom and experience from the staff in the MSU offices of Campus Planning, Design & Construction (CPDC) and Facilities Services. It is understood that not all of the instructions contained within this manual will be applicable to each project, and that on occasion, deviations from these standards may be requested to meet special conditions. The designated CPDC Project Manager will facilitate obtaining necessary approvals of any variations required by special conditions.

The intent of the MSU Campus Design Guidelines is to assist the Design Consultant in achieving the best end goal desired by MSU in regard to design, selection of materials, effective layout of spaces and preferred installations of products and systems.

All information listed below regarding project responsibilities and procedures is for general information and is not intended to supersede the requirements set forth in the Design Consultant's contract for services with the university. In the case of any conflict between this language and the language of the contract, the contract shall govern.

1.3.1 Procedural Instructions

1. General

- A. The Design Consultant will manage the entire project effort in a timely manner. A proposed project schedule shall be submitted by the Design Consultant to the Project Manager at the outset of the project. The Project Manager will manage the project process and assist in the execution of the project by responding with information and communications with the Client Representative and other university entities as necessary.
- B. The Design Consultant shall refer to other sections of this document for the MSU planning and design philosophies or projects impacting the exterior areas of Campus. This document can be accessed on the PDC web site at <http://www.montana.edu/us/pdc/>.
- C. All projects at MSU will be designed in accordance with all local, state and national codes that may pertain to the scope of the project and which are in effect at the time of permitting of the project.
- D. The University Facilities Planning Board (UFPB) must review projects that impact either exterior or interior public spaces. If UFPB approval is required, the Project Manager will present the project to the committee at one or more of their scheduled meetings. The Design Consultant may be asked to attend or present and is to coordinate this with the Project Manager at the appropriate time(s) during the design.
- E. The Project Manager, will provide to the Design Consultant information the university has regarding the building or area impacted by the design in printed and/or electronic format. This may include original construction documents, previous completed projects and floor plans. Information is provided for the Design Consultant's general information but is not represented to be complete or accurate. It is the responsibility of the Design Consultant to review and confirm all information provided.
- F. All projects at MSU deal directly with, or are impacted by, existing facilities and infrastructure including underground infrastructure. MSU will provide to the Design Consultant information the university has regarding existing utilities and infrastructure, however it is the responsibility of the Design Consultant to confirm all information in the field. The Design Consultant will be thorough in their investigation of and response to existing conditions.
- G. The Design Consultant has a specific obligation to investigate and bring to resolution all code, safety and accessibility related requirements of the project.
- H. The Design Consultant will investigate and specify products, materials and processes that will ensure adequate quality for the intended use. Substitutions prior to the bid opening will only be allowed with CPDC's approval and in accordance with the bid documents. Substitutions after the bid period will only be allowed in accordance with the construction documents.

Submit a project schedule at the start of the project

MSU will provide current floor plans and access to original building plans

MSU will provide information on underground utilities



Reviews of contract documents occur at 35 percent, 65 percent and 95 percent of completion

Requirements for hazardous materials investigation and abatement

2. Correspondence
 - A. During the programming, design and construction phases of the project, the Design Consultant shall generally correspond with the CPDC Project Manager. The Project Manager will act as the primary point of contact for the Design Consultant to others that are involved in the project, including the Client Representative. Lines of communication between the key project entities are to be established by the Building Committee at the project kickoff meeting.
 - B. All correspondence should reference the complete MSU project name and PPA number (include the State A&E project number if applicable).
3. Design and Drawing Reviews
 - A. At the milestones indicated in the Design Consultant's contract, design information, plans and specifications shall be submitted to the CPDC Project Manager for review. These milestones occur at the end of Schematic Design (commonly referred to as the "35 percent submittal"), end of Design Development ("65 percent") and the Construction Documents ("95 percent") phase. Larger projects may require two reviews during the Construction Document phase. The development of the Drawings and Specifications are to correspond to the "Consultant Performance and Document Requirements for that particular phase.
 - B. The CPDC Project Manager will coordinate the review of these documents with other key project entities, including the Client Representative, CPDC and Facilities Services. The Design Consultant and their sub-consultants may be required to attend and participate in these reviews and should allow for a two-week review period for each submittal.
4. Existing Conditions
 - A. At the start of a project, and no later than the beginning of Schematic Design, the Design Consultant is expected to independently examine and document the existing conditions, including utilities and building systems, for all areas in and around the project location. CPDC's Records Clerk and CADD Technician can provide original record documents of existing campus facilities and as-built documents from previous projects in electronic (PDF) format for the Design Consultant. In addition, above/below ground utility and other site information is available for most of the campus. All information being provided to the Design Consultant is understood to be for background information only, and MSU does not attest to the completeness or accuracy of the information.
 - B. The Project Manager will provide the Design Consultant with information that MSU may have regarding the presence of hazardous materials in the building or area in which the project is planned. This information is not represented to be exhaustive in nature and the Design Consultant should request any additional examinations they deem necessary in order to identify hazardous materials that maybe present and/or need to be abated as part of the project. The hazardous materials abatement plan should be incorporated into the Design Consultant's construction documents and included as part of the scope of work.

- C. Information between the campus Client, the Design Consultant, the Contractor, and any other campus or off-campus entities as may be required for the execution of the project.
- 5. Project Meetings
 - A. The Design Consultant shall manage all required and necessary project meetings and site visits. This will include preparation and distribution of the meeting agenda 24 hours prior to the meeting, preparation and distribution of meeting minutes. Each meeting should include agenda items for discussion of the project schedule, budget and progress. The Design Consultant will prepare and distribute meeting minutes and site report notes for all meetings.
 - B. The Project Manager will provide agenda formats to the Design Consultant for Pre-Bid and Pre-Construction meetings.
- 6. Project Budget
 - A. The Design Consultant is responsible for preparation of the project budget at each phase of the project, unless otherwise instructed.
 - B. All statements of probable construction costs (estimates) will include project costs for construction, design contingencies, alternates, professional fees, and permits. The Project Manager will provide an MSU form for the estimate, which will include markup factors, FS, ITC and other required fees.
 - C. The Project Manager will review the preliminary and final estimates, examine them for conformance with the project budget, and review them with the Client Representative.
 - D. If at any point in the design process, or after bidding of the Work, the estimate or the construction bids exceed the stated project budget it will, under the terms of the Contract, be the responsibility of the Design Consultant to modify the design to bring the work into conformance with the budget.
- 7. Construction Administration
 - A. The Design Consultant is responsible to furnish drawings and specifications sufficient to obtain competitive bids and the appropriate building permits. The Design Consultant will apply for the building permit with the appropriate jurisdiction(s). On typical projects, MSU will pay the plan review fee and the Contractor will pay for the building permit.
 - B. The Design Consultant will review all shop drawings and other submittals on a timely basis for conformance to the contract document requirements. A copy shall be submitted to the Project Manager for review after the Design Consultant's review.
 - C. The Design Consultant and all consultants will notify the Project Manager of each on-site visit.
 - D. Site visit reports shall contain observations and shall be in a format approved by MSU. Field instructions, change orders, change directives, clarifications and punch lists shall contain directive terminology stating the problem and corrective action. Copies of all correspondence between the Design Consultant and Contractor shall be forwarded to the Project Manager.

Design Consultant
responsible for project
cost estimates

1.3.2 General Instructions for Contract Documents

1. Drawings
 - A. Design professionals using AutoCAD to produce construction drawings will follow MSU's CAD Standard. At the beginning of each project, the Design Consultant shall review MSU's most recent CAD Standard. Any requests for variation from the Standard must be approved by the Project Manager or the CADD Technician in writing. Drawings submitted during Schematic Design will be reviewed by CPDC for conformance to the Standard. The Design Consultant shall make corrections to the drawings as required to meet MSU's Standard.
 - B. All drawings will be produced on MSU's standard size sheets incorporating standard border and title block information. Refer to the CPDC's CAD Standard document, available at <http://www.montana.edu/us/pdc/arch/caddstandards.php>
 - C. Each sheet of the final original drawings shall bear the seal and signature of the appropriate licensed Design Consultant according to Montana State law and the Authorities Having Jurisdiction.
 - D. The Design Consultant shall provide record documents incorporating changes made during the construction process which reflect the as-built conditions in accordance with the Owner Consultant Agreement. These drawings must adhere to MSU's CAD Standard and shall be transmitted to the MSU CADD Technician within 30 days after the date of Final Acceptance for review and approval.
2. Project Manual (Specifications)
 - A. The Project Manager will provide a standard "boilerplate" to the Design Consultant at the beginning of each project. This information should be reviewed thoroughly for coordination and content. The boilerplate typically includes the Invitation for Bids, Instructions to Bidders, Proposal, Performance Bond, Labor and Material Bond, Affidavit on Behalf of Contractor, Consent of Surety, General Conditions of the Contract, Supplementary General Conditions, Substitution Request Form and Montana Prevailing Wage Rates. The boilerplate will also include pertinent Division 0 sections.
 - B. All specifications shall follow the current Construction Standards Institute (CSI) format.
 - C. The project manual cover shall bear the seal and signature of the Design Consultant. It should include the approved project name, CPDC's PPA number, and the State's Architecture & Engineering project number (if applicable).
 - D. The specifications shall include a list of submittals required for the project, to be incorporated into the Division One information.
 - E. The Design Consultant shall follow the Montana Code Annotated (MCA) Procurement Procedures in the development of the specifications. Sole source items are not permitted unless approved, in writing, by MSU. Whenever possible, the specification shall list three approved manufacturers for any one item of material. The specification must state sufficiently the description, manufacturer's names and catalog numbers, technical data, etc. so the bidder will have a complete understanding of what is required to bid on.

- F. Products shall be noted as “no substitution”, “approved equal” or “prior approved equal”. Approval during the bidding period of items, materials or processes not listed in the Contract Documents will be done only by Addendum. “Prior Approved Equals” will require submittal of information with the form included in the specification. Limit the use of substitutions and require “prior approved equals” whenever possible.
- 3. Design/Material Standards
 - A. In addition to indicating all buried utilities on the drawings, the Design Consultant shall clearly communicate on the Contract Documents that the contractor shall notify the Project Manager 72 hours in advance of any type of excavation activity. The Project Manager shall be notified immediately of any damage occurring to utilities.
 - B. It shall be indicated in the contract documents that, except for materials and equipment to be salvaged for reuse or to remain the property of the owner, all demolished materials and equipment are to be removed from the project site by the contractor immediately and disposed of by legal means. No temporary storage or collection sites are available on the MSU campus. Use of university dumpsters is not allowed.
 - C. Designs shall be in compliance with the requirements of the latest published version of the Americans with Disabilities Act guidelines, ADAAG. This requirement extends to the exterior site portion of projects.
- 4. Assignment of Room Numbers
 - A. Room numbers must be approved by CPDC. Room numbers will be assigned, according to standard MSU room numbering guidelines, at the end of Schematic Design, and must be coordinated with existing rooms for all new buildings and renovation and addition projects. Assignment of correct room numbers early in the design is important, so that all drawings provided by the Design Consultant are consistent and accurate.

1.4 Building Design Service Life Expectancy

In general, MSU buildings are to be designed with an overall, 75-year, life expectancy. The life expectancy for any facility shall equal the life expectancy for the following items: designed life of building, inaccessible or structural components, expensive or difficult to replace components (for example, below-grade utilities), major replaceable components, and exterior materials. There are two exceptions to the above. These include buildings with a 75-year life expectancy shall have a life expectancy for major, replaceable components of 25 years and some student housing buildings may be designed with a 30-year life expectancy.

University facilities
designed for 75 year
life expectancy

For buildings and sites over 50 years old, CPDC will initiate the consultation process with SHPO during the early phases of the project.

Principles for Sustainable Building
See Appendix 1.6-1 -Sustainability

1.5 Preservation of Architecturally Significant elements

MSU has a responsibility to protect the physical features and historic character of properties designated on the National Register of Historic Places and the State Register of Cultural Properties which includes those properties that are considered eligible for such designation. MSU maintains a list of these properties and will notify the design team at the initiation of any project impacting them.

Before the start of renewal and new construction projects which will affect designated or listed properties, MSU is required, in cooperation with the Montana State Historic Preservation Office (SHPO), to determine appropriate treatments and to seek ways to avoid and mitigate any adverse effects on designated or listed properties. The Design Consultant may be requested to provide supporting information to assist MSU in initiating the consultation process with SHPO.

CPDC, through the University Architect and Associate University Planner, provides analysis, interpretation and advisory input on all historic buildings, objects, landscapes, and archeological sites affected by renewal, new construction, restoration, rehabilitation, renovation, and maintenance projects throughout the Montana University System (MUS).

1.6 Sustainable Building Principles

MSU was founded in 1893 on principals of land stewardship. It began as a School of Agriculture and has evolved into a University of 7 Colleges and over 70 Departments, Centers, Institutes and Programs, extending over 900 acres of the beautiful Gallatin Valley of Montana. In addition to identifying and reinforcing important visual and physical connections to our agricultural context, development on campus should be an example to our students and community of how sustainable development can enhance the short term and long term quality of our environment.

MSU recognizes that along with effective long range planning, a greater transformation is necessary to advance its commitment to environmentally, socially and economically sustainable decisions and choices. See the MSU's Long Range Campus Development Plan (Design Guidelines: Appendix 2.1) for existing sustainable practices and recycling efforts that are in place and are to be considered for all projects.

These principles are intended to provide direction and point towards resources for sustainable designs and construction of new buildings and the comprehensive renewal of existing buildings at MSU. The requirements of this process are intended to complement other sections within the Campus Design Guidelines which contain requirements particular to specific building programs or systems. These Sustainable Building Principles are summarized as follows:

- Set goals and benchmarks for each project
- Conduct a site survey and evaluate existing conditions.
- Model various methods of meeting goals and benchmarks and use results to make decisions.
- Repeat the modeling and analysis as the design is developed to refine decisions.
- Review and monitor the expected outcome during documentation and construction.
- Measure the outcome to determine success, and to establish benchmarks for future projects.

1.6.1 Sustainable Building Process

The Project Manager will notify the Design Consultant whether or not this process will be carried out for the specific project under consideration.

1. Integrated Design

- A. Buildings are often comprised of interconnected networks with complicated and complex systems. Building in a sustainable manner requires consideration of those networks and systems, as well as the individual components, and can be best accomplished through an integrated design process, i.e. the active and continuing participation of all members of the project team. The Building Committee and the Design Consultant (and the Construction Manager if using the General Contractor/Construction Manager alternative delivery method) must collaborate to find the beneficial relationships among site and building systems that result in an environmentally sustainable outcome in support of the program. The Design Team must be committed to working through a collaborative process to learn new ways of considering these systems.
- B. New construction and major renovation projects will benchmark against the equivalent to LEED silver rating. At the beginning of the project, the Building Committee will determine if formal LEED project certification will be sought.



Minimum Benchmark:
LEED Silver exclusive
of certification

2. Organizational Meetings

- The Design Consultant will plan and facilitate meetings with the Building Committee and other campus committees specifically to further the integrated design process during different stages of the project:
 - A. Programming/Pre-Schematic : the Design Consultant will facilitate a Sustainability Charette to establish goals and objectives with respect to sustainable building design, benchmarking and metrics. Ideally, this will be done as part of a broader agenda focused on overall project goals including program, campus planning and project-budgeting. If those goals have already been set, a meeting focusing specifically on sustainable design objectives which are mutually supportive of other project goals will be conducted.
 - B. Pre-Bid and Pre-Construction Meetings: During the Pre-Bid the Project Manager and the Design Consultant will convey project sustainability objectives to bidders. Requirements will be reviewed again at the Pre-Construction meetings for relevant trades.
 - C. Final Acceptance: At the conclusion of the project the Design Consultant will facilitate a Best Practices meeting in order to evaluate the process and the initial outcome.

3. Required Documentation

Following is a summary of documentation requirements for the sustainable design:

- A. As part of the programming document or feasibility study, record of the project's sustainability goals from the Sustainability Charrette, including benchmarking objectives and metrics.
- B. Record of largest energy impacts & priorities based on preliminary energy model in conjunction with the mechanical and electrical narrative.
- C. Projected energy usage.
- D. Energy model reports.
- E. Annotated LEED checklists.
- F. Meeting notes from the Best Practices meetings recording the discussion and recommending improvements for future projects and processes.

1.6.2 Social and Environmental Impact Assessment

Below is a list of considerations for social and environmental impact assessment. This list is not intended to be all-inclusive, but to highlight anticipated issues for review and discussion:

1. Land Use, Water and Ecosystem Quality
 - A. Retain open space
 - B. Optimize program and development density
 - i. Limit site disturbance
 - ii. Reducing building footprint
 - C. Increase flexibility / adaptive reuse potential
 - D. Optimize building orientation
 - i. Utilize passive design strategies
 - E. Reduce heat island effects
 - i. Providing adequate shade coverage
 - ii. Select high albedo / light-colored materials
 - iii. Select high-reflectance, high-emissivity roofing materials
 - F. Reduces automobile use
 - i. Promote efficient transportation alternatives
 - ii. Optimize parking lot location and design
 - G. Maximize water use efficiency
 - i. Reduce potable water use
 - ii. Use captured or recycled water
 - iii. Employ sustainable landscaping strategies
 - H. Minimize storm-water runoff
 - i. Select permeable paving materials
 - ii. Increase on-site stormwater filtration
 - iii. Reduce stormwater contaminants
 - I. Employ restorative design strategies



Promote
transportation
alternatives

Has the Design Team
addressed the social
and programmatic
factors?

Permeable paving
materials



Have the social and environmental items relating to materials and waste been addressed?

Daylight and natural ventilation



2. Social & Programmatic Factors
 - A. Improve building safety and security
 - B. Improve site security
 - C. Improve interior acoustic control
 - D. Reduce exterior noise pollution
 - E. Reduces exterior light pollution
 - F. Improve operational efficiency
 - G. Provide flexibility of systems
 - H. Promote user information and education value
3. Materials and Waste
 - A. Reduce solid waste generation
 - i. Enforce construction / demolition waste management plan
 - ii. Promote existing building reuse
 - iii. Select reused and salvaged materials
 - iv. Select recycled content materials
 - v. Reduce non-renewable resource selection
 - vi. Maximize storage / collection of recyclables
 - B. Select rapidly renewable resource materials
 - C. Select low-embodied energy materials
4. Indoor Environmental Quality
 - A. Optimize ventilation effectiveness
 - B. Employ natural ventilation strategies
 - C. Minimize indoor and chemical pollutants
 - i. Select low-emitting materials
 - ii. Encourage non-toxic maintenance protocol
 - iii. Design separation from exterior pollutants
 - D. Increase thermal comfort, improve controllability of systems
 - E. Optimize natural daylight and view

5. Energy and Atmosphere
 - A. Reduce fossil fuel depletion
 - B. Using renewable energy sources
 - C. Reduce energy-related emissions
 - i. Reduce greenhouse gas emissions
 - ii. Reduce ozone-depleting emissions
 - iii. Maximize envelope thermal performance
 - iv. Integrate daylight / electric lighting controls
 - v. Improve Mechanical systems performance
 - vi. Eliminate equipment use of CFC's (chlorofluorocarbon refrigerants)

1.6.3 Materials Selection

Conscientious design is the first step towards controlling the generation of solid waste on a building project. Effective design-stage waste reduction strategies include existing building reuse, optimization of building program, envelope and systems energy efficiency, the use of alternative building materials (salvaged, recycled content and rapidly renewable materials), detailing and dimensioning to limit material waste, proper planning for the storage and collection of recyclables, and sustainability-oriented design specification language and contractor requirements.

Durability, maintenance and aesthetics are the primary criteria for materials selection. These standards have been developed on a material's proven ability to meet the programmatic, maintenance and aesthetic performance goals of MSU through the test of time and use. See the [Appendix Section x.x.x](#) for these standards.

Changing technologies have resulted in a wealth of new materials on the market. The potential for their application in MSU building projects is encouraged provided adequate evaluation of the primary criteria cited above.

Have the material selection requirements been incorporated into the project specifications?



1.6.4 Waste Management

Design Specifications and Construction Waste Management

1. According to the EPA (Environmental Protection Agency), construction, deconstruction and land-clearing debris combined comprises at least 24 percent of municipal solid waste. Establishing waste reduction goals and supplementing cost-effective construction waste management techniques can significantly reduce this impact and provide economic advantages for projects of all types and scales. Currently, the MSU's established goal is for the recycling of 95 percent of all eligible materials post-abatement.
2. The Design Consultant shall include in the project specifications the requirement for the contractor to submit a construction and demolition waste management plan for approval by the Design Consultant and Project Manager at the beginning of the submittal and renewal period (or earlier when applicable). This plan must include, but is not limited to the following:
 - A. Analysis of the proposed project site waste to be generated, including the types of recyclable and waste materials generated (by volume or weight).
 - B. A list of each material proposed to be salvaged, reused or recycled during the project.
 - C. A list of proposed recycling facilities to be used in the project.
 - D. An outline of proposed project waste management meetings (at a minimum, waste management goals and issues shall be discussed at the Pre-Bid meeting, Pre-Construction meeting and regular project construction meetings).
 - E. Materials handling procedures for removal, separation, storage, and transportation.
 - F. A communication plan for informing subcontractors and crews about the waste management plan, establishing job-site instruction, notification and signage procedures for waste management and providing a methodology for documenting and reporting quantities of types of materials reused, salvaged, recycled, and disposed.
 - G. Proof of distribution times, weights, etc from trucks removing debris from the project site.
3. Other effective specification waste-reduction strategies include the use of bid alternates for undertaking specific recycling measures, the use of language that requires waste reduction, reuse and recycling to the fullest extent possible. Useful waste management references for both Design Consultants and Contractors can be found in Appendix 1.6-1(Sustainability Resources).
4. Project specifications and contracts must include the Contractor to provide proof of delivery to recycling sites in accordance with the MSU's internal deconstruction and construction debris recycling goals. Early in the process, deconstruction contractors should provide the Project Manager with a list of proposed recycling facilities intended for use as part of the project recycling plan.

1.6.5 Commissioning

Commissioning is an integral part of the sustainability effort for all projects which include new or modified mechanical systems. On smaller projects the Design Consultant may provide commissioning services, but on all larger projects MSU will engage a commissioning agent under separate contract.

1.6.6 Site Planning

1. The Long Range Campus Development Plan speaks to both campus-wide and neighborhood-specific strategies for
 - A. utility distribution
 - B. stormwater management
 - C. energy efficiency goals / targets
 - D. sustainable landscape strategies
 - E. planting materials
 - F. paving materials
 - G. exterior lighting plan
 - H. transportation and parking plan
 - I. potable water use plan.

2. The greatest potential for understanding and managing the environmental impacts of a project is through early and multi-disciplinary consideration of
 - A. site selection criteria
 - B. building siting
 - C. orientation and massing
 - D. water usage
 - E. stormwater management
 - F. landscaping strategies.

The Sustainability Charrette (to be conducted during the Pre-Schematic/Programming phase) is intended to ensure that these critical issues are addressed by the Design Consultant in a timely and holistic manner (Refer to Section 1.6.3 Outline of Process).



Outline of
Site Planning Process:
See Section 1.6.3

Project Responsibility
Checklist Form
See Appendix 1.7-1

1.7 Project Responsibility Checklist

The project responsibility checklist is intended to assist the Project Managers in developing consistent approaches to respective phases of every project. Although not every task herein is listed or necessary, the overall method of project delivery commonly follows this format and serves as MSU's standard. Dates are to be inserted by the Project Manager as each task is completed by MSU or the Design Consultant. Shaded areas indicate the responsible party. Please note that many tasks have a dual responsibility between MSU and the Design Consultant (See Appendix 1.7-1).

List of Acronyms Used

- BIM – Building Information Management
- EHS – Environmental Health and Safety
- GIS – Geographic Information Systems
- LCCA – Life Cycle Cost Analysis
- PM – Project Manager
- SRM – Safety & Risk Management
- UFPB – University Facilities Planning Board

1.8 Documentation and Archiving

The purpose of this section is to state the requirements for documentation and procedure for archiving project documents.

1. The documentation requirements involve specific formatting and procedural requirements for drawing production, particularly related to Computer Aided Drafting (CAD). The archiving requirements pertain to both CAD and printed materials.
2. All requirements are intended to be consistent with the General Conditions of the Contract for Contractors and Owner Consultant Agreement for the Design Consultant. The aforementioned documents provide a basis by which the university may accept or reject the digital deliverables related to a project. These requirements are to be adhered to for all projects.
3. Guidelines have been established for the process of calculating both the net and gross square foot area of MSU buildings. The Design Consultant should anticipate the incorporation of these guidelines as they apply to the building program (See Appendix 1.8-4).
4. During the Schematic Design Phase, the Design Consultant must meet with the CPDC to review the process for the square foot calculation of areas and classification of operational uses for the various elements of the building program (See Appendix 1.8-4).

1.8.1 Room Numbering Requirements

1. It is the intent of all projects to have permanent room numbers assigned by the end of the Schematic Design Phase. It is the responsibility of the Design Consultant to initiate and complete this process by submitting floor plans with room numbers, and the Project Manager's responsibility to gather required approvals. All drawings shall reference MSU's approved final room numbering system.
2. Guidelines have been established for the process to be followed in the assigning of numbers and designations for both net assignable and nonassignable spaces. The Design Consultant should anticipate the incorporation of these standards into the construction documents for the project and should work with the Project Manager to conform to the system set forth in Appendix 1.8-3.
3. To facilitate the understanding of room numbering requirements, a meeting with the Project Manager and Design Consultant should occur at the start of the Schematic Design phase. This meeting will clarify the appropriate method for assigning room numbers based on previous MSU projects. **1.8.2 Existing Documentation Availability and Distribution**
4. Electronic documents of site and building information are available and accessible in a variety of formats. The Project Manager will assist the Design Consultant to obtain the information and options for transferring of data.

1.8.2 Archiving Requirements

1. The preparation and submittal of well-executed closeout documents requires close coordination between the Design Consultant and Contractor as defined by the General Conditions of the Contract for Construction and the Owner Consultant Agreement.
2. The list of required documentation may be found in the Project Closeout Checklist in Appendix _____. It is the responsibility of the Design Consultant and the Contractor to ensure that all documentation is submitted in order and in a timely manner. This procedure is initiated by the Design Consultant, providing latest design information to the Contractor in the field. Once received by Contractor, the following procedures apply:
3. As-Built – consists of Contractor or Sub-Contractor produced documentation of work in place of respective systems.
 - A. Submission requirements may be found in individual Specifications sections of the Contract Documents
 - B. At a minimum, all systems listed in Specifications shall be submitted by the Contractor. The Contractor is required to provide dimensional verification of all plans, in addition to any changes made to the documents or work during construction.
 - C. Refer to the Summary of Document Archiving Requirements in this section for details.

4. Project Record Documents – Consists of Design Consultant produced versions of the latest Construction Document set sent to the field with the addition of all information from the As-Built Drawings and Project Manual.
5. Operational and Maintenance Manuals/Data – The Contractor shall submit all operations and maintenance manuals to the Design Consultant for review and approval, prior to the final demonstration of the equipment.
6. After final approval, the Design Consultant shall deliver one complete set of digital files and sets of printed copies to the Project Manager. See Appendix ___ for more details.

1.8.3 Archiving Requirements – Paper

The Design Consultant will provide two paper copies of record drawings on 20 pound bond paper and three copies of the Project Manual to the university. A/E will provide three copies of O&M information to the university.

1.8.4 Archiving Requirements – Electronic

The Design Consultant will provide an electronic copy of Record Drawings, Project Manual and O&M manuals in the format noted in the Owner Consultant Agreement and as noted in Appendix 1.8-2.

1.8.5 Closeout Documentation Review

Prior to submission to the university of all Closeout documentation listed, complete the MSU project Closeout checklist.

1.8.6 Formatting of Printed Deliverables – As-built Drawings

Document Identification

1. Project Title
2. Drawing Title
3. Project Location
4. Document Submission Date
5. Name and Dress of Subcontractor
6. Contract Name and Telephone Number
7. Revision Dates
8. Scale and North Arrow include the specific reference (NAD83, Grid or Magnetic) to any applicable information such as deed, filed plan.
9. Datum and Grid / Ground Scale Factor Notes

1.8.8 Formatting of Electronic Deliverables

Document Identification

All requirements for document identification from printed deliverables apply to electronic deliverables. Additional digital requirements are specified in Appendix 1.8-2. Formatting of Electronic Deliverables

1.8.9 Use of Montana State University Existing Digital Data

MSU strives to be completely digital, including the conversion of all existing hard copy building and utility plans to digital CAD drawings. After the Design Consultant is under contract, MSU will provide relevant available electronic files for the project. The digital information is provided to assist the Design Consultant obtain as much information about the existing conditions related to the project and shall be used for any other purpose by the Design Consultant. While the information is as accurate as possible, discrepancies between drawings and actual existing built conditions may exist. To that extent, MSU does not warrant the accuracy of the information provided.

1.8.10 Building Information Modeling

1. The use of Building Information Modeling (BIM) will be utilized where appropriate and if required by the Owner Consultant Agreement. The use of BIM will
 - A. enable measurable improvements to the quality of projects and savings in cost and time.
 - B. It will promote value-added visualization,
 - C. simulation and optimization technologies (such as renderings, cost estimating, energy modeling, and clash detection).
 - D. The BIM model will also be used after completion to complement, leverage and improve facilities management technologies.
2. The project-specific BIM requirements will be established at the project inception, based on collaboration with the project team, led by MSU. All parties of the Project Team will work collaboratively together to establish a BIM Execution Plan early in the design phase that will provide a framework allowing the Design Consultant, the Contractor, and MSU to deploy BIM technology and best practices on the the project faster and more cost-effectively.
3. In addition to the design phase, the BIM implementation plan will include strategies for use of the BIM model during the bidding, construction and close out phases.
4. A digital copy of the BIM file shall be transferred to the CADD Technician for the Close-out documentation.
5. The Design Consultant submitting the BIM file for archiving by MSU shall include an Electronic File Transfer Disclaimer stating that the BIM file was produced for use on the specific project at that time and future use of the BIM file by MSU will not hold the original creator of the file liable for program discrepancies.

BIM Execution Plan
- developed by the
Project Team

Provide a Digital Copy
of BIM Model: with
Disclaimer

1.9 Accessibility

Much of MSU's historic campus was originally designed in ways which may not have provided for accessible routes and features to all parts of its buildings. Nevertheless, one of the goals of every MSU project is to enhance and improve the accessibility of the campus and its buildings, and to create accessible routes to and through MSU facilities accomplished without assistance or special knowledge.

Moreover, it is the goal of MSU that all new construction and renovation be designed and includes features to allow for independent use to the highest extent possible of all campus facilities by all individuals regardless of disability. MSU is committed to ensuring access for individuals with disabilities, including but not limited to students, employees, occupants, spectators, participants, consumers, or visitors.

1. MSU is subject to regulations under state and federal laws, including the International Building Code (IBC) and the Americans with Disabilities Act (ADA), and the Montana Human Rights Act. Under applicable law, disabilities may include physical, mental, sensory or cognitive impairments or disorders.
2. The Design Consultant is responsible for meeting all applicable codes as referenced by the Montana Department of Labor and Industry's Building Codes Bureau and regulations required by the ADA, specifically the ADA Accessibility Guidelines (ADAAG) adopted by the Department of Justice.
3. For all projects, in addition to meeting the above referenced codes and standards, any project-specific goals identified by MSU to enhance and improve the accessibility of the campus and its buildings must be considered and incorporated by the Design Consultant.
4. No modification may be undertaken that makes the campus less accessible. It is the MSU's long term goal to have an accessible campus to the fullest extent possible.
5. To begin identifying the extent of facility accessibility needs, MSU has compiled an ADA Transition Plan (insert link here) describing the location and the specific deficiency for each building.
6. For all projects, the Design Consultant shall review the Transition Plan and incorporate accessibility upgrades into the project scope if within the project site or boundary.



Accessibility
Requirements
See ICC/ANSI A117.7

See Section 2.9
Pedestrian Access

1.9.1 University Review Guidelines

1. The Project Manager will facilitate a meeting, prior to the schematic design phase, with
 - A. the Office of Disability,
 - B. Re-Entry and Veteran Services
 - C. Parking Services (if accessible routes are part of the project) to discuss the project's goals with respect to accessibility.
2. For all projects, the Project Manager will review the project's accessibility goals with the Design Consultant and will serve to determine the scope of the accessibility improvements to be included in the final scope of work for the project. Refer to Design and Drawing Reviews in Section 1.3.2.
3. For any project that affects the exterior of the building, including walks, drives or landscape, a planning review by UFPB may be required.
4. The Design Consultant should consult the Project Manager at the beginning of the project regarding this process as it can be time consuming and projects are often time-sensitive.

1.9.2 Design and Procedural Guidelines

First and foremost, no alterations may be made to buildings or areas on campus that make the campus less accessible.

1. The Design Consultant must incorporate requirements stipulated by the IBC and the ADA regarding accessibility. Refer to Chapter 1.2.2 Building Location and Design Goals and Chapter 2.9 Pedestrian Access for additional information.
2. In addition to the building code requirements and accessibility guidelines, the Design Consultant shall use the following list to review with the Project Manager and incorporate into the final design these concepts that are applicable:



See Section 7.0
Historical Buildings
for Renovation or
Additions to Historical
Buildings



Assistive Listening
System for
Instructional Space
See Appendix 1.9-2

Accessibility Program
Document
See Appendix 1.9-4

Accessibility Checklist
See Appendix 1.9-5

- A. Connection of the new or existing building with the existing campus accessible routes and/or transportation features. These include but are not limited to the Streamline Bus and the Campus Accessibility Map (See Appendix 1.9-1).
 - B. If applicable, modification of existing entrances to provide accessible ingress
 - C. Access to primary function spaces in the building
 - D. Access to accessible toilets in the building Access to all public services in the building
 - E. Assistive listening system at all fixed seating classrooms
 - F. Identification of existing non-compliant conditions within the limits of the project scope
 - G. If applicable, workplace accommodations as appropriate for the building type
 - H. If applicable, accommodations for housing
3. The Design Consultant should be cognizant of normal construction tolerances, and as such, exercise appropriate judgment in applying code minimum or maximum dimensions so that installed work will always fall within federal and state guidelines.

1.9.3 Guidelines and Requirements for Documentation

1. The Design Consultant shall provide documentation in adequate detail for accessible features such that will allow review agencies to approve the project.
 - Proposed conditions shall be shown to comply with the requirements of the IBC and its barrier free subcode, and with ICC/ANSI A-117.1 American National Standard for Accessibility and the Federal standards as identified by the ADA and ADAAG.
2. The Design Consultant shall review and fill out the Accessibility Program Document for any new construction project with significant access considerations (See Appendix 1.9-4).
3. The Design Consultant shall review and fill out the Accessibility Checklist for any project in existing MSU facilities having accessibility-related issues (see Appendix 1.9-5).
4. Site plans need to show the accessible parking spaces required for the project if applicable, and accessible routes from existing parking lots, walks, or drives to accessible entrances.
5. The contractor shall provide an as-built survey to confirm the elevations along the accessible route.

1.9.4 Other Considerations for Accessible Design

The Design Consultant should review the following with the Project Manager, to ascertain approaches to accessibility and design features that might be unique to MSU facilities which above and beyond the requirements of the Code Requirements, but never less accessible than that required by the Code Requirements:

1. Site Related Design Issues:
 - A. Parking
 - B. Curb ramps, curb cuts and accessible routes
 - C. Walking / travel
 - D. Exterior and interior ramps
 - E. Exterior signage

2. Building Related Design Issues:
 - A. Building entrances
 - B. Floor surfaces
 - C. Doorways
 - D. Toilet and bathing rooms
 - E. Elevators
 - F. Operational building components
 - G. Protruding objects
 - H. Clear floor areas
 - I. Interior signage Braille requirements
 - J. Handrails
 - K. Residence halls / dwelling units
 - L. Laboratory equipment and features
 - M. Classroom accommodations and features
 - N. Business and office spaces



ADA Design Guide
See Appendix 1.9-3



1.10 Environmental Graphics

Environmental graphics includes both interior and exterior signs or lettering that are project specific, as well as campus-wide sign systems for wayfinding and information.

1. The Design Consultant is encouraged to retain the services of a Graphic Designer for all project-specific signage and to coordinate their work with emerging campus-wide sign systems (See Wayfinding below).
2. The MSU LRCDP and LMP have set forth campus signage goals that are to be incorporated into every project (See Environmental Graphics Checklist Appendix 1.10-3).

1.10.1 Exterior Building Signage

1. Typically each building project requires at least two types of exterior signs,
 - A. a building identification sign (building ID) showing the officially recognized name of the building (See Appendix 1.10-6), and information signs for ADA routes, service deliveries, parking, etc. The building identification sign should be located near the primary entrance and its design is to meet the current design standard.
 - B. The determination of primary vs. secondary entrances is to be made by the Project Manager during the design phase.
2. MSU's Wayfinding and Signage Plan shows several examples of appropriate use of materials and typography for exterior building identification; these include carving directly into the building's stone, pin-mounted metal lettering, vinyl lettering on glass, and various metal plaques.
3. There are many existing precedents on campus; informational, regulatory and traffic signage and are included in the Wayfinding Plan (See Appendix 1.10-1).

Building Information signage (See Appendix 1.10-6).



MSU Campus
Wayfinding Plan
See Appendix 1.10-1

Environmental
Graphics Checklist
See Appendix 1.10-3

1.10.2 Interior Building Signage

In addition to complying with building code requirements and ADA guidelines for interior signage, the Design Consultant shall follow the Interior Signage Standard (Appendix 1.10-2) for the following locations for size, color, typeface, and Braille requirements:

1. Auxiliary entrances
2. Individual rooms (offices, classrooms, etc.)
3. Stairs
4. Hallway / corridor
5. Restrooms
6. Mechanical / custodial rooms
7. Elevator
8. Area of refuge
9. Room occupancy
10. LEED plaques

Technical information for construction specifications regarding solutions for manufacturing of signs (i.e. CNC, pressure molded, sand blasted, etc.) is included in the Door and Room Signage Specifications (See Appendix 1.10-5).

1.10.3 Dedicatory Inscriptions

In addition to the design of interior building signage, graphic design services may also include design of a dedicatory, commemorative, or memorial inscription or plaque, as part of the project. Whenever relevant, the requirements will be provided to the Design Consultant during the schematic design phase by the Project Manager.

1.10.4 Print Guidelines

The MSU graphic identity program consists of logo and tagline information as well as branded fonts, color palettes and photography style. These visual identity guidelines apply to use of the MSU name, logo, and brand strengths in print, electronic, and video communications. The Design Consultant may access this for general information through MSU's University Communications website.

Building Information
Signage
See Appendix 1.10-6

MSU Graphics &
Communications
Office Website:
[www.montana.edu/
cpa/](http://www.montana.edu/cpa/)

MSU Wayfinding Plan
See Appendix 1.10-1





1.10.5 Wayfinding

MSU is currently moving from a conservative use of exterior environmental graphics to the deployment of a comprehensive, yet, discreet, Campus Wayfinding Program.

1. The program consists of a campus-wide directional and informational sign system, campus maps and directories, which are geared primarily for campus visitors.
2. The improved College Street and South 11th Avenue entry signage set the standard requirements for campus entry points.
3. CPDC shall locate primary and secondary entries to campus.
4. MSU's LMP describes the goals of campus-wide wayfinding and should be referenced by the Design Consultant.
5. Wayfinding signage shall be designed by the university's Graphic Design Consultant and will be implemented over time.
6. Campus wayfinding is generally independent of project specific signage but may in some instances be used to supplement exterior building identification (See the Montana State University Wayfinding and Signage Plan Appendix 1.10-1).

1.10.6 Construction Signage

The Design Consultant shall review the Construction Signage Standard (Appendix 1.10-7) for design examples and guidelines and include in the contract documents. The Design Consultant and the Contractor shall review the location of the construction sign with the Project Manager for final approval prior to installation.

1.10.7 Review Guidelines

1. Documentation for interior signage typically comes late in a construction project, and review is generally limited to the Project Manager, the University Architect, and representatives of the client department.
2. If the Project Manager determines that a consultant independent of the design firm will be used for signage, then the signage is usually shown on plans specifically drawn for that purpose; otherwise the signage will be included on the construction documents as shown in the Appendix 1.10-8.
3. Typically, signage proposals will be reviewed in preliminary form, and may proceed directly to the final plans, depending on the complexity of the project.
 - A. Design Consultants shall provide timely and coordinated responses to all review comments. Preferably, with the assistance of the Project Manager, review meetings should be held with respective internal contacts as identified by the Project Manager to facilitate this process.



Signage
Documentation
Checklist
See Appendix 1.10-8

Construction Signage
Standard
See Appendix 1.10-7



- B. The Design Consultant is responsible for documenting minutes of all these meetings. There, review comments or recent revisions may be discussed and documented.
- C. If these review meetings are not held, or if any non-compliant design or component is selected, the Design Consultant shall provide MSU written documentation of respective changes prior to submission of the next round of documents.

1.10.8 Procedural Guidelines – Preliminary Design and Design Development

1. The Design Consultant should determine at the beginning of the project, in consultation with the Project Manager, whether a Graphics Consultant will be used on the project and what the scope and budget of graphic services will be for the project.
2. During preliminary design, the Design Consultant is to consult with the Project Manager to ascertain
 - A. the level of signage needed for a building,
 - B. that required for specific building areas, and
 - C. that needed in the area around a building.
3. The Design Consultant is to develop a code-conformance schedule, outlining the minimum signage to meet code requirements.
4. The building exterior signage shall comply with the MSU Wayfinding and Signage Plan (Appendix 1.10-1).
5. The building interior signage shall comply with the Interior Building Signage Standard and Interior Building Information Signage (See Appendix 1.10-3).
6. Floor plans, indicating the location of each sign, and a sign schedule, with sign types listed on a room-by-room basis, are to be included in the Design Development review set.
7. The Design Consultant shall provide an elevation drawing of sign type, showing mounting heights, and specifications, for the Construction Document review set (See Appendix 1.10.2).

1.10.9 Guidelines for Installation and Performance

1. Signage for room numbers is considered permanent and shall comply with ADA barrier-free requirements.
2. Names that may be attached to or be a part of a room number sign should be easily adaptable and changeable. Window signs, for example, allow the client/user to maintain the signs in the building. To this end, a limited graphics computer program is will be provided to the client, which will allow the creation of new sign inserts in the Design Consultant’s selected typeface and format.

Graphics Consultant may be required by CPDC Project Manager

Wayfinding Plan
See Appendix 1.10-1

Building Information Signage
See Appendix 1.10-6

Door and Room Numbering Standards
See Appendix 1.10-5

Signage Meeting Occurs before Design Development

3. Interior signage is typically installed using double-faced foam tape.
4. Installation of signage is either done by the Contractor or by a work order to Facility Services, depending on the size and complexity of the installation.
5. Once the final scope, size and construction schedule of the building is determined in Schematic Design, the Project Manager will determine if the Contractor or Facilities Services will install the signs.
6. For exterior signage, concealed, and/or vandal-proof, fasteners are preferred. Through-bolts are not to be used unless no other option is available, and then only with permission from the Project Manager. Embedded anchors are typically used on masonry.

For residence hall interior signage, see Section 6.3.

1.11 Furniture, Fixtures and Equipment

During the development of the Initial Project Information (IPI), the need for, and the extent of, interior design services for the project is to be determined. The Design Consultant should come to an agreement with the Project Manager to determine responsibilities for space planning, and the design, specification, procurement and installment of furniture, fixtures, and equipment; whether design is to be done under the project Design Consultant's, whether a separate design professional will be engaged or whether the MSU will assume responsibility for the design and purchasing of furnishings under another arrangement. The scope and budget for furnishings must be established early on to ensure delivery and installation will fall into its proper sequence in the project schedule. An inventory of the existing furniture and equipment may be required if concluded that they will be re-used or re-purposed in new or renovated space.

1.11.1 Design Guidelines

The shapes and sizes of office, classroom, and lab spaces vary greatly, although there are furnishing needs common to many uses. Depending on the department and use of space, there may be a greater or lesser need for pieces such as shelving or filing cabinets, work tables or computer stations, etc. Some of the common elements follow.

Finishes are dependent on a number of factors – budget, aesthetics, etc., and may be different for different functions and positions within a department. The furnishing of public spaces should reflect the nature of the building's architecture, while other spaces may vary from such design constraint and take on a more personalized character.



Who Has FF&E
Responsibility for the
Project?

Existing Furniture and
Equipment Inventory

1. Work Spaces / Office Spaces

The Design Consultant should consider the following to determine the extent of furniture for office areas:

- A. Chairs - office task chair, ergonomically-designed, and guest chairs,
- B. Work surfaces - sufficient depth, sufficient space for multiple monitors, keyboard, and a phone. Provide adjustable-height surface only if requested by MSU.
- C. Computer accessories - space for towers, keyboard trays, printers, etc
- D. Task lighting - assess lighting levels at work surface, coordinate with layout and overall lighting design
- E. Storage - freestanding bookshelves, binder bins, lateral file cabinets, and pedestal or mobile file cabinets. The amount of storage will vary with the needs of the office space type (closed office, open office, for faculty or staff). Determine the amount of storage required for each space type. For any storage selection that is attached to walls, provide sufficient blocking within walls to support the weight. The height and configuration shall not interfere with the sprinkler systems. Provide manufacturer's standard lock on all storage units.
- F. Seating area or meeting table - determine the number of seats required
- G. Tack boards and markerboards (chalkboards not permitted)
- H. Coat hook - 1 per office, wall-mounted
- I. Cable management - location and number of grommets, managed pathway for all cables, proximity to power and data

2. Laboratory Furnishings

- See Section 6.1 - Laboratory Design.

3. Classroom Furnishings

- See Section 6.2 - Classroom Design.

4. Residence Hall Furnishings

- See Section 6.3 - Residence Hall Design.

5. Furnishings for Meeting Spaces

- A. Review access to power and data connections (including the need for table-top connectivity) and audio-visual equipment, including whiteboards, smartboards, and glassboards. Coordinate table placement and design with all aspects of technology.
- B. Determine number and type of seating to be used – stacking/non-stacking, ganged, task seating, etc.
- C. Consider flexibility of the space in the design and selection of the tables and chairs within the meeting space movable, modular, one-piece, etc.



Door Hardware
Standards
See Section 4.1

Laboratory Design
See Section 6.1

Classroom Design
See Section 6.2

Residence Hall Design
See Section 6.3

Conference Room and
Seminar Room Design
See Section 6.11

6. Furnishings for Lounge Spaces and Lobbies
 - A. In planning a lobby or building entry space, the Design Consultant shall locations for building directories, signage, appropriate furniture, trash and recycling receptacles. See Section 1.10 - Environmental Graphics and Section 2.7 - Trash and Recycling Areas.
 - B. Because lounge spaces and lobbies are often an extension of the architecture of a building, the Design Consultant should place special emphasis on the selection and coordination of the furniture and fixtures with the architectural character and function of the space to create a welcoming and inviting entrance.

1.11.2 Requirements for As-Built Drawings and Project Closeout

1. At the end of the project, the Contractor or Vendor is to supply in electronic format,
2. As-Built furniture installation plans indicating
 - A. all wall mounted components,
 - B. systems furniture and freestanding case goods,
 - C. locations or work surface supports, and
 - D. integral lighting and power and data accommodation.
3. Product identification and dimensions are to be included on the plans, as well as
 - A. walls, window and door openings, and
 - B. elements requiring access such as HVAC units, power and data receptacles.
 - C. Also required are lamp specifications for relamping task and ambient fixtures.
4. Information is to be formatted so that it can be tied to locations, and make it possible to derive the contents on a room-by-room basis.
5. One hard copy with actual finish samples and vendor contacts is to be provided for project library.

1.12 Security

MSU maintains a campus that is open to students, faculty and staff and to any visitor to campus, and encourages interaction between members of the university and the community. Given those facts, providing for the security and safety of students, faculty, staff, and the general public must be addressed in the design of our facilities and exterior spaces.

1.12.1 Procedural Guidelines – Programming and Schematic Design

During schematic design, the extent of security needed for the building's exterior, or the building's entrance, or any rooms within the building, is to be defined by MSU. The Project Manager shall facilitate a meeting with the University Police, the University Fire Marshall, the Building Committee, and any others on campus to determine this. These issues may include, but are not limited to, the following:



Environmental
Graphics
See Section 1.6

Access Control
Systems
See Section 3.1



1. Discussion and coordination of user requirements
2. Card Access Control System (CACS) design. CACS required at one exterior access, mechanical at all other locations
3. Fire Safety Security Monitoring System (FSMS) building
4. Fire alarm status system in lobby Card access system training requirements
5. Campus video management system

1.12.2 Design Guidelines – Passive Security Features

The Design Consultant should be aware of features that can be included to enhance safety in and around the building, and should also be aware of problematic conditions that might make a project inherently less safe. Some of the features to consider follow below:

1. Landscaping: Use landscaping to enhance a design, but avoid creating heavy cover, dark areas and isolated areas.
2. Path Routing: Design paths with sufficient lighting, and avoid cul-de-sacs and dead-ends
3. Building Configuration: Take care in the building layout to avoid alcoves, blind corners, enclosed courtyards

The Design Consultant, the Project Manager and the Contractor are to review the construction staging plan and/or the limits of construction, prior to start of construction, to ensure the highest level of security for the construction site and for the safety of the people that may be near the site.

1.12.3 Design Guidelines – Active Security Features

The Design Consultant should pursue solutions that will enhance the safety of the project, both during construction and subsequent occupancy. Many of the features that provide safety to building occupants and to the public can be simple solutions working through the process of thoughtful design, and the employment of common sense answers.

If determined that active security features are required for the project, the Project Manager shall facilitate a meeting during Design Development, with the University Police (UPD) and Safety & Risk Management (SRM), to review the proposed system and the location of devices. The following systems are possible solutions and have been used previously on campus:

1. Exterior
 - A. Security cameras (Central Video Monitoring System), may be placed at selected areas of campus, where required.



Passive Security
Consider visibility
from exterior and
within interior spaces
of the building



2. Interior
 - A. Card access, using identification cards
 - B. Code access, using PIN keypads
 - C. Combination locks in specific areas (Trilogy electronic locks, non-alarmed, for special-use areas such as computer rooms and laboratories)
 - D. Security cameras, may be placed at selected areas of campus, where required.

END OF SECTION 1.0

2.0 SITE

2.1 Site Planning

MSU was established in 1893, officially called the Agricultural College of the State of Montana, and in 1917 the Cass Gilbert Plan was created. This plan was implemented throughout the early years of MSU and molded what is now the historic core of the campus. In 1982, the Montana State University: Master Plan for Campus Development was created at the same time the City of Bozeman updated its master plan. The current Long Range Campus Development Plan (LRCDP) continues with the development goals and implementation processes that were created in the 1982 plan with additional and more relevant goals for future development on campus.

MSU published the LRCDP (Appendix 2.1-1) and a Landscape Master Plan (LMP) (Appendix 2.2-1) in support of projected, significant academic expansion while preserving the historic beauty and walkability of the campus. These plans break down the scale of the campus through the identification of “campus neighborhoods”: to assess local site relationships within the vibrant diversity of the campus as a whole. The Design Consultant shall become familiar with the LRCDP and LMP and embrace its guiding principles within each respective project design.

2.1.1 Design Guidelines for Site Planning

The image and identity of MSU is closely tied to the natural landscape, attracting students, faculty and staff from around the world. In this context, it is appropriate to think of buildings as backdrops to the exterior spaces that are ultimately the cohesive factor in experiencing MSU’s campus.

Buildings may give form to the exterior space, they may frame an exterior space, or they may create circulation patterns for exterior space. Overall, the following concepts, which are explained in greater detail in the LRCDP and LMP, are to be adhered to in the site planning aspects of project design:



MSU Long Range
Campus
Development Plan
See Appendix 2.1-1

Landscape Master
Plan



1. Hierarchy of Spaces: The building placement and plantings should reinforce and enhance the hierarchy of exterior spaces (for example: campus, building, entrance, etc.)
2. Sequence: There is to be a sense of continuity between spaces; where major spaces are enhanced by the sequence of moving through secondary spaces; where there is a play of expansion and contraction, of light and shade.
3. Connection: Connections between existing buildings, structures, walks and plazas, and open space are to be created and reinforced to further tie the campus together, through views, vistas and experiential travel to and from the site.
4. Context: There is to be an understanding of the immediate, established context adjacent to the project site and an awareness of the overall context of the campus. The design of the building, and the design of spaces and landscape around the building, shall result in a project that compliments and reinforces this context. Circulation through, and around, the project must also relate to its context by connecting to existing circulation, or to create new routes, to make a seamless transition between new and existing.
5. Elements: All new buildings and major renovations should include designated areas for bike parking, snow removal, trash and recycling facilities, and outdoor seating. The detail of these elements is discussed later in this section.

2.1.2 Internal Review Guidelines – Site

If a project affects an exterior site or the exterior of a building, the Design Consultant shall meet with the Project Manager to determine whether the extent of the change requires a review by UFPB or a review by Facilities Services to understand the impact of the project to site utilities and landscape. The purpose of the initial meeting with the Project Manager is to understand the project's scope and design concept for all site work, including site utilities. The PM will schedule a meeting to obtain the required campus approvals and to maintain the project's schedule. All final site plans must be reviewed by UFPB before implementation.



University Facilities
Planning Board
Website
[www.montana.edu/
us/committees/ufbp](http://www.montana.edu/us/committees/ufbp)



The Project Manager has the responsibility of insuring that the scope and concept for all sitework has been approved by UFPB and additional MSU departments.

As part of the milestone submittals (See Section 1.3 - Design and Drawing Reviews), the following deliverables for site design, if applicable are required:

1. Existing conditions survey: prior to the start of Schematic Design (see Section, 2.1.9 General Survey Requirements).
2. Sidewalks, drives, service areas, parking, plazas, site walls, accessible routes: Schematic Design
3. Landscape design concept & planting areas: Schematic Design
4. Planting materials: Design Development

2.1.3 Internal Review Guidelines – Landscaping

The review for landscaping projects is similar to projects that involve site design and may require UFPB approval. Smaller grounds maintenance or replacement projects may not need review by UFPB, but will still be required to meet the Design Guidelines and are to be reviewed by CPDC and Facilities Services. The Project Manager will schedule a meeting to obtain the required campus approvals and to maintain the project's schedule. All final landscape plans must be reviewed by UFPB before implementation.

The university may also employ a Landscape Design consultant to help plan and document MSU's landscaping projects. This consultant should be considered a member of the Design Consultant, and should be consulted on all issues regarding landscaping and site planning.

CPDC will review the proposed location and layout of buildings, walks, drives, plantings, etc. to ensure continuity with the MSU's Long Range Campus Development Plan and Landscape Master Plan and for other university goals, such as improving accessibility.

1. It is the Design Consultant's responsibility to provide accessible routes within the project site and to connect these to accessible paths outside of the project site.
2. The Project Manager may utilize an internal or outside consultant to review and comment on the design to ensure compliance with current state and federal ADA requirements.



Sitework design and CD's submitted for

The Project Manager is responsible for insuring that sitework has been approved

3. As with any building project, when preliminary design is completed additional departments may be brought into the Design Development and construction planning phases. Special consultants may also pay a part in the final design and review of all projects.
4. Landscaping projects are exempt from City of Bozeman jurisdiction review.
5. CPDC will notify the City of Bozeman of any projects that are adjacent to City of Bozeman property. A review is not required, but it is MSU's procedure to keep the City of Bozeman informed.
6. As part of the milestone submittals (See Section 1.3 - Design and Drawing Reviews), the following deliverables for landscaping, if applicable, are required:
 - A. Landscape design concept & planting areas: Schematic Design
 - B. Selection of planting materials: Design Development
 - C. Drawings and Specifications for all landscape materials, including soil preparation, lawns, planting materials: Construction Documents

2.1.4 Internal Review Guidelines – Utilities

Before Schematic Design, the Project Manager will facilitate a meeting for the Design Consultant with the CPDC CADD Technician and Mapping Technician to discuss existing site utilities. These individuals maintain the campus utility plans and can also be a source of general knowledge for involving agents for public utilities in the project. These plans are available to the Design Consultant in electronic format upon request.

1. Prior to the design of utilities, a site survey shall be completed to document horizontal and vertical locations of all utilities within the boundary of project site, and beyond, to provide sufficient information to properly design the utilities for the project (See Appendix 2.1-2 for additional information).
2. CPDC can provide assistance in locating utilities for each project. Likewise, MSU, with proper support from the Design Consultant, will often make application to local utilities for the needed services. The approach taken varies from project to project, and will need to be confirmed prior to construction. Unless otherwise determined, site utilities required for the project are to be included in the project.



Landscape projects are exempt from City of Bozeman review

Site Survey
Requirements
See Appendix 2.1-2

3. Utilities that can be made available to the site by MSU include:
 - A. Steam and condensate
 - B. Chilled water (localized areas)
 - C. Electric power
 - D. Emergency electric power (within specific specific building locations only)
 - E. Stormwater drainage
 - F. Voice and data communications
4. Utilities that are provided by public or private agencies include:
 - A. Sanitary sewer
 - B. Domestic water
 - C. Fire protection water
 - D. Natural gas (utilities must be provided separately for each building; utility company regulations prohibit feeding one building through another. The route for utilities must be outside any building's footprint. The utilities will not allow a building to be built over an existing service route, but would require that the service be re-routed) .
5. Sleeving for all utilities is required under paved areas. The Design Consultant is to coordinate with CPDC and Facilities Services for required locations and sizing of sleeving.

See Section 5.5 (Utility Guidelines) for additional information. See this Section; Item 2.2.3, for layout of trees over utilities.
6. Stormwater runoff is a concern to local, county, and regional authorities, and is closely reviewed in the planning, permitting, and construction phases of a project. The amount of hardscape in a project directly affects the stormwater detention requirements, and must receive appropriate attention in the design phase.
7. All stormwater systems on campus are regulated under the MS4 Co-Permittee. The MS4 committee is required to familiarize themselves with the MDT's MS4 permit requirements.

2.1.5 Guidelines and Requirements for Documentation

As noted above, MSU maintains campus utility maps that can be used as the starting point for site survey information. Auto CAD planimetric data covering the campus can be obtained through CPDC to supplement the campus utility maps.

2.1.6 Sustainability

One of the goals of the LRCDP, is to “develop the campus using practices that avoid irreversible damage to natural resources by encouraging development projects that include utilization of green technologies and renewable materials.” These guidelines are intended to provide direction and resources for the sustainable design of exterior space, sites and utilities, new building construction, and the comprehensive renewal of existing buildings for capital projects at MSU. The steps of this process are described in Section 1.6 Sustainable Building Principles.

MSU performed a campus wide energy audit in 2011 to determine sustainability strategies for reducing energy costs pertaining to:

1. Energy efficiency goals/targets
2. Interior and exterior light plan
3. Energy efficient fenestration
4. Potable water use plan

The greatest potential for understanding and managing the environmental impacts of a project is through early and multi-disciplinary consideration of site selection criteria, building siting, orientation and massing, water usage, storm water management, and landscaping strategies. The sustainability charrette (to be conducted during the Pre-Schematic phases) process is intended to ensure that these critical issues are addressed by the design team in a timely and holistic manner.

2.1.7 Considerations for Exterior Design – Circulation

Open space priorities are a major concern of the UFPB and should be the starting point in site plan development. The Design Consultant should strive to enhance the experience of the open spaces while guiding people through those spaces. Careful consideration must be given to laying out walks and drives, the way such paths intersect, and to the materials of the paths.

The Design Consultant should address building service issues as an integral part of the site design in order to produce a comprehensive plan that will augment, or improve, existing services. Planning should include delivery routes, loading and unloading areas, service vehicle parking and trash and recycling storage areas.



Sustainable Building
Principles
See Section 1.6
Sustainability
Charrette

Has the project
site plan taken into
account the circulation
requirements for the
campus?
-Vehicular
-Pedestrian
-Bicycle

Building use patterns and circulations should help to dictate the layout of future paths and pedestrian walkways. Allow for open and non-restrictive circulation to main entrances to buildings.

For all walks and drives, the Design Consultant should review any areas that need special treatment, such as snow-melting equipment or weather protection. The Design Consultant needs to keep in mind that all walks and paths at MSU are cleared of snow using mechanical means (as far as possible) so access for the equipment and storage of plowed snow is equally important as the placement and finish of the path (See Section 2.6 Snow Removal / Storage).

A landscape buffer is required next to all paved circulation pathways. No rock or mulch edging adjacent to paved areas is permitted for snow removal purposes.

On campus, circulation paths fall into several different categories, depending on use:

1. Vehicular Circulation
 - A. Vehicular circulation consists of three different categories: primary, secondary and tertiary. Each category allows varying levels of integration with pedestrian circulation (See Section 2.10 Vehicular Access below for further definition of requirements).
 - B. Along with circulation needs, the Design Consultant should be aware of various parking needs for MSU staff, visitors, and accessibility (see Section 2.4 Parking).
2. Pedestrian Circulation
 - A. The LRCDP has set goals to ensure the campus core remains pedestrian-oriented, limiting vehicular intrusion, providing safe access choices, encouraging alternate modes of transportation and providing service corridors and service access to all buildings.
 - B. Pedestrian circulation is divided into a three tiered design system: primary, secondary and tertiary. Each category allows for varying types of surface treatments (see Section 2.9 Pedestrian Access).
3. Bicycle Circulation (see Section 2.11 Bicycle Access):
 - A. Bicycles are an essential part of the overall circulation planning process. As MSU moves forward with reducing vehicular dependency on campus, the demand for bicycle transportation increases. In general, pedestrian paths and corridors are shared with bicycles. A comprehensive network of off-street pathways, on-street marked bicycle lanes, shared paths with pedestrians, and bicycle storage areas, are conducive to encouraging bicycle travel.
 - B. MSU will be coordinating with the City of Bozeman's bicycles trail system to ensure city-wide connectivity. The LRCDP designates bicycle trail connection points and should be referenced by the Design Consultant.



Snow Removal
Storage
-Indicate on Site Plan
See Section 2.6

Vehicular Access
See Section 2.10
See Section 2.4

Pedestrian Access
See Section 2.9

2.1.8 General Survey Requirements

For projects that affect existing grades, underground utilities, property lines, and other significant site work, the Design Consultant shall provide a survey by a licensed surveyor (see Appendix 2.1-2, Site Survey Requirements). All survey drawings are required to meet CAD Standards and electronic submittals requirements (See Section 1.8 Documentation and Archiving).

Upon request, MSU shall provide the Design Consultant with the most up to date available site and utility drawings relevant to the project. MSU will provide any CAD drawings in either the current version of Auto CAD or the version being currently utilized by the university. It is the responsibility of the Design Consultant to perform any necessary conversions to utilize the data.

2.1.9 Requirements for Record Documents

See Appendix 1.8-2 Record Document Requirements and the Owner Consultant agreement.

The Project Manager is responsible for distributing the record drawings to the CADD Technician and to the Records Clerk at project closeout.



Bicycle Access
See Section 2.11

Site Survey
Requirements
See Appendix 2.1-2

Documentation and
Archiving
See Section 1.8

2.2 Landscape and Planting

This portion of the Design Guidelines is to provide more specific details for landscape design and planting than the LMP and serves to address more project specific goals than planning and design “philosophies.”

2.2.1 Review Guidelines – Landscaping

Landscape projects or modifications must follow the Internal Review process set forth in section 2.1.4.

2.2.2 Considerations for Exterior Design – Planting Concepts

The following concepts should guide the Design Consultant in both building and landscaping projects on campus at MSU. While following the concepts listed below, the Design Consultant must coordinate with the layout of proposed utilities throughout the project and make adjustments to the plantings as necessary.



Planting to reinforce hierarchy of open spaces

Define and enhance spatial sequences



1. There is a hierarchy of open spaces which the planting (and any building) should reinforce and enhance.
 - A. The size of outdoor spaces should determine the scale of the planting, i.e. large spaces should contain large trees, while small spaces should have shrubs, small ornamental trees and perennial plantings.
 - B. Smaller, more defined spaces should be characterized by distinctive planting (color, scale and texture).
 - C. Large spaces should be defined by “structural” tree planting (e.g. perimeter planting and entrance definition).
 - D. Vistas should be reinforced by tree plantings where possible.
 - E. Plantings at buildings should emphasize and enhance the character of the architecture. Plantings within the landscape should define spaces.
 - F. No trees should be planted within 20 feet of buildings.
 - G. General foundation planting should be avoided.
 - H. All building perimeter landscape should include a two foot rock buffer strip with one of the following edging conditions:
 - i. Commercial grade plastic edging
 - ii. Commercial grade aluminum edging
 - iii. Concrete curb style edging (extruded or formed)
 - I. Wildlife habitat corridors should be planted with native vegetation and should be enhanced where applicable. Likewise, areas adjacent to agriculture operations or buildings should be planted with simple planting designs, featuring more trees and wind breaks than intricate or detailed planting beds.
2. Spatial sequences through the campus should be defined and enhanced.
 - A. Major entrances should be identified by planting.
 - B. The campus perimeter should be strengthened with planting.
 - C. Major campus axes should be defined by planting.

- D. Landscape design should reflect the setting of the building within the District and Neighborhood so that it complements the building use and provides the right type of spaces for circulation, socializing, bicycle parking, transition into the building, etc.
- 3. Plantings and landscape elements should provide solutions for various functional needs.
 - A. Security should be an upmost concern when designing plantings and site amenities. Open site lines should be maintained and landscaped areas should be properly lighted to industry and MSU standards for low, medium and high level lighting.
 - B. Provide shade for events and for outdoor use areas, including commencement, reunions, and other outdoor gathering places
 - C. Conceal unattractive use areas, including but not limited to, parking and loading areas, trash and recycling areas, and other service areas
 - D. Retaining walls should have separation from sidewalk in the form of a grass mow strip or a concrete curb to prevent deterioration of the wall. Planting design should reflect the micro-climate of the area:
 - A. Sunlight availability
 - B. traffic flow and impact
 - C. potential for “cow paths” to develop are to be considered.
- 4. Retain a 25 percent urban canopy: The MSU campus was once a treeless hilltop with grass and sage brush. However as the campus developed, so did the collection of trees and other plant vegetation, commonly called the “urban forest”. MSU has established the goal of retaining a 25 percent urban canopy (percent of campus covered by tree canopy divided by the total square feet of non-pervious surfaces, including hardscapes, roads and building roofs) and maintains a map to track the percentage of canopy. The Design Consultant is to provide the total area of non-pervious surfaces in the Schematic Design phase. reference the landscaping map on file at CPDC to ensure this percentage is being maintained.
- 5. The layout of trees over underground utilities must be avoided:
 - A. Review the tree location with possible conflicts with existing or new underground utilities. Establish the appropriate offset between tree and utilities and the Design Consultant is to ensure that offset is maintained until the tree planting is complete.
 - B. Utilities and trees should be planned and coordinated to maximize access for maintenance to the utility and to minimize the disturbance to existing landscape and plantings during construction.
 - C. Conditions caused by backfilling of utilities should be examined before final location of trees is determined.
 - D. Include maintenance periods for landscaping in the Construction Documents: One year maintenance period for lawns and plant material.



Maintain a 25 percent Urban Canopy

Avoid the use of invasive species



6. Diversity of planting materials and spacing of plantings are important:
 - A. In choosing planting material for a project, the Design Consultant should recognize that diversity provides not only the opportunity for a pleasant variety of color and shade, but also insures that if disease strikes a particular variety, the entire bed is not lost.
 - B. Plants should be selected to:
 - i. avoid patterned planting that would be hard to replace dead plants,
 - ii. maximize diversity of species,
 - iii. group plants with similar watering needs to conserve water and provide for more efficient care during maintenance operations.
 - iv. preserve and improve the natural habitat
 - v. minimize unnatural inputs for survival (i.e. water, fertilizer, soil conditioners, etc)
 - vi. do not use invasive species
 - vii. not have fruit bearing properties close to paced surfaces or pedestrian plazas



Plant Palette
See Appendix 2.2-5

2.2.3 Suggested Plant Palette

MSU has created a list of suggested plants to be used on campus (See Appendix 2.2-5). The plants suggested in the list have been selected for various reasons. In general, they share qualities that have proven that they are hardy for the zone; they are appropriate in regards to security, maintenance and long term viability; they are noninvasive; they create diversity; and they provide significant visual or aesthetic impact for the investment. Plants not listed in this plant palette shall be submitted for consideration to MSU to determine if they are an appropriate alternative.

2.2.4 Landscape and Planting Specifications

The Design Consultant shall incorporate MSU's standard specification sections for the following: Landscaping, Lawns and Grasses, and Tree Protection into the Construction Documents for applicable projects (see Appendix 2.2-2 Landscaping, Appendix 2.2-3 Lawns and Grasses, and Appendix 2.2-4 Tree Protection).

Landscaping
Specification
See Appendix 2.2-3

Lawns and Grasses
Specification
See Appendix 2.2-3

Tree Protection
Specification
See Appendix 2.2-4

2.3 Irrigation

MSU has gone to great lengths to install, maintain and operate an efficient and sustainable automated underground irrigation utility. This philosophy and the associated practices shall be continued and improved upon in all future projects involving both in-house and contractor installations and repairs.

1. MSU shall continue to push towards an entirely automated irrigation utility. Areas that are currently watered by hand shall be automated as funds become available, in the end saving labor costs and increasing efficiency.
 - A. This utility shall incorporate “smart” controls, by continuing to utilize Maxi-Com Control that allows the system to be monitored and track water usage from one point.
 - B. The central control increases irrigation system efficiency through the use of daily scheduling based on the previous days evapo-transpiration which is calculated by MSU’s on-site weather station to irrigate the amount of water lost the previous day and eliminating unneeded watering that is inadvertently done due to “blanket” programming on stand-alone controllers.
2. MSU shall strive to utilize entirely non-potable sources of irrigation water for all of central campus and Family and Graduate Housing irrigation.
 - A. MSU currently irrigates approximately 95 percent of central campus using non-potable water. Applications and associated permitting are underway in an attempt to add Family and Graduate Housing property to the area irrigated without the use of treated city water.
 - B. The use of untreated, non-potable water dramatically increases MSU’s irrigation sustainability program.

2.3.1 Irrigation Design

Factors, such as areas for planting beds, lawns, type of soils, and establishment period, shall be carefully considered in design of the irrigation system by the Design Consultant.

1. The Design Consultant shall incorporate MSU’s standard specification section for irrigation into the Construction Documents (see Appendix 2.3-1 Irrigation).
2. Head placement shall minimize overspray onto hardscapes and no heads shall spray onto buildings or the buffer strip by the building foundation.
3. All irrigation systems shall provide head to head coverage, even water distribution, and the highest efficiency possible with the selected irrigation head.



Irrigation to use 95 percent non-potable water

Standard Irrigation Specification
See Appendix 2.3-1



All new landscaping
tied to MSU irrigation
system

4. The irrigation system design shall be reviewed and approved by CPDC, Facilities Services and the Irrigation Manager.
5. The Project Manager will facilitate site visits with the Irrigation Manager during construction of the project.
6. Where feasibly possible, all new irrigation projects shall be connected to MSU's non-potable, irrigation reservoir water source and to MSU's automatic irrigation system.
7. Micro-climates and landscapes features shall be taken into consideration for zone layout.
8. A point of connection will be identified by MSU. Available volume of water will be determined by MSU and shall not be exceeded in installation.
9. Any upsizing of adjacent / upstream mains required for flow will be the responsibility of the project.

2.3.2 Irrigation System Integration

1. Central control product choices and installation placement must be reviewed and approved by MSU's Irrigation Manager to ensure complete compatibility and functionality with the existing control system.
2. All systems must be controlled by Maxi-Com Central Control and will include a fully functional radio communication system.
3. All control components must be installed by certified Maxi-Com Installer.

Install all irrigation
piping with tracer
wire

2.3.3 Installation

1. Using wire locate flags, the Contractor shall layout the irrigation components to be reviewed and approved by MSU's Irrigation Manager before any installation begins.
2. The Contractor is responsible for obtaining all utility locates and must have locates clearly marked on ground prior to any excavation, post pounding, etc.
3. Temporary systems for establishing during construction are prohibited.
4. All irrigation installations should be installed with a trace wire in order to enable the location of the underground piping during utility markouts.
5. Maxi-Com flow metering devices shall be installed at all points of connection according to Maxi-Com – Installation Parameters.
6. Water outage, Turn on, and irrigation runtime scheduling must be coordinated with MSU.
7. See the "Site Protection" section for requirements to minimize damage to
 - A. landscape
 - B. plantings
 - C. hardscapes
 - D. existing irrigation.
8. Any damaged irrigation components and landscapes will be repaired according to MSU specifications by an authorized commercial irrigation and/or landscape contractor and all repairs must be inspected and accepted by MSU.
9. Any mainline disruption and/or damage shall be repaired immediately.
10. The main shall be able to be put back into operation within three working days to avoid effects on areas further downstream.
11. As-Built drawings will be supplied within 30 days of project completion and reviewed with MSU Irrigation Manager for clarity before full payout can occur.
12. All electrical and communication wire repairs and splices shall be
 - A. repaired according to MSU specifications
 - B. shall be noted on As-Builts
 - C. be accessible through a ten-inch round valve box
 - D. splice lengths will be long enough to be accessible / inspected at ground level and be inspected by MSU Irrigation Manager prior to burying.
13. Additional, unused, "for future use" wires shall be installed according to MSU Specifications.

2.4 Parking

2.4.1 Parking Space Ratio

MSU currently has a high ratio of parking spaces per FTE among its peer institutions group.

1. The Design Consultant is to familiarize themselves with the goals set forth in the LRCDP to reduce this ratio over time by
 - A. increasing alternative modes of transportation
 - B. planning and constructing parking facilities to accommodate future university needs
 - C. continue to encourage bicycle use as a part of traffic and parking demand management.
2. Parking requirements for a project must be established during Programming and determined whether the parking will be included within the project site or in existing MSU parking lot.
3. Prior to final site plan approval, it must be demonstrated how the parking requirements for a project will be fulfilled.
4. The Design Consultant shall prepare a plan, working with the Project Manager, the Parking Services Manager, and other MSU departments, outlining parking requirements and provisions for use in the site plan review.

2.4.2 Existing Conditions

Parking availability within the campus core is limited, but usually has available parking along its perimeter, particularly to the south of campus. The parking is situated to provide convenient parking with a five-minute walk to destinations on campus. Demand for parking in the campus core is becoming increasingly difficult to accommodate as the campus expands and interior surface lots are converted to building sites.

1. When the design of a new building encroaches on, or is built on existing parking spaces, the project budget will be required to include a fee for each parking space removed to be allocated to a fund towards a future parking structure or lot.
2. The dollar amount per parking space is to be set by the Parking Services Manager.

For reference, see Campus Parking Map for location of all parking lots. (<http://www.montana.edu/parking/documents/ParkingMap2014.pdf>).



2.4.3 Permits

Parking permits are required for all parking facilities on campus. The Design Consultant and Contractor are required to purchase a parking pass when doing work on campus, unless otherwise noted by agreements or contracts. There are eight different categories of parking on campus including remote, proximate, visitor, service, bicycle, and motorcycle. City streets adjacent to campus are categorized as either resident only, time of day or duration restricted.

Vehicle signage and parking signage is to follow guidelines set forth in Section 1.6 Environmental Graphics.

2.4.4 Construction Impact on Parking Lots

Construction staging areas generally negatively impact the areas / surfaces upon which they are placed, regardless of duration, and that the negative impacts have associated repair / restoration costs. Restoration costs associated with locating construction staging areas on landscaped surfaces are typically greater than the costs associated with staging on parking surfaces. When possible, construction staging areas are to be located on hard surfaces, such as parking areas, than on open spaces or landscaped areas. The Project Manager shall review options with the Design Consultant to determine possible locations and include proposed staging area on the Construction Drawings.

2.4.5 Future Parking and Parking Structures

As outlined in the LRCDP, parking structures and surface lots are best located at the perimeter of campus neighborhoods. Parking shall be located close to major streets, adjacent to primary campus gateways, and no more than a five minute walk to neighborhood destinations.

1. If public transit stops are added as part of a project, it is best to coordinate the location of the new transit stop with an existing parking facilities. The Project Manager will facilitate a meeting with the transit company to discuss proposed locations.

Construction Parking
and Staging on
Parking Lots
See Appendix 2.4-2

2. Design parking structures that include architectural characteristics and include mixed-use or multi-modal opportunities.
3. Provide energy-efficient lighting throughout the parking system that also promotes dark-sky policies.
4. Design of parking facilities shall include appropriate measures for snow removal and storage. The Design Consultant is to coordinate parking lot layout with the Parking Services Manager.
5. If tree islands are to be incorporated into the parking design special are consideration is to be taken to ensure that:
 - A. Financing for the appropriate landscaping and irrigation system is included in the overall budget.
 - B. The tree island is designed in a way as to not create issues with snow removal.
 - C. Selection of trees and design of planting beds to be used shall be such that the roots do not damage the parking lot surface.

See Appendix 2.4-1 for parking lot curbs.

2.4.6 Accessibility

If the project includes parking, the design shall follow the ADAAG requirements and incorporate these requirements into the design of new parking facilities. Some existing parking facilities do not include accessible parking, however the required number of accessible spaces have been located in parking lots that serve clusters of buildings. The goal of location and number of accessible spaces at MSU is to provide opportunities to accommodate appropriate accessibility throughout the parking system.

The Project Manager will facilitate a meeting with the Parking Services Manager during Schematic Design to review the number and location of accessible spaces for the project relative to the spaces that exist on campus (see Section 1.9 Accessibility)



2.5 Site Signage

2.5.1 Environmental Graphics

MSU has set forth standards for signage to be used throughout the campus; See Section 1.10 Environmental Graphics.

2.5.2 Information Signage

Information signage includes ADA routes, service deliveries, parking, etc. the MSU's Wayfinding Plan (Appendix 1.10-1) includes standards for these signage types and is to be referenced by the Design Consultant.

2.6 Snow Removal and Storage

Snow removal is a seasonal issue on campus and must be addressed by the Design Consultant during site design. To optimize snow removal operations, drives and sidewalks must be designed to allow ease of movement for the snow removal vehicles and materials selected must be durable to withstand the methods used to remove snow.

1. There should be at least three feet of separation between lighting, site amenities and pavement for plowing ease in the winter.
2. Pathways and site features shall be appropriately sloped to allow proper snow removal and drainage into snow storage areas.
3. Design of building entrances and all paved areas adjacent to buildings are to be reviewed with the Environmental Services Manager. If appropriate, building entrances should be designed to include snow removal gratings near the entrance doors.

2.7 Trash and Recycling Areas

The design of trash and recycling areas shall be reviewed and approved by CPDC, Facilities Services, and the Environmental Services Manager. The Project Manager will facilitate a preliminary meeting for the Design Consultant to obtain information regarding current standards for trash and recycling containers, design parameters for access by collection vehicles, etc., prior the Schematic Design submittal (see Appendix 2.7-1 Trash and Recycling).

Environmental
Graphics
See Section 1.6

Wayfinding Plan
1.10-1



2.7.1 Considerations for Exterior Design

All entrances to buildings are to include at least one trash receptacle and one recycling receptacle. Reference Appendix 2.7-1 for acceptable trash and recycling receptacles.

Where possible, trash and recycling dumpsters in service areas are to be sufficiently screened from view from major streets, heavily used sidewalks, and the Centennial Mall. Sizing of the trash and recycling containers shall be determined by the Environmental Services Manager to meet the building's required capacity. The screen shall not interfere with the function of the service area, snow removal, or create a safety issue. Reference Appendix 2.7-1 for acceptable screens and enclosures.

2.8 Exterior Lighting and Design

1. Lighting should be carefully considered in the design of the site and is an important element in security design. An effective security lighting design should consider all elements of the site, including
 - A. building location and usage
 - B. the landscape or planting plan
 - C. site walkways (including steps and ramps)
 - D. traffic patterns as well as the impact of the lighting on the surrounding areas.
 - E. Light pollution, trespass and glare should be minimized.
 - F. A consistent level of lighting will provide a sense that the site is well lighted and safe (an average of 1 to 2 foot-candles for exterior lighting is considered sufficient).
2. Many types of exterior lighting fixtures and poles have been used on campus. However, the use of direct burial, precast concrete poles and LED fixtures are becoming more common. Bollard lights are not permitted unless directed otherwise. Exterior lighting design shall be reviewed and approved by CPDC and Facilities Services. Review requirements for burial of power lines for lighting with Facilities Services Engineering and Utilities.
3. Point-by-point foot-candle calculations of the site lighting and voltage drop calculations for site lighting circuits shall be provided with the Contract Document submittal.
4. Photometric data shall be provided that shows the percentage of up light.
5. Footcandle calculations shall include the IES design level and classification used.
6. IBC requires that exitways be lighted (with emergency power backup) to the exterior of the building and at the exterior of the exitway; these lights should be accounted for in the design and calculations.

Standard Trash and Recycling Receptacles
See Appendix 2.7-1



2.9 Pedestrian Circulation

Pedestrian circulation includes, but is not limited to sidewalks, paved plazas and footpaths. Most pedestrian circulation has been created as a result of historic traffic patterns and designed connections to building entrances. Unintended paths occur near building and sidewalk corners, where foot and bike traffic cross grass, causing significant soil compaction that inhibits continued vegetation growth. The LMP has set forth boundary and edge conditions to help alleviate the deterioration of landscaping.

MSU has worked with the City of Bozeman to align campus bike and pedestrian trails with the city designated trail system. Pedestrian crossings are to be coordinated with the City of Bozeman and MDOT to create safe pedestrian crossings to tie into the non-MSU roads and drives.

2.9.1 Pedestrian Pathways

1. Pedestrian circulation pathways are constructed of concrete. The primary east-west pedestrian corridor, Centennial Mall, is constructed of integrally colored concrete with a twelve inch border defined by an accent color. Primary circulation pathways eight feet wide or wider shall follow existing character and have a bordering pattern.
2. For walks seven feet wide or narrower, a single paving material without borders is recommended. In such cases, concrete pavers or concrete slabs are among the possible material choices.
3. Secondary walks lead from the main campus walks into buildings, may occur within courtyards, or simply cross open areas.
 - A. These paths are constructed of durable materials such as stone, concrete pavers or slabs, or brick.
 - B. All paving materials shall be laid over a base material suitable for the paver and anticipated traffic condition with a structural sub-base of concrete or asphalt to eliminate the potential for heaving.
 - C. With the exception of walks leading into buildings (which may be as wide as the building entry or form an entry plaza), these secondary walks are typically five to six feet wide.
 - D. If vehicular traffic is anticipated on a secondary walk, bands of unit pavers will be installed on either side of the walk, to increase the total width to eight to ten feet.



Photometric Diagrams
are required for
lighting

Determine Pathway
designation:
-Primary
-Secondary
-Tertiary





4. Tertiary walks lead to secondary entrances in buildings, or crisscross a green area. They are designed for foot traffic across open areas (or are sometimes installed after a traffic pattern has been established).
 - A. The material may be permanent in nature, such as concrete or asphalt, or may be renewable, such as compacted, decomposed stone, stabilized gravel systems or wood chips.
 - B. If concrete pavers are to be used, minimum dimensions are to be four by eight inches.
 - C. Minimum width for tertiary paths is four feet. Monolithic surfaces are preferred for sidewalks or other largely paved areas of circulation.
5. The first three feet from the sidewalk should be positively drained but not with greater than a two percent slope.
6. In order to accommodate some changes in elevations, steps may have to be incorporated into the design. Steps should be designed with a change in materials, or color change, to alert the pedestrian of the difference in grade.
7. An emerging challenge in site design has to do with the use of steps and plazas by roller-blade enthusiasts, skateboarders and stunt bicyclists. This activity has damaged a number of elegant site amenities, including stone-capped walls, memorial benches, and handrails. While a punitive policy of public space design should not result, the Design Consultant should be aware that what some would view as amenities become attractive nuisances for others. Landscape walls and railings adjoining pedestrian areas shall be designed to incorporate deterrents to abuse by skate and snow boards. Follow existing designs and materials where possible.

2.10 Vehicular Access

Although MSU tries to minimize vehicular traffic in the main campus area, there are undeniable requirements for access to each building such as trash and recycling pickups, mail delivery and pickup, delivery of supplies, furniture delivery, shop vehicles for normal maintenance of a building, etc. Certain academic disciplines may require frequent delivery of equipment or materials, and dining facilities, for example, have extremely heavy service requirements. There are periods of the year, including residence halls move-in and move-out days, reunions, and commencement, when unusually heavy traffic patterns occur, and universal access to campus areas is needed. Additionally, emergency access to a building must be provided for fire department and medical vehicles. The Design Consultant shall address types of service and service access in Programming and Schematic Design.

Service vehicular access to buildings is to be separated from parking areas. Services entrances are to be designed away from or screened from the main entrance to the building.



2.10.1 Vehicular Circulation Types

1. Primary: typical of streets characterized by full-width travel lanes for all vehicle types with curbs and raised sidewalks; usually paved with asphalt, with concrete sidewalks, curbs and crosswalks.
2. Secondary: pathways that serve both vehicular and pedestrian traffic. Currently, MSU does not delineate a separation of users, but will be moving towards characterizing these pathways by an asphalt center section, with additional width to either side in a different or contrasting paving material, set flush with the asphalt but defining the pedestrian space. Secondary vehicular pathways often serve as fire lanes or emergency routes, and must provide an 18-foot wide lane of stabilized base at a depth sufficient for fire truck criteria; refer to Appendix 2.1-4 (Campus Emergency Route map) for locations, and review requirements with Project Manager.
3. Tertiary: these are primarily pedestrian paths that can be used occasionally by service vehicles. Access is controlled by removable, lockable bollards spaced to allow for snow removal equipment to pass, but excluding normal vehicles. Verify bollard locations and spacing with CPDC during design phase. Minimum width for tertiary paths is six feet.

2.10.2 Emergency Vehicular Access

The Design Consultant should consult with the Project Manager and review the Campus Fire Lane Plan for requirements for a particular project. If a walk must be designed to carry emergency vehicles, there may be some increase in traffic-bearing capacity over normal university design, and the stabilized width most certainly will be increased. A common design variation is to provide the increased width using stabilized base and structural soil, which can then be planted with grass.



Campus Emergency
Route Map
See Appendix 2.1-4

2.11 Bicycle Parking

The design of all MSU facilities, or major site renovations, shall provide adequate bicycle storage near the entrances of buildings. CPDC shall review the design and location of bicycle parking and determine the appropriate number of bicycle parking spaces.

2.11.1 Bicycle Rack Design

1. See Appendix 2.1-5 for the design of the bicycle parking. Location of bicycle racks shall not impede snow removal around the building and may be movable for the purpose of snow removal.
2. Bicycle racks may be designed to be secured in place as deemed necessary per project and are to be located on a pad of pavers over stabilized base according to MSU's standard.
3. Sheltered bicycle storage areas shall be an integral design element to the project.
4. Bicycle racks are to be integrated into the design of all new transit stop shelters.



Bicycle Rack Standard
See Appendix 2.1-5

END OF SECTION 2.0



3.0 Building Envelope

3.1 Access Control Systems

MSU requires that selected doors for academic and administrative buildings, and all exterior doors of residence halls, are included as part of the campus-wide access control system (CACS). During the Schematic Design phase of a project, a determination must be made, commensurate with the risks posed by the intended occupancy or use, regarding the extent of, or desirability of access control system, including interior door access control and/or intrusion alarm systems and/or ADA power assisted exterior doors.

If an access control system is required, all exterior doors, including mechanical rooms and mechanical penthouse doors which allow access to other parts of the building, must be incorporated into the CACS design. Inclusion of access control hardware may limit door design possibilities. Card readers are generally installed on the building exterior, with conduit and door / frame preparation integrated with the envelope design. While desirable for ease of system maintenance, card access readers installed in vestibules may pose security concern, depending on the design of the vestibule. Review proposed system with the Project Manager, Building Committee, and University Police.

The Design Consultant is responsible for the design and specification of the doors, door hardware and raceways to provide a coordinated installation of the access control system. The final configuration shall be reviewed by CPDC and Facilities Services (and Auxiliaries, if applicable) for approval.

3.1.1 Guidelines and Requirements for Documentation

Sufficient documentation shall be prepared for design review of the access control system and for contract bidding of the work. Floor plans that clearly indicate locations of doors, door access control and operator diagrams, and specifications shall be prepared for all CACS construction documentation. Minimum documentation requirements include:

1. Door, Door Frame, and Door Hardware schedules
2. Door Hardware Product Data
3. Door Access Control and Operator Diagrams
4. Keying Plan

CPDC to facilitate meeting to determine extent and type of access control for project

Door Hardware Specification
See Appendix 3.2-2

Door Documentation Checklist
See Appendix 3.2-1

3.1.2 Guidelines for System Installation and Performance

1. New Construction and Renovation
 - A. All access control devices and junction boxes shall be accessible in accordance with the National Electric Code.
 - B. Raceways in finished areas shall be concealed where possible.
 - C. In the event that exposed raceway must be employed, the Design Consultant shall review the approach to the layout of the raceway with CPDC and shall specify the appropriate material.
 - D. All electromechanical door hardware shall be reviewed and approved by CPDC prior to installation. Installer must be a certified installer and qualified by the manufacturer. Doors shall be tested with electrical actuation of the hardware to provide proper adjustment. Testing equipment will be the responsibility of the certified installer.
2. Accessibility Considerations
 - A. Provide a standard size reader or larger accessible type
 - B. For locations required to be accessible, provide assisted door opener or fully automatic operation.
 - C. For doors greater than 2 inches thick, evaluate and select most appropriate opener for size of door and easily integrated with access control system.
 - D. Coordinate placement of card reader and/or accessible paddle with swing of door
3. Interface between Access Control and Fire Alarm Control Panel
 - Doors equipped with delayed egress features and/or magnetic hold-open devices shall have appropriate "supervised" wiring provided from the building fire alarm panel release function.
4. Requirements for Access Control Panel Locations
 - A. The building access control processor cabinets are preferably located in mechanical equipment rooms or electrical vaults that are in dry locations.
 - B. Data communication lines as well as emergency power and lighting requirements shall be provided to the location.



5. Signage

- A. Each door that is monitored and/or controlled by the card access system has a unique electronic address. This electronic address corresponds to a door number on the Construction Documents. Each door that is monitored and/or controlled by the card access system shall be labeled with the door number.
- B. The Construction Documents shall include a table of all door labeling requirements for the Access Control System. Exterior door numbers are determined no later than the end of Schematic Design Development phase.

6. Operational Performance

- Doors shall be reviewed for proper operation as a single entity, to ensure compatibility of all installed components. Components shall include, but are not limited to hardware, hinges, sweeps, etc.

7. Spare Parts

- Determine if spare parts are required for the project. If required, provide a list of spare parts in the specifications.

3.1.3 Requirements for As-Built Drawings

Electronic CAD files with separate layers for access control along with separate Access Control drawings shall be submitted with Record Documents.

Exterior Door
Numbers
determined no later
than end of Design

Documentation and
Archiving
See Section 1.8

3.2 Exterior Door Design and Materials

Reference Section 3.1 Access Control Standards and Section 1.9 Accessibility.

1. The minimum door size is 3'-0" x 7'-0". If double doors are used, the center mullion must be removable.
2. All exterior doors to be insulated and fully weatherstripped and all frames (unless hollow metal) are to be thermally-broken.
3. Hollow metal doors shall have a 18 gage minimum facing skin, galvanized, and 1 3/4-inch minimum thickness. Hollow metal frames shall be 16 gage minimum and shop-galvanized. Door frames shall be full weld construction; knock-down frames are prohibited.
4. Anodized aluminum or prefinished aluminum are acceptable materials for the primary entrance doors. Major portions of the door sections shall have .188-inch wall thickness. Continuous hinges shall be used for all aluminum doors.
5. Prevailing wind patterns are to be considered when determining door swings of exterior doors.
6. Exterior wood doors are prohibited unless a part of a historic renovation / addition project (See Section 7.0 Historic Buildings).

3.2.1 Review and Documentation

Prior to shop drawing submission by the Contractor, a hardware coordination meeting is to be scheduled with the Project Manager, user groups, Facilities Services Locksmith and the Contractor to discuss project-specific issues related to lock functions, coordination and delivery. Reference Appendix 3.2-1 Door Documentation Checklist for submittal requirements.

3.2.2 Door Hardware

Reference Section 4.1 Door Hardware Standards and Appendix 3.2-2 Door Hardware.



3.2.3 Installation of Doors and Door Frames

1. Side jambs to be set plumb and straight. Head jambs to be set level and straight.
2. Wood jambs to have blocking at a minimum of five points on each side placed between jamb and framing member, include blocking behind each hinge and lock strike plate. At no point on side jambs or head jambs shall the distance between blocking exceed eighteen inches. Jambs to be securely fastened at blocking points, to framing members.
3. Metal frames to be installed as per manufacturer's written specifications. If filled with concrete or grout, block-outs or insulating foam blocks to be placed behind hardware attachment points on frame to facilitate drilling and tapping for bolts or crews.
4. Clearance between door and jamb shall be 1/8-inch plus or minus 1/32-inch. Clearance between door and door stop shall be 1/16-inch with door in the locked position. Floor clearance shall be 1/4-inch plus or minus 1/16-inch above finish floor material. Wood doors shall be beveled 3 degrees on both hinge side and lock side.
5. Weather-strip or smoke-seal applied to door or door frame shall not interfere with the proper operation of door.
6. The threshold for exterior doors that access rooftops shall be set twelve inches minimum above the roof.

3.3 Windows, Storefront and Skylights

Special care shall be taken when designing window, storefront and skylight systems. The climate at MSU requires specific detailing to withstand wide fluctuations in temperature, high levels of snow and wind-driven rain. Special attention to the detailing for sealing and flashing of all fenestrations is critical to the success of the opening and wall system. Total area of openings must be considered for its impact on heating and cooling loads.



Roof Access Doors
-Sills required to be 12 inches off roof surface

Door Hardware
Specifications
See Appendix 3.2-2



3.3.1 Energy Requirements

Window, storefront and skylight design and construction shall comply with IECC (International Energy Conservation Code) and State of Montana high performance building standards. The minimum U-factor designated by the IECC shall be the bases of design. Spray-foams shall be used to seal the perimeter of windows meeting the required r-value, while making sure weeps built into the windows remain free and open.

When designing the placement of fenestration systems, the Design Consultant is to take into consideration the level of shading required and/or the glazing shading coefficient, a higher shading coefficient on higher solar exposure sides, and the addition of shading devices for south and west facing windows.

3.3.2 Windows

1. Aluminum and aluminum-clad windows are acceptable window constructions. Aluminum-clad windows are used primarily in Historic preservation projects, but may be incorporated into other projects at the discretion of the University Architect.
2. Vinyl windows and wood windows shall not be used.
3. Aluminum windows shall have thermal break frames and insulating glass.
4. Operable and fixed windows are acceptable window types. The Design Consultant shall review window types during Design Development with the Project Manager and Facilities Services.
5. Operable windows may include awning, casement, sliding or single/double hung operations. The Design Consultant shall review the advantages and disadvantages of each operation with the Project Manager and Facilities Services before determining the most appropriate for the project.
6. Crank operators shall not be used on operable windows.

Reference Section 7.0 Historic Buildings.



Sustainable Building
Principles
See Section 1.6

Translucent Skylight



3.3.3 Storefront

1. All storefront shall have thermal break frames and insulating glass.
2. Storefront framing sections shall be .080-inch minimum wall thickness with snap-on glazing trim of .050-inch minimum wall thickness.

Reference Section 3.2 Exterior Door and Appendix 3.2-2 Door Hardware.

3.3.4 Skylights

Skylights are acceptable if access is provided. The Design Consultant shall review the means of access with the Project Manager and Facilities Services.

1. All skylight systems shall have thermal break frames and glazing designed to meet IBC requirements.
2. All skylights shall have internal condensate drain systems.
3. There is to be an 18-inch minimum curb height measured from roof plane to lowest point of skylight frame.
4. West and south facing skylights shall be designed to reduce unwanted heat gain.

3.4 Roofing

These standards apply to new and replacement roofs for academic, administrative, athletic, and residential buildings on MSU's campus. For agricultural buildings, the Design Consultant shall consult with the Project Manager and Facilities Services for requirements.

3.4.1 Review Guidelines

Preliminary design and material selection for roofing shall be reviewed by the Project Manager, the University Architect, and Facilities Services in Schematic Design when the roof shape has been determined.

3.4.2 Guidelines and Requirements for Documentation

1. The Design Consultant shall provide the following documents (as minimum requirements) at the appropriate phase of the project. Reference Appendix 3.4-1 Roofing Documentation Checklist.
2. Roof plan showing roofing materials, slopes and location of drains, equipment locations, roof accessories, and other roof penetrations.
3. Project-specific details of the roofing systems and intersections to adjacent construction (parapets, skylights, equipment, expansion joints, etc.)
4. If applicable, details showing U.L. assemblies required to meet fire rating requirements for roofing system.



Roofing Review
-Roofing design and
material selection
reviewed by
University Architect
during preliminary
design

Window Standards
See Appendix 3.3-1



3.4.3 Guidelines for Installation and Performance – Roofing

Of prime importance to MSU is the type of roofing material, the quality of the initial roof installation and the provision of a long life warranty for any roofing system installed on campus.

1. For low slope roofs, a fully-adhered, EPDM, black, single-ply membrane roofing system is preferred. Other types of single-ply roof membranes are acceptable, including PVC and TPO, where appropriate. The Design Consultant shall present the best material for the specific installation and budget for the university's review.
2. The roofing installer shall have a record of a five successful installations (minimum) of similar roof installations in the previous five years where the roofing manufacturer has provided supervision during installation.
3. The following warranties are to be provided in the specifications:
 - A. Minimum warranty for low-slope roofing systems is 15-year, no limit, full system warranty.
 - B. Minimum warranty for manufactured, pre-formed metal panel roofing systems is 20-year, non-prorated water tightness and finish warranties.
 - C. Minimum warranty for three-tab fiberglass or dimensional shingle is 25-year, full system warranty.
4. Roof decks: concrete or steel decking is the preferred decking material, sloped to drain. If sloped deck cannot be used, a flat deck with tapered insulation or another material meeting the construction classification required for the building may be considered (Consult with the Project Manager).
5. If there is a mechanical penthouse in the project, the floor of the penthouse should be concrete; a steel roof or roof deck is acceptable over the penthouse.
6. Insulation: Roof insulation is to be part of the roofing system and is to be covered by the roofing warranty. Point loading and uniform loading requirements must be considered in the choice of insulation material and method of installation. Insulation must meet current IECC and State High Performance Building standards for minimum and average thickness and R values. Insulation is to be installed in two layers with staggered joints; insulation is to be fastened to a vapor barrier using 'fasten free' adhesive, and successive layers of insulation are to be fastened with the same adhesive.

7. Polyisocyanurate insulation should be covered with 1/2-inch minimum DensDeck (or equal). On structure without slope, insulation is to be tapered to roof drains; roof drains are to be installed in 4-feet by 4-feet sumps to provide positive flow to the drains.
8. Through-wall/counter flashing is to be receiver-type to allow for re-roofing. Flashings are to be locked and soldered at seams and corners. Flashings at roof penetrations, curbs, and transitions should extend up a minimum of 8-inches above the surface of the roof. Coordination of through-wall flashing is very important. For through-wall flashing, details shall eliminate the need for sealants: sealant or caulking are not to be relied on for water-tightness.
9. At parapets all drains shall have an overflow scupper to divert water off the roof in times of drain blockage. Overflows shall be 2-inches minimum, below lowest point of base or wall flashing.
10. Metal copings should be designed to allow for expansion without bending or flexing. Expansion joints should be installed within four feet of corners and at every third joint along walls (at twenty feet on center +/-). Use loose-locked-and-caulked joints or use splice joints for expansion. All other joints are to be drive locked. Premolded corners shall be used. Use concealed cleat on exterior and gasketed fasteners at roof side of parapet.
11. Stone copings at parapets and other locations shall be installed over through wall flashing.
12. Due to the increase in the number of penetrations and to minimize foot traffic on the roof, installation of equipment on a low-slope roof is to be avoided if possible. Where equipment must be installed on a roof, NRCA design considerations are to be followed. Clearance requirements for ease of re-roofing are to be met; equipment supports are to be detailed so that re-roofing can be easily accomplished. Curbs are to be 18-inches minimum (24-inches preferred) and use of pitch pockets is to be avoided. The location of equipment shall be coordinated with the location of the roof drains to provide a minimum of six feet separation.
 - Prefabricated walks are to be provided with the roof for maintenance access to the equipment and to roof hatches or access points.

Coping Joints
-Shall be drive locked where fixed

Masonry Copings
-Install masonry copings over through-wall flashing

Equipment on Flat Roof
-Avoid installation of equipment on flat roof areas



Manufacturer's
Warranty

-Shall include all
materials and labor
for the term of the
warranty

Steep slope Roofs
need an ice shield over
entire roof

Utilize cold roof
design where possible



13. For steep-slope roofs, metal roofing, slate and asphalt shingles are acceptable materials. Synthetic slate products are discouraged. Attic stock of replacement slate or shingles shall be specified.
 - A. All steep-slope roof areas should have continuous ice and water shield under all of the roofing material. Saturated asphalt felts or an approved synthetic underlay with a rosin slip sheet are the typical underlayment for most pitched roofs, with a rosin slip sheet used between felts and metal roofing material.
 - B. Codes require eaves and other areas subject to the effects of ice dams to be protected with cemented underlayment or waterproofing membrane. A self-adhering, self-sealing membrane is the preferred ice shield. Ice shield is preferred over the entire pitched roof.
 - i. Cold roof design – where possible implement a cold roof design with two-way ventilation.
 - ii. Determine if lighting protection is required during Schematic Design.
 - iii. For membrane roofs, full-time jobsite inspection by the manufacturer's trained representative is required.

14. Flashings are to be 20-ounce minimum or equivalent for standing vertical flashings, valley, through-wall flashings, and areas subject to excessive wear. Materials, including slates, shingles, felts, metals, fasteners, etc. are to comply with the requirements of the NRCA Roofing and Waterproofing Manual and the SMACNA Architectural Sheet Metal manual, and be fabricated and installed in compliance with good practice and the details listed in Appendices.

3.4.4 Guidelines for Protection and Maintenance

Roofing specifications for work, to or around existing roof areas, are to contain the following statement: "The Contractor shall not move equipment or materials over, or in any way modify the existing roofing that will remain during or after the completion of roofing work unless the roofing is fully protected from damage. The Contractor will be responsible for repair or replacement of defective material, improper installation, or damage resulting from work performed through the project prior to MSU accepting the roof as completed".

All new roofs are to be designed for ready access to all areas during adverse weather conditions with a minimum use of portable ladders or other lift conveyances.

3.4.5 Design Guidelines for Safety in Roofing Maintenance

The Design Consultant is to consider requirements for safety in the maintenance of the building in designing the roof for the building. During the Design Development phase, consideration is to be given to providing parapet walls for low-slope roof areas to ensure that OSHA recommendations for maintenance on roof areas can be met. The Design Consultant shall review proposed solutions with the Project Manager and Safety & Risk Management.

Fall protection systems, where needed, in the absence of parapet or other structural components, are to be installed in new construction projects and in major renovation / alteration projects. The need for fall protection will be reviewed and determined if required for reroof projects. An alternative may be a built-in system of permanent mounting points for safety railing.

3.4.6 System Evaluation

The Design Consultant responsible for the roofing design shall evaluate and specify the roofing system for:

1. Fire resistance rating
2. Wind uplift resistance
3. Warranty
4. Tear resistance
5. Resistance to harmful local chemicals
6. Membrane compatibility with insulation
7. Type of membrane seams and joints
8. Flexibility / Elongation Coefficient
9. Resistance to hail damage

Masonry
See Section 3.5

3.4.7 Guidelines for Installation and Performance – Waterproofing

The preferred method for waterproofing horizontal areas below grade is a loose-laid single-ply PVC membrane.

1. Below-grade structures: When applying a horizontal membrane over below-grade structure (particularly in cases where plantings or “soft” cover are planned as a top surface)
 - A. a 4-inch concrete protection slab should be applied over drainage mat and filter fabric, which in turn is installed over the waterproofing layer. This will ensure protection of the treated areas from penetration by fencing, tent spikes or the like.
 - B. The added depth of the lab should be taken into consideration when planning grades and planted areas.
2. Below-grade penetrations: for piping, conduit, and similar services,
 - A. individual sleeves for each pipe are to be installed in new construction, and individual cores for each pipe in existing construction are to be used.
 - B. Penetrations are to be spaced to allow a minimum of 6-inch clear area in all directions for proper application of waterproofing assembly; a 4-inch conduit, for example, will require a frame approximately 16 inches in diameter.
 - C. Clear space requirements for adjacent penetrations are allowed to overlap one another.
 - D. Space between core or sleeve and conduit or pipe is to be sealed with a mechanical link-type seal. Any deviation must meet with the approval of the Project Manager.
 - E. The exterior wall at the penetration is to be primed and coated with a bitumastic waterproofing membrane. The bitumastic is to be formed around the pipe or conduit, and outward 4-inch to allow a stainless-steel clamp to be installed around the extended membrane.
 - F. Termination bars are to be applied, picture-frame style, to finish the edges of the membrane.
3. Refer to code requirements as needed for utility penetration spacing where these pass through foundation walls. Where MSU requirements exceed code requirements, spacing is to meet the more stringent requirement.
4. Concrete or CMU foundations: when concrete or CMU foundations are part of the waterproofing design, ensure proper curing, cleaning and preparation of the wall prior to the application of the bituthane waterproofing system and subsequent mirror drain fabric.

Refer to section 3.5 Masonry for specific detailing required to ensure proper waterproofing of masonry systems.

3.4.8 Requirements for As-Built Drawings

Reference Appendix 1.8-2 Record Documents Requirements

3.5 Brick

The color, size, texture, bonding patterns, and construction methods of buildings with brick have varied as availability, architectural style, and preferences have changed and evolved throughout the history of design and construction for at MSU.

1. During the Schematic Design phase, the Design Consultant shall select brick, mortar and joint tooling for the project, in context with surrounding buildings or LRCDP neighborhood, and what is appropriate for the design of the project. The selection is to be approved by the University Architect.
2. If fewer than three brick manufacturers and/or mortars are selected, performance specifications for size, type of brick, color, range, strength and permeability shall be used, citing as the basis of design of one or more manufacturer's brick products.
3. Additions to existing buildings shall match the existing brick in size, color, texture, unless otherwise directed.
4. Standard and oversized bricks are acceptable. The primary bonding pattern shall be running bond, unless otherwise directed.

3.5.1 Guidelines for Installation and Performance

Particular care is to be taken in designing interfaces of masonry anchorage systems and in placement of through-wall flashings to bring any water that penetrates the system out to the exterior.

1. Flashing pans with welded seams are to be installed beneath all sills at openings in masonry veneer walls. A reliable flashing and weep system is to be designed for the wall, including a mortar suspension system to prevent mortar build-up in the cavity and at the weeps.
2. If a relatively porous material is to be used to face the building (such as limestone, brownstone, and some types of brick), the concrete foundation wall or a nonporous material (such as granite) shall extend 8" (min.) above finish grade.
3. All parapet walls up to 3'-0" height above roofing shall be flashed from coping to roofing.
 - A. The inside face of parapets exceeding 3'-0" height above roofing shall be of an approved material other than exposed concrete masonry unit.
 - B. Metal or stone are acceptable materials for coping (brick is not permitted).

Documentation and Archiving
See Section 1.8

Historic Buildings
See Section 7.0

Weep System
Required



4. All through wall flashing shall be 16 oz. minimum copper or equivalent fabric coated copper. Other metals, vinyls and plastics shall not be used.
5. If masonry work is planned as part of a 'rain-screen' system (or if metal or glass panels are planned as part of a combined masonry / metal / glass rain-screen system);
 - A. the Design Consultant is to review proposed system and proposed waterproofing techniques with the Project Manager, the University Architect and Facilities Services.
 - B. It is expected that redundant systems will be included as part of the design, so that the failure of the primary watershedding system will not result in total system failure.

3.5.2 Garden or Landscaping Walls

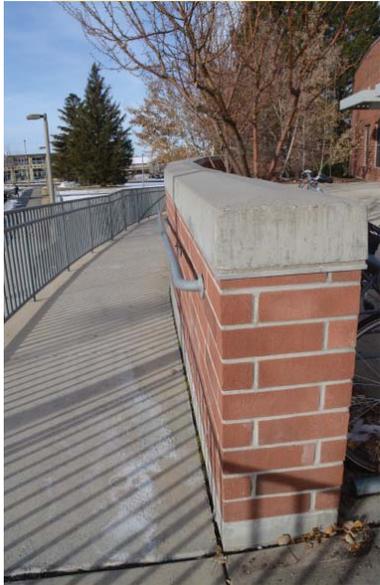
Garden or landscaping walls should have through-wall flashing under the coping to prevent water penetration that can damage the wall.

1. Stone is an acceptable material for coping (brick is not permitted).
2. Mortar joints of the coping are to be raked then caulked.
3. On stone walls, specify through-wall flashing near the top of wall under stones, using lead flashing to conform with irregular shapes.
4. If over an occupied space (below) set through-wall flashing at waterproofing level in addition to coping detail.

3.6 Exterior Paint

Exterior painted surfaces are to be avoided if possible. The Design Consultant shall review all areas of exterior painted surfaces to determine if other options are available.

1. Proper preparation, cleaning and priming of surfaces are essential to a durable exterior paint application.
 - A. The Design Consultant shall review the specifications with the Project Manager and Facilities Services during the Construction Document phase.
 - B. The specifications shall include a pre-installation conference.
2. Use a high-gloss or semi-gloss sheen for exterior painted wood trim, doors, and windows. If clear stains are necessary because of historical preservation requirements, use a gloss, high-solids polyurethane stain.
3. For exterior painted metal, proper preparation and priming is critical. Ensure that primer is compatible with the finish specified. Higher gloss finishes are preferred on metal and wood for longevity of finish.



Rainscreen Systems:
System design review
required

Through wall flashing
below wall coping

3.7 Exterior Metal Siding

1. Prefinished aluminum or steel, zinc and copper, or composite panels are acceptable materials for exterior metal siding.
2. Metal siding panels may be the primary weather barrier or may be part of a rainscreen type system. The type of panel should be chosen to meet the aesthetic requirements of the building, including
 - A. panel size
 - B. panel length, fastener system
 - C. the type of seaming from panel to panel
 - D. Care must be taken with flat panels and larger panels to assure that unacceptable “oil canning” does not occur.
3. Appropriate gauge of metal must be specified for location and exposure to ensure long service life and to resist environmental factors such as exposure to ice and hail.
4. Metal panel connection and joinery must be carefully considered due to high degrees of expansion / contraction and large numbers of freeze / thaw cycles especially on south and west facing wall exposures.
5. Metal finishes must be carefully specified to resist environmental factors such as temperature extremes and severe UV exposure. Warranties shall include
 - A. fading or degradation of metal finishes
 - B. installation
 - C. material replacement.
6. Metal panel systems should include a minimum of sealant joints that require periodic maintenance and replacement for the life of the building.

3.8 Insulation and Vapor Barriers

1. MSU’s climate is considered Cool-Dry by the International Energy Conservation Code (IECC). The campus climate requires great attention to detailing of insulation and moisture control for the building envelope.
2. The Design Consultant shall meet or exceed the current Energy Code and State High Performance Building requirements for insulation of the building envelope.
3. MSU’s climate zone requires Class I or II vapor retarders provided on the interior side of exterior walls. Vapor retarders are to be installed per the manufacturer’s requirements.



3.9 Flashing

3.9.1 Metal Flashing

1. Design flashings to resist oil canning.
2. All flashing details are to be shown in the 50 percent Construction Document phase submittal.
3. All concealed and exposed flashings shall be included in details and clearly coordinated with the Specifications.
4. Use 3D details where appropriate to show proper fabrication and installation of flashing and counter flashing.
5. Flashing at masonry walls should have reglets or termination bars.
6. Steel flashings should only be used when they are required to match steel siding products. Steel flashings shall be prefinished with the same quality finish as the siding. Galvanized steel flashing should be avoided.
7. Prefinished or anodized are acceptable finishes for aluminum flashings are the most common flashings for different roofing types.

3.9.2 Flexible Flashing

1. Flashing at single ply roofing shall match the roofing material.
2. All flashing must be reviewed and approved by a manufacturer representative during construction and at the completion of the roofing installation.
3. Concealed flexible flashing should typically be PVC.
4. Flexible copper flashing should be avoided.

3.10 Hazardous Materials

Reference Section 4.10 Hazardous Materials

END OF SECTION 3.0



Review of Flashing
Details

-Flashing details to be
shown on 65 percent
review drawings





Access Control
Systems
See Section 3.1

-Design Consultant
shall have "first
pass" at hardware
schedule and
specification for 65
percent Construction
Documents

-A complete and full
Hardware Schedule
and Specifications
are required at 95

4.0 Building Interior

1. In general, building entrances, lobbies and significant public areas require design input and approval by the University Architect, coordinated by the Project Manager. The University Architect may designate other building areas to be included.
2. Materials, finishes, and colors shall be recommended by the Design Consultant, with the involvement of the Building Committee and, when required by the University Architect.
3. As a public institution, extravagant and/or higher maintenance interior finishes are discouraged. Areas are likely to remain in the same use for 10 or more years and require durable, lower maintenance finishes.
4. Interior flooring and ceilings shall be selected from manufacturer's standard material selection.
 - A. Custom material selections are prohibited, regardless of initial lower costs resulting from significant quantities.
 - B. Future replacement or matching materials are an unnecessary premium in cost.
 - C. Custom material selections may only be used with prior written approval.

4.1 Door Hardware Standards

Reference Section 3.1 Access Control Standards, Section 1.9 Accessibility, Appendix 3.2-1 Door Documentation Checklist for submittal requirements, and Appendix 3.2-2 Door Hardware

1. Early in the planning stages of the project, the Design Consultant must meet with the Project Manager and with the Facilities Services Locksmith to review both the design standards and the program needs for locks and hardware in the proposed project.
2. Prior to shop drawing submission by the Contractor, a hardware coordination meeting is to be scheduled with the Project Manager, user groups, Facilities Services Locksmith and the Contractor to discuss project-specific issues related to lock functions, coordination and delivery. The specifications shall include a pre-installation conference.
3. MSU allows door hardware from a number of manufacturers, however because of ongoing maintenance needs and normal modifications for certain components of door hardware within buildings, it is important that the Design Consultant specify the stipulated manufacturers.
4. For renovation work, the Design Consultant shall not reduce the level of quality or service provided by existing hardware when specifying replacements without prior approval by Project Manager.

4.1.1 Key Schedule and Core Installations

1. All cores will be combined and installed by MSU Facilities Services Locksmith unless directed otherwise by CPDC.
2. The Design Consultant is to arrange a meeting with the Project Manager, the departmental representative for the project, the Facilities Services Locksmith, and a representative from the door hardware supplier prior to the shop drawing submittal phase of the project. The purpose of the meeting is to confirm requirements for lock function, keying and for levels of master keying and sub-masters, and any access control issues. The lock supplier is to deal directly with the Facilities Services Locksmith for sequencing requirements.
3. Room numbering and room designations used in the key schedule are to be consistent with those used in fire alarm nomenclature (See Section 5.1 Information Technology and 5.3 Heating Ventilation and Air Conditioning).
 - A. Facilities Services Lock Shop is to prepare the key schedule for review by the other parties, and is to proceed with setting up lock cores upon receipt of the approval key schedule.
 - B. The contractor is to supply one key per core minimum
 - C. Residence hall projects will require three keys per lock.
4. Facilities Services Locksmith shall be given 4 weeks notice to schedule the installation of the cores in the finish hardware.
 - A. It is critical that the specification require that the contractor retain all factory-supplied lockset tailpieces needed for lock core installation.
 - B. Tailpieces are to be turned over to Facilities Services Locksmith for core installation.
5. Specifications are to include requirements for employing only experienced, qualified mechanics for installation of finish door hardware.



Access Control
Systems
See Section 3.1

Door Hardware
Specifications
See Appendix 3.2-2

4.1.2 Electrified Hardware and Access Control Considerations

Refer to Section 1.12 Security for guidelines to establish general security goals for the project.

Campus Access Control System (CACS) Hardware Specifications – Electromechanical (See Section 3.1 for Access Control Systems guidelines for exterior doors) as follows:

1. Door mounting configurations shall be RIM (See Appendix 3.2-2).
2. “Request for Exit” (RX-LC) switch requirements shall be addressed during the 50 percent construction drawing door schedule “first pass” meeting and will be implemented on a per project basis.
3. Magnetic locksets must be equipped with key bypass.
4. Hardware, Panic bar, trim styles and finishes to be specified by the Design Team Standard specifications and series numbers for hardware, trim styles and finishes (See Appendix 3.2-2).
5. Panic Hardware
 - A. All electromechanical Panic Hardware shall be manufactured by Von Duprin.
 - B. Panic Bar with Electric Trim Release (24V Fail-Secure Operation) this type of hardware has the locking function in the outside lever trim. Electrical solenoid activation releases the locking mechanism allowing the lever handle to withdraw the door latch. This type of locking hardware is standard on all exterior dormitory doors. Key override shall be “Night Latch” function (NL).
 - C. A Van Durpin Power Transfer Device shall be included with each panic bar installation.

6. Panic Bar with Electric Latch Retraction (24V Fail-Secure Operation).
 - A. This type of hardware has the locking function in the bar. A special high current power supply is required to retract the door latch. This allows for the use of standard pull handles as outside trim. Commonly used on the exterior doors of Administrative and Academic buildings. Required on all ADA motorized doors, Key override shall be "Night Latch" function (NL).
 - B. The following equipment shall be included with each EL panic bar installation: A) Von Durpin Power Supply. Double leaf doors require one power supply. B) Von Durpin Power Transfer Device.
7. Panic Bar with Delayed Egress function
 - A. This type of hardware has all the same requirements of a standard latch Retraction panic bar but with a "Delayed" action release scheme when exiting. Building code requires that the hardware must be interconnected with the Fire Alarm System for immediate release in case of fire.
 - B. The following equipments shall be included with each CX bar installation: A) Von Durpin Power Supply. Double leaf door only require one power supply. B) Von Durpin Power Transfer Device
 - C. Mortise Lockset Hardware (24V Fail-Secure Operation)
 - D. Electrified mortise locksets are typically not used by MSU. As an option for Access Controlled doors that don't require panic egress Mortise Lockset may be used. Key override shall be "Night Lath" function (NL). A "Door Status" monitor switch (DSM) shall be provided. The manufacturer of choice shall be Best.
8. Cylindrical Lockset Hardware (24V Fail-Secure Operation)
 - A. Electrified cylindrical locksets are only to be used on Access Controlled doors in place of the mortise type when there are specific Architectural constraints. Key override shall be "Night Latch" function (NL). The manufacturer of choice shall be Best.
 - B. Motorized Door Operators (ADA)
 - LCN is the overhead operator manufacturer of choice. NO SUBSTITUTIONS.

4.1.3 Requirements for Mechanical Rooms, Penthouses, Roof Access

Specify cylindrical lockset with storeroom function. If padlocks are to be used (on roof hatches, e.g.), specify Master Locking interchangeable-core padlocks; use weathertight locks for exterior applications. American manufacturer may be used on interior applications, to be approved by Facilities Services Locksmith. All padlocks must be equipped with a key override.

4.1.4 Millwork and Cabinetry Locks

Specify National or Timberline deadbolt or dead latch cabinet locks for custom cabinetry or millwork applications. The use of Best for custom applications requiring interchangeable cores is to be determined by use group.

Media Services lecterns and media cabinets are to be keyed with a media module.

4.1.5 Access Panel Locks

Access panels are commonly used for the maintenance of building utilities and are typically required to be locked. Those which exist in maintenance (non-public) areas do not require locks; those in public spaces are required to be lockable. Exceptions may be made in the case of very high ceilings (above 9 feet) or other unusual locations and shall be reviewed by CPDC.

Depending on the access panel manufacturer, locks should be Best rim cylinder or mortise cylinder.

4.1.6 Requirements for As-Built Drawings

Reference Appendix 1.8-2 Record Documents Requirements

4.2 Elevators

The following standards set forth the criteria to be utilized by the Design Consultant for the installation of new elevators at MSU. The standards have been prepared for use by Design Consultants to properly specify in-ground hydraulic elevators and geared traction elevators in a manner satisfactory to MSU. The Elevator Requirements for hydraulic and geared traction elevators in Appendix 4.2.1 shall be utilized as a reference in preparing the Contract Specifications for all elevators. Although the standards apply specifically to new elevators, they shall be used as a reference for upgrading existing elevators.

4.2.1 Review and Procedural Guidelines

1. Early in design development the Design Consultant should arrange a meeting with the Project manager and the Engineering and Electrical foreman to discuss the programmatic requirements of the proposed elevator, and to begin to set technical requirements. The meeting should be followed up with a review session with the same attendees and the City of Bozeman Building Department.
2. At 65 percent completion of contract documents for the project, the mechanical design of the elevator should be nearly complete and the architectural and MEP coordination required for the installation of the elevator should be included with the contract documents in the 65 percent review.
3. Shop Drawings are to be submitted to the Design Consultant, who is to forward the submission to the Project Manager. Note that elevator plan review and inspections at MSU are performed by the City of Bozeman Building Department and the Montana Department of Labor and Industry (DLI).
4. The Project Manager will return any comments to the Contractor who makes the official review submittal to the Montana DLI. Shop Drawings for permit review must be signed and sealed by a licensed design professional.
5. A copy of the shop drawings is also to be provided to the Project Manager for review by Facilities Services.



Montana DLI to review elevator permit.

Provide a copy of Shop Drawings to FPDC Project Manager for review by Facilities Services

4.2.2 Design and Installation Guidelines – General

1. All general purpose elevators shall serve both to transport passengers and to transport furniture and equipment typical to the function of the building. Determine if the building requires a passenger and a freight elevator in the Programming phase.
2. Elevators shall service all floors of a building, including basements and penthouses if possible. Access to floor may be limited, if necessary, by key switches or access control card readers. Review requirements for limiting access with Project Manager.
3. Travel distance up to 4 stops: The typical general purpose elevator type to be used in academic and student residential buildings is the electric “Machine Room-Less” (MRL) type, such as the Otis “Gen 2” system, the Kone “MonoSpaces/EcoSpace” system, and the ThyssenKrupp “Synergy” system, among others. Other manufacturers and elevator series are to be approved if equal.
4. Travel distances above thirteen stops: Use of geared traction required. Design to be determined per project.

4.2.3 Design Requirements for Hoistway Entrances and Cabs

1. The Design Consultant should determine early in the design process if the elevator will be used as an accessible means of egress. Elevator design must meet all state and local codes regarding accessibility for the required height and number of floors served.
2. Hallway doors are to be stainless steel finish unless specifically stated to be otherwise.
3. Cab doors are to be stainless steel finish unless specifically stated to be otherwise.
4. Cab wall finishes at passenger elevators are to be solid surface panels if available, or high pressure plastic laminate if not. Stainless steel guard rails are to be provided.
5. Cab wall finishes at freight elevators are to be baked enameled steel panels with stainless steel guard rails.
6. The cab for both passenger and freight elevators are to be fitted with studs for moving blankets and blankets are to be provided.
7. Standard cab lighting is to be a luminous ceiling type, LED if available. The preference for cab lighting is 4-foot fluorescent fixtures connected to the emergency system.
8. The flooring material for the cab shall be appropriate for the amount of passengers, and the type of use.



4.2.4 Design and Installation Guidelines – Elevator Machine Rooms

It is the goal of MSU to design and layout elevators to be Machine Room-Less. If there are restraints within the project that do not allow Machine Room-Less elevator design then the elevator machine room shall be designed and constructed in accordance with the requirements of the IBC.

1. The elevator machine room shall be adequately ventilated and accessed by means of an outwardly swung fire rated door measuring at least 3 feet by 7 feet. The door must be outfitted with a spring closer to lockset. The lockset installed on the elevator machine room doors shall be keyed like the MSU's other elevator machine rooms and shall automatically lock when closed (See Section 4.1 of these guidelines for further door hardware standards).
2. Two elevator hoistway door keys shall be provided in a key case or box mounted to the wall in the elevator machine room, located in close proximity to the main power disconnect.

4.2.5 Design and Installation Guidelines – Elevator Hoistway and Pit

Elevator hoistways and pits shall be designed and constructed in accordance with the requirements of the IBC. The sizing of hoistways and pits are to conform to the manufacturer's requirements.

4.2.6 Design and Installation Guidelines – Related Work

For proper installation of an elevator, appropriate related work must be included in the project. The following list, including but not limited to, contains some of the work needed to be included in other sections of a project specification:



Reference IBC and other jurisdictional codes for compliance with elevator standards
Machine-Roomless Elevator design is preferred

Final testing to be witnessed by the Project Manager

Contractor to perform on-site training of elevator

1. Smoke and heat detectors shall be installed per the American National Safety Code for Elevators, ANSI A17.1 (latest edition accepted by the State of Montana) and interconnected with the fire fighter provisions of the elevator's control system. Smoke detectors shall be installed at the top of the shaft, in the elevator machine room and at the interior elevator lobbies and shall be the sole devices to initiate Phase I Elevator Recall. Heat detectors shall be installed in elevator machine room, at top of hoistway and in hoistway pit. In a building equipped with sprinklers, any sprinklers installed in the elevator shaft must be protected from freezing.
2. A shunt trip circuit breaker shall be provided on the main power feed to the elevator any time the hoistway and/or elevator machine room is sprinkled. Anytime the elevator hoistway or machine room is sprinkled, a rate of rise / fixed temperature heat detector shall be installed in close proximity to each sprinkler had and wired to the main power shunt trip circuit breaker. Activation of heat detector shall cause the main power to the elevator to disconnect. Fire service key switches will be available at each elevator inside of key lock boxes. Fire department will have key to lock boxes (all keyed alike).
3. Cab Telephones – all cabs must be equipped to accept an elevator telephone as specified by the elevator guide specifications, which have been coordinated with the Information Technology Center (ITC). Accommodation for mounting the telephone must include holes tapped to accept standard mounting machine screws.

4.2.7 Requirements for Testing and Training

The elevator subcontractor is responsible for conducting the final acceptance test with the State inspector, with a representative of the university's elevator maintenance shop in attendance. The Project Manager is to be advised of the schedule for inspection and testing.

1. The procedure for testing shall be followed closely in accordance with code requirements.
2. The Project Manager is responsible for witnessing and approving the acceptance test. The elevator subcontractor shall certify the report of the test data, and shall deliver a signed and sealed copy to the Project Manager prior to final payment.

3. At a minimum, prior to seeking final acceptance of the completed project as specified by the contract documents, the contractor shall conduct a comprehensive training program on-site with university elevator maintenance personnel. The session shall provide instructions on the proper safety procedures to be utilized in assisting passengers that may become entrapped inside the elevator car. The session shall also provide instructions on the use of each control feature and its correct sequence of operation. Control features covered shall include, but not be limited to, the following:
 - A. Independent service operations
 - B. Emergency fire recall operations, Phase I
 - C. Emergency in-car operations, Phase II
 - D. Emergency power operations, if applicable
 - E. Emergency communications equipment
 - F. Security operating features
 - G. Interactive systems management, if applicable
 - H. Remote monitoring / controls, if applicable

4.2.8 Requirements for As-Built Drawings

Reference Appendix 1.8-2 Record Document Requirements

The operating and maintenance manual is to contain

1. wiring diagrams,
2. parts list
3. list of recommended spare parts
4. list of manufacturers of major components of the elevator
5. operating and maintenance recommendations
6. details of any tie-ins to other systems, such as
 - A. fire alarm
 - B. electric systems, including elevator shaft wiring and details

4.2.9 Non-Conformance with Standards

Any requests for exceptions to elevator standards at MSU shall be presented to the Project Manager, with written notice detailing the reasons for the requested exception. The Project Manager will review the request with Engineering, the Electrical Shop Foreman, and with the MSUs elevator consultant if deemed appropriate. The exception will be granted only if such action is in the best interests of the university.

4.2.10 Maintenance After Substantial Completion

Specifications shall require maintenance of the project elevator by a local Elevator Technician (within one hour drive) to be included in initial installation price.

4.3 Painting and Staining

4.3.1 Standards for Painting Grounds and Building Maintenance

Paint finishes, once a new building or a renovation project has been completed and occupied, may require frequent maintenance if a building is to be kept presentable. The frequency of maintenance depends on the type of facility, the quality of the finishes and the nature of use, abuse the occupants subject the building to. Regardless of the frequency of maintenance required, the task of repainting a space or a building most often falls to the Facilities Services Painting; rather than to a contractor.

1. It is important for the Design Consultant to know that Facilities Services Painting stocks a limited number of paint colors, has the capability of mixing a fairly wide range of colors, but should not be expected to provide an infinitely varied palette. MSU employs a number of standard colors that are to be used for “common” spaces such as corridors, offices, classrooms, laboratories, residence hall rooms, or other spaces. The Design Consultant is normally allowed greater latitude in selecting colors for spaces such as lobbies, lecture halls, lounges, and similar spaces. MSU has a standard of six paint palettes to be used throughout campus interior use (See Appendix 4.3-2). MSU utilizes the MPI paint system numbering for project specifications.
2. The Design Consultant should attempt to incorporate breaks, reveals, or other architectural details to divide large expanses of painted surfaces, particularly in the vertical direction. This is especially true in high traffic areas, areas using high pigment paints, or locations that are especially subject to abuse. Consider locations of items such as trash / recycling containers relative to accent paint locations, as these areas are subject to frequent marring and require a higher degree of maintenance.
3. Regardless of the colors used in a project, the Design Consultant is expected to produce a color schedule for approval by the Building Committee. This schedule is to be updated at the end of the project and converted into a record of color selections that is turned over to the Facilities Services Painting foreman. A record of all paint information, including color and sheen, shall be included by the Contractor as part of the operation and maintenance manuals.
4. Unless otherwise directed, all excess paint shall be removed from the construction site by the Contractor.

5. The Design Consultant should be aware of MSU's requirements for minimizing the volatile off-gassing compounds (VOCs) in products such as paint finishes, and should specify products accordingly. The preferred manufacturers used for paint are: Benjamin Moore or Sherwin-Williams.
6. Reference Appendix 4.3-1 Interior Paint Palette and Appendix 4.3-2 Paint Finishes Standard.
 - A. In areas of heavy traffic, such as hallways and corridors, consider the use of a wainscot finish (with or without appropriate trim), which would allow for an easily cleaned and maintained finish on the lower surface, and lower luster finish on the upper, reflective area.
 - B. For wood flooring, finishes must meet MSU's requirements for volatile organic compound compliance. Water-based finishes shall be used for private rooms and public spaces such as corridors. Meet or exceed manufacturer's recommended minimum number of coats. To achieve color match, consider staining prior to the application of water-based protective coatings.
 - C. Interior wood finishes require careful review of sanding and sealer procedures as they relate to staining and finish coating. Long-term UV protection is essential.
 - D. If interior walls are exceptionally high (such as atriums or loft areas), consider the installation of a "break" in the upper wall, such as a picture rail or second contrasting color, to allow for less maintenance painting over time.

4.3.2 Special Coatings

1. Long-lasting exterior finishes are encouraged, and special coatings may be specified as part of a planned low-maintenance building project. Among the special coatings that can be used are anodized finishes, tnenic paints, and epoxy paints. Shop-applied special finishes are preferred to site-applied, due to better control of conditions.
2. Exterior metals must be coated, if not naturally weather-resistant such as copper and brass. Steel should be galvanized prior to receiving finishes, unless the specifications for a special coating will not permit galvanizing.
3. Regardless of finish used, manufacturers' instructions for on-site application and touch-up of finishes are to be followed. As part of the submittal process, those instructions are to be provided to the Project Manager, with a copy for the Facilities Services Painting.
4. The use of Anti-Graffiti Paint and coatings are highly encouraged. Consult the Project Manager for required applications.



Paint Finishes
Standard
See Appendix 4.3-2

Wainscot in corridor

4.3.3 Requirements for As-Built Drawings

Reference Section 1.8 Documentation and Archiving.

The Contractor shall include in the operating and maintenance manual a detailed schedule of actual paints used in each space of the project, including manufacturer, color name or formula, sheen applied, etc.

4.4 Rough Carpentry and Finish Carpentry

While the Campus Design Guidelines cover basic principles of several different project elements and building blocks, considerations for a host of other issues related to the construction and maintainability of facilities continues to develop. There is a considerable interest in the use of abuse-resistant and sustainable materials and methods of assembly which allow for long-term maintenance and corrective procedures.

This section address preferred construction practices, material selections and methods of assembly which have repeatedly arisen in carpentry tech reviews and reflect the experience gained in maintaining and servicing campus facilities.

4.4.1 Review Guidelines – General

Reference Section 1.9.2 University Review Guidelines

4.4.2 Construction

1. Cold-Formed Metal Framing Assemblies
 - A. 16-inch centers required
 - B. Cold-formed metal, 20-gauge typical
 - C. Refer to SSMA limiting height tables and provide intermediate bracing as required
 - D. Design assembly to meet or exceed IBC

2. Rough Carpentry Requirements
 - Fire-resistant wood grounds, furring, blocking, and nailers required within rated interior steel stud framed partitions to facilitate fastening of interior wood window and door frames
3. Millwork Fabrication Requirements
 - A. Specify compliance with Architectural Woodwork Institute (AWI) "Premium Grade" standards
 - B. "Premium Grade" cabinet drawer box construction to be limited to dovetail (multiple or French) or doweled
 - C. Specify "Premium Grade" per HPVA material fabrication standards per ANSI/HPVA HP-1-2004.
 - D. Full overlay cabinet type is the typical standard
 - E. Plywood construction for cabinet carcasses and shelving, typical (no particleboard)
 - i. Veneer core plywood is acceptable complying with American plywood Association PS-1 Standards
 - ii. Hardwood or furniture grade plywood shall be used if cabinet carcass is exposed.
 - iii. High Pressure Decorative Laminates (HPL) shall be used for interior surfaces of cabinetry (no melamine).
 - F. Edge banding at shelving to be hardwood or PVC, minimum of 3mm thick.
 - G. Cabinetry in laboratories shall be all metal construction, have metal panel veneer, HPL
 - H. Drawer fronts are to be secured to drawer box with four screws (minimum), adhesive attachment is not allowed.
 - I. Shelving internal to the cabinet and not in the vicinity of moisture may be Melamine with three mm PVC edge band at nosing.
 - J. Shelving support shall be heavy duty standards and brackets. "Premium Grade" standards require standards to be recessed flush.
4. Countertop Requirements: Refer to Appendix 4.4-1 for substrates allowed.
 - A. Plastic laminate countertops to have 3 millimeter edge banding to match laminate color or solid hardwood nosing. Plastic laminate nosing is not allowed.
 - B. Solid surface countertop are required in wet locations.
 - C. Man-made granites are acceptable countertops
 - D. Laboratory countertops will need to be discussed on a per project bases to determine if a non-acid or acid resistant countertop is required.



Allowable Substrates
See Appendix 4.4-1

4.4.3 Installation Requirements

1. Specify compliance with AWS “Premium Grade” standards.
2. All millwork applied to existing construction shall be anchored with methods appropriate for the wall construction as well as the anticipated maximum load requirement of the fixture.
3. Toe kicks are to be minimum of four inches
4. Countertops are to be scribed to fit to ensure no gaps remain. Countertops are to be caulked prior to installation of back and side splashes. Back and side splashes to be set on continuous sealant bead. Sealant is required at top of back and side splashes as well.
5. Blocking details and locations are to be indicated clearly on plans / elevations.
 - A. Light Duty – 20-Gauge Steel Flat Stock per SSMA
 - B. Medium Duty – 20-Gauge Steel Stud / Track per SSMA
 - C. Heavy Duty – Wood Blocking
 - D. Extreme Duty (i.e.: grab bars / shower seating) – Solid Wood Blocking
 - E. Blocking, anchoring and fastening methods are to be as tested in accordance with applicable ASTM weight rating standards per applied loads
6. Specify compliance with AWI “Premium Grade” standards for wall-mounted shelving. All shelving and fixtures and/or wall standards applied to existing construction shall be anchored with methods appropriate for the wall construction as well as the anticipated maximum load requirement of the fixture.

4.4.4 Gypsum Wallboard Applications

Refer to ANSI A 137.1 for standard practices pertaining to on site storage and handling.

Specify compliance with ASTM C-1396/C-1396M standards of applicable panel type per location criteria.

1. High impact drywall to be installed up to six feet for areas subject to abuse and high traffic. The Design Team is to review the areas that would require high impact drywall with Project Manager during the Design Development phase.
2. Specify compliance with ASTM C-1047 for wall board system accessories standards and specify structural drywall interior trims with copolymer cores and paper faces. Plastic trims are to be glued, not stapled.
3. Reference Appendix 4.4-3 for requirements for levels of gypsum wallboard finish
 - A. Specify Level #4 decorative wall finishes in critical lit areas including hallways, stairs and common areas where a uniform finish is required. Avoid Level #3 finishes except in mechanical and electrical closets.
 - B. No lightweight joint compound for finish coats.

4.4.5 Ceramic Tile Applications and Shower Installations

Installation to follow TCNA Tile Installation Handbook (current edition) standards of application

1. Ceramic tile is to be installed over cement board in wet locations, no green board is allowed.
 - A. Where possible, specify pre-formed corners and trim units. Where pre-formed pieces are not available, specify a silicone caulk at inside corners (not grout).
 - B. Grout is typically sanded at wet wall applications (anything with less than one-eighth inch joint) and unsanded at non-wet wall applications. Grout should be sealed per manufacturer's recommendations at wet locations.
 - C. Use matching sanded caulk at corners and areas requiring flexibility due to building movement.
 - D. Epoxy Grout is required at wet floor applications and sealed sanded grout at non-wet floor locations.
 - E. Where tile applications meet with dissimilar material (i.e. doorways), provide a raised saddle (one quarter inch above floor elevation).
2. Substrates are to be mold / moisture / mildew resistant, refer to GA-238-03, guidelines for prevention of mold growth in gypsum board.

Gypsum Wallboard
Finish Standards
See Appendix 4.4-3



3. Specify adhesive to set tiles less than eight inches by eight inches in floor applications and less than four inches by four inches (nominal) in wall applications.
4. Consider use of floor drains where possible and/or feasible.
5. At all floor penetrations in wet areas use integral water barrier sleeve device.
6. The use of fiberglass unitized shower pans and tub enclosures is prohibited.
7. Specify an anti-fracture membrane beneath floor tiles.
8. Specify a PVC pan with welded corners or fluid applied waterproof membrane beneath tile at wet locations.

4.4.6 Attic Stock

Specify attic stock requirements for ceramic, ceiling and carpet tiles. Specify that attic stock be separated out and stored off-site upon arrival at the project. Facilities Services may be able to assist in the short-term storage of attic stock if needed.

4.4.7 Firestopping

Meet UL 1479 and ASTM 814 fire test standards based on the floor and wall assemblies planned.

At fire-rated slab penetrations, there is a preference for the use of integral fire stop.

4.5 Floor Finishes

1. Floor finishes are an integral part of the design of a space being constructed or renovated.
2. The Design Consultant shall present floor finish options to the Building Committee and Facilities Services during Design Development.
3. All hard surface flooring materials must meet current codes for slip resistance.



4.5.1 Building Entrances

Building entrances should have a built-in walk-off system. In new construction this should be a recessed system. The minimum length for this system should be to fill a vestibule or if there is no vestibule, for 12 feet in the direction of travel.

4.5.2 Hard Surface Flooring

1. Terrazzo, VCT, porcelain tile, linoleum and sealed concrete are acceptable materials for high traffic areas such as lobbies and corridors
2. Ceramic tile and porcelain tile are acceptable materials for toilet rooms and locker rooms. Tiles shall extend to wainscot height at plumbing walls and full height at wet areas.
3. All stair treads, regardless of the finish material of the tread, shall have non-slip nosings.
4. Heavy-duty, seamless flooring (minimum four-inch covered base) and fluid-applied, epoxy-based flooring (extend minimum four-inches up walls) are acceptable materials for wet labs. Sealed concrete is an acceptable material for dry labs. The Project Manager will review the proposed flooring materials with the lab user.
5. Quarry tile, heavy-duty seamless flooring, and high performance architectural epoxy coating are acceptable materials for food preparation areas. All flooring materials in food prep areas shall have minimum six-inch integral cove base. The Project Manager will review the proposed flooring materials with the MSU Registered Sanitarian.
6. Porcelain tile, heavy-duty seamless flooring, sheet linoleum with welded seams are acceptable materials for dining areas. All flooring to have 4-inch covered base.
7. Vinyl composition tile (four-inch cove rubber base) is an acceptable material for general purpose rooms and dry utility areas such as closets, store rooms, fire rooms. All rubber bases to have manufactured outside corners.



Ceramic Tile
See Section 4.4.7

4.5.3 Carpet

Carpet tiles are the acceptable material for all carpeted areas. Broadloom carpet is discouraged and must be approved by the University Architect. Attic stock of minimum 10 percent of the installed floor area must be provided to MSU at the time of installation.

1. All carpet products should have a high recycled fiber content.
2. Carpet tiles should be rated for heavy traffic with soil and stain protection, solid backing with fabric scrim, minimum 26-ounce face weight, nylon fiber type 6 or 6-6.
3. Tiered rooms may be fully carpeted or carpet only the traffic aisles.
4. If approved, broadloom carpet should be rated for heavy traffic with
 - A. soil and stain protection
 - B. a level loop or multi-level loop design, with minimum 26-ounce face weight
 - C. nylon fiber type 6 or 6-6 solution dyed yarn.
 - D. Broadloom carpet should typically be glued down.

4.5.4 Access Flooring

Certain spaces with increased needs for technology and flexibility may require access flooring. The following characteristics are required by MSU:

1. Class A listing for flamespread and fire resistance
2. 24-inch square panels, steel frame with lightweight concrete fill on adjustable pedestals, compatible with carpet tiles or VCT.
3. Integrated modular system for line voltage and low voltage wiring systems
4. Able to accommodate plenum air supply/return design



4.6 Interior Doors

Interior doors to comply with IBC and ANSI operational clearances and size requirements

4.6.1 Door Types

All doors shall have a minimum width of 3'-0" and a minimum height of 7'-0". All wood doors shall be five plies, solid core with a minimum thickness of 1 3/4". Specifications shall require a lifetime warranty for wood doors. Rail and style doors are acceptable in historic preservation projects.

1. Wood doors shall be prefinished.
2. Hollow core wood doors and plastic laminated are prohibited.
3. Specify compliance with AWS and WDMA "Premium Grade" quality standards for fabrication, reproduction, repaint, and installation of wood interior doors.
4. For wood repair, "Bondo" is prohibited.
5. Hollow Metal doors are required for mechanical rooms.
6. All metal doors shall be welded construction.

4.6.2 Hardware

Reference Appendix 3.2-2 Door Hardware

1. Kick and push / pull plates are required for doors in high use areas.
2. Protection plates are required for laboratory areas where movable carts commonly moved in and out of rooms.
3. Floor mounted stops are prohibited.



4.7 Interior Borrowed Lights

Interior window glazing shall comply with IBC standards.

4.7.1 Window Construction Types

1. Site constructed wood windows, hollow metal and aluminum storefront are acceptable methods and materials for interior borrowed lights.
2. Specify compliance with AWI and WDMA “Premium Grade” quality standards for the fabrication, reproduction, repair and installation of wood windows.
3. All interior borrowed lights shall have removable stops in the event that the glazing is damaged.

4.8 Stairs

Stair design and construction shall comply with IBC standards.

4.8.1 Stair Categories

1. Open, communicating stairs are to be designed as an integral part of the surrounding building area, with higher finishes used for treads and railings. Design of architectural feature stairs should be closely coordinated with local code officials in terms of open areas from floor to floor, placement of railings, etc.
2. Enclosed, code-required stairs may be concrete filled steel pan or precast concrete tread.
 - A. The quality of workmanship on stair rails shall not be reduced in fire stairs. The Design Consultant is to ensure the construction of stair rails in fire stairs is performed to the same quality as rails throughout the project.
 - B. Fire stairs shall have luminescent and/or color contrasting nosings per IBC.
3. Historic stair designs, regardless of category, shall be provided with permanent non-slip nosing.

4.9 Caulking and Sealants

1. The Design Consultant shall specify joint caulking and sealants that establish and maintain watertight, airtight, and gap-tight continuous joint seals without staining or deteriorating joint substrates.
2. Elastomeric joint sealants shall be specified for exterior applications.
3. All joint caulking and sealants shall be specified as Low VOC.



Ceremonial Stairs
have special design
considerations



4.9.1 Review Process

The Design Consultant shall specify that the Contractor shall provide product data and samples to verify that the joint caulking and sealant to be used meets the requirements listed in the specifications, and that the selected color matches neighboring material colors.

Locations, sizes and materials of exterior sealant joints must be reviewed with Facilities Services and the Project Manager for weather integrity of the building envelope and maintainability for the life of the building.

4.10 Hazardous Materials

Whenever remodeling work is considered in existing campus buildings consideration must be given to identification and abatement of hazardous materials. Typical materials that may be found and that require abatement are asbestos, lead, and mercury, although other materials may need to be considered on a case by case basis. Typical materials routinely identified for abatement include asbestos containing materials such as floor tile and mastic, drywall and drywall mud, ceiling tile, fireproofing, ductwork, and various insulation materials. Also common are lead containing materials such as paint and ceramic tile glaze. This is not an exhaustive list, asbestos and lead are always being found in unexpected materials and locations. Identification and abatement costs are typically to be a part of the project budget.

4.10.1 Process

Early in the consideration of a remodeling project, especially in buildings constructed prior to 1978, the Design Consultant should examine any existing information the university may have on hazardous materials in the building. If no such information exists the Design Consultant should request that MSU conduct an examination of potential hazardous materials in the project area. In any case, existing information that MSU may have should not be considered complete. A thorough examination should be made by a qualified and licensed Industrial Hygienist and a report made including abatement procedures. MSU may choose to self-perform abatement of small areas. If not, the abatement plan should be included in the scope of work of the contractor performing work on the project. The scope of work of the Industrial Hygienist must include monitoring the work of the abatement contract, testing, sampling and providing a final clearance report. Depending on the type and scope of abatement an EPA permit may be required. All efforts outlined above are to be coordinated by the Project Manager.

4.10.2 Special Considerations

On projects involving laboratory spaces that have quantities of stored materials that may include dangerous chemicals or radioactive materials MSU Safety and Risk Management shall be informed and engaged as part of the initial examination and identification process.

END OF SECTION 4.0

5.0 BUILDING SYSTEMS

5.1 Information Technology

MSU's Information Technology Center (MSU ITC) controls all data systems, wiring specifications and installation, and audio visual specification and installation on MSU campuses. Facilities Services and CPDC work closely with ITC on the design, specification and installation of information technology infrastructure and equipment on all remodeling, addition and construction projects at MSU.

5.1.2 Design and Installation Requirements

ITC has a wiring and equipment specification for academic buildings, the latest version of which can be found at

<http://www.montana.edu/itcenter/guidelines/telecomm/>.

ITC has a wiring and equipment specification for audio/visual installations for classrooms, which is incorporated as a part of the MSU Classroom Design Guide (See Section 5.2).

ITC manages the installation of all technology infrastructure and equipment on campus, including work by the Contractor. Requirements for certifications, licensing, etc. must be included in the specifications.

A separate but affiliated information technology group at MSU, ResNet, provides all IT services in Auxiliaries buildings including student housing, food, service locations, the Student Union, Marga Hosaeus Fitness Center, and all athletic buildings including Brick Breedon Fieldhouse and the Stadium. ResNet has control over the design and installation of all information technology systems in these buildings.



5.1.3 Requirements for As-Built Drawings

Reference Section 1.8 Documentation and Archiving.

5.2 Audio and Visual Systems

Classroom technology is managed by the Instructional Technologies department within ITC. They are responsible for the design, installation and maintenance for the audio / visual technology for classrooms, lecture rooms and conference rooms in academic buildings on campus. A separate group exists within ResNet that has responsibility for Audio / Visual systems in Auxiliaries buildings.

Designers working on projects for which Audio / Visual systems will be included will need to work with ITC or ResNet through the Project Manager to determine all electrical and wiring requirements for equipment to be included in the project. ITC will provide detailed information on all AV systems that will be purchased and installed by ITC, including screen sizes, projector locations, system control technologies, etc.

Reference Appendix 6.2-1 Classroom Design Guidelines

Documentation and
Archiving
See Section 1.8

Classroom Design
Guidelines
See Appendix 6.2-1



5.3 Heating Ventilation and Air Conditioning

5.4 Power and Lighting

5.5 Plumbing

END OF SECTION 5.0

6.0 FUNCTIONAL USES

6.1 Laboratory Design

Laboratories are critical to MSU's mission in the 21st Century. The laboratory Design Consultant must be aware of the needs of the users, the ways the laboratory will and might be used, and the technical needs of the department involved and the technical requirements of the space itself. Critical to the success of the project will be the early involvement of the University Facilities Engineering and Ground & Building Maintenance Departments.

Establishing parameters for energy consumption and sizing of utility services and distribution is of paramount importance to the university. These parameters must be established early in the project, pre-schematic phase, applying established benchmarks, and projected usage with demand and diversity factors. The Project Manager will meet with the academic department / client, the Design Team and Facilities Engineering to establish these parameters which will be included in the Basis of Design.

The Design Consultant should keep in mind that laboratory design is a highly specialized field. Adequate research, programmatic development and due diligence are essential to their successful design and construction. Codes and guidelines referred to in this (or any other) section of the Standards Manual are not to be assumed as comprehensive. It is incumbent upon the Design Consultant to properly investigate the specific requirements of the lab to ensure compliance with all local, state and national codes and regulations.

6.1.1 Guidelines for Laboratory Design

1. General Approach
 - A. Meeting the educational and research goals of the academic department and those for the project should be the guiding principle for the Design Consultant. Laboratory design should be reviewed with the Project Manager and the academic department / client to determine programmatic needs and parameters. Refer to the MSU Laboratory Design Guidelines (See Appendix 6.1-1).



Laboratory Design
Guidelines
See Appendix 6.1-1



Establish parameters for sizing and distribution of utilities services early in design

- B. There are different requirements for laboratories, teaching and research, depending on the educational approach to be used in the laboratory. Detail is extremely important to the success of laboratory space; it is incumbent upon the Design Consultant to ascertain the needs of the various laboratory types in a project, to thoroughly understand the requirements for the systems to be incorporated into the laboratories, and to detail the space around those needs and requirements. Based on these meetings a “Basis of Design” will be developed.
- C. Establishing parameters for energy consumption and sizing of utility services and distribution is of paramount importance to the university. These parameters must be established early in the project, pre-schematic, applying established benchmarks, projected usage with demand and diversity factors. The Project Manager will meet with the academic department / client, the Design Team and Facilities Engineering to establish these parameters which will be included in the Bases of Design.
- D. Flexibility of and reconfigurable cabinetry and utilities.
- E. All labs to provide for accessibility

2. Layout – General Requirements

- A. Laboratory space should be separate from offices and common space.
- B. Laboratories should be oriented such that a common service corridor can serve two laboratories (lab, service corridor, lab).
- C. Occupants should not have to go through a laboratory space to exit from non-laboratory areas.
- D. Fire-rated hallway doors should have magnetic hold-open devices.
- E. Mechanical and Electrical services and devices shall be readily accessible

3. Finishes

- A. Acoustic considerations should be primary concern in finishes for laboratories. Acoustic control between laboratories is also important, so that sound transmission classification (STC) ratings of structural components and finishes should be taken into account when selecting materials and systems.
- B. Walls and Doors – There is no “standard” wall material or finish, but the Design Consultant must remember that the facility needs to be finished in a way that allows for normal cleaning, upkeep and maintenance (See Section 4.3 Painting for additional information).
- C. Doors into laboratories should be provided with vision panels to allow students to see if room is in use.

4. Floors

- A. Wet chemical laboratories should have chemically resistant covered flooring, particularly in areas where fume hoods are located. Finished flooring shall be installed throughout the laboratory to accommodate flexible laboratory conditions and room modifications.
- B. Preferably, floors shall be level with no floor drains to accommodate flexible laboratory conditions and room modifications. Floors in predominantly wet areas shall be non-slip and floor drains are preferred.

5. Ceilings

- Concern for proper acoustics should prevail in selection of ceiling materials. If acoustic ceilings are to be used, the preference is for a removable tile system framed on a unistrut system.

6. Window Treatment

- A. Review need for sunlight filtering in laboratories. Roll-down solar shades are standard. If additional light control is necessary room darkening shades may be used, and may be manual or motorized.
- B. Room Darkening vs. Solar Controls – Solar controls to support the HVAC needs must be considered for both the exterior and interior of the laboratory space.

7. Furniture, Fixtures and Work Surfaces

- A. Should be chemical resistant, smooth, and readily cleanable.
- B. Benchwork areas should have knee space to allow room for chairs near fixed instruments, equipment or for procedures requiring prolonged operation.
- C. Handwashing sinks for particularly hazardous chemicals or biological agents may need elbow or electronic controls.
- D. Casework exteriors of high pressure plastic laminate or metal are preferred
- E. Casework in teaching laboratories shall conform with ADA requirements. Casework in non-teaching (research) laboratories shall be adapted to the requirements of the individual users.
- F. Limit the number of cup sinks in the laboratory (including in fume hoods) in order to avoid dry traps and the ensuing odors.





Safety Considerations
-All planning for laboratory safety considerations, including chemical storage and handling, signage, and personal safety must be reviewed with MSU Safety and Risk Management (SRM)

8. Storage

- A. Cabinets for chemical storage should be of solid, sturdy construction and vented as required. Hardwood or metal shelving is preferred.
- B. Laboratories using compressed gases should have areas designated for cylinder storage and be equipped with devices to secure cylinders in place.
- C. Provide space for chemical waste collection containers other than in fume hoods and sinks.
- D. Provide space for storage of supplies and combustible materials, e.g., boxes of gloves, spill kits, boxes of centrifuge tubes, etc.

9. Eyewash and Safety Showers

- A. Laboratories using hazardous materials must have an eyewash and safety shower within 100 feet or ten seconds travel time from the chemical use areas.
- B. Eyewashes and safety showers should be standardized within a laboratory building.
- C. Flooring under safety showers should be slip-resistant.

10. Safety

- A. Utility shut-off controls should be located outside the laboratory.
- B. Environmental chambers where evacuation or other alarms cannot be heard should be equipped with strobe lighting or additional alarms.
- C. Include "Laser in Use" signs at all entrances to labs with lasers.

11. Security

- A. Review the need for security control of laboratories with the Project Manager. The university employs access control, as part of a campus-wide system, at all entrances of many of its buildings, and to some interior spaces as well.
- B. Laboratories classified by Safety & Risk Management as Security Protection Level 2 (high value equipment or security-sensitive materials) or higher may require additional security measures, such as card access, intrusion alarms, cameras, etc.

12. Laboratories having Bio Safety Levels (BSL 1-3)
 - BSL laboratories have very specific design requirements and the services of a laboratory design specialist should be used for all such laboratories.
13. Laboratories using radioactive material
 - A. MSU Safety and Risk Management (SRM) must be included during planning for any laboratories in which radio active material will be used.
 - B. Eating and drinking areas must be physically separated and conveniently located.
 - C. Allow for separate storage of radioactive materials.
 - D. Consider designing the laboratory to allow separation of radioactive materials use from other laboratory spaces.

6.1.2 Guidelines and Requirements for Documentation

See Section 1.8 (Documentation & Archiving) for requirements for code review and permits, including the organization of construction drawings and documents for timely release of permits.

In addition to the documentation required for the permitting and construction of the project, the Design Consultant will (if specified in the contract for services) provide a Statement of Design Criteria during the schematic design phase and a written Basis of Design (B.O.D.) document during design development.

6.2 Classroom Design

Classrooms are the heart of MSU's mission. The classroom Design Consultant must be aware of the needs of the particular users, the ways the classroom will and might be used, and the technical needs of the department involved and the technical requirements of the space itself.



Radioactive Materials
-Any planning for laboratories with radioactive materials must include MSU

6.2.1 Procedural Guidelines

Early in the programming phase of the project, the Project Manager will review the proposed project with the University Registrar. The Classroom Committee, a subcommittee of UFPB, has the university-wide responsibility for classroom space on campus, and will provide oversight in the programming phase. The Project Manager, with the Design Consultant should meet with the University Registrar's office and the Classroom Committee to confirm the requirements for classroom space in preliminary programming.

The Project Manager remains the Design Consultant's primary contact and source of information, the Project Manager will involve other university sources in the project, including the University Architect, the project representative for the Facilities Services, and ITC personnel.

Meetings with the academic department / end user, Registrar, ITC and the University Architect will be arranged by the FPDC Project Manager.

6.2.2 Guidelines for Classroom Design

MSU has set forth a standard Classroom Design Guide, the Design Team shall become familiar with the requirements and design principles detailed in the Classroom Design Guide (See Appendix 6.2-1).

6.2.3 Guidelines and Requirements for Documentation

See Section 1.8 (Documentation and Archiving) for requirements for documentation.

In addition to the documentation required for the permitting and construction of the project, the Design Consultant will (if specified in the contract for services) provide bidding documents for fixed classroom furniture and for the Audio / Visual systems in the building.

These should be separate documents prepared with the furniture and Audio / Visual consultants and coordinated with the electrical contract documents (for conduit runs, junction and floor box selection and placement, lighting, power, etc.). See Sections 6.12 (Audio-Visual Standards) and 1.7 (Furnishings, Fixtures, and Equipment) for additional information.



Classroom Design
Guidelines
See Appendix 6.2-1

Documentation and
Archiving
See Section 1.8

Furnishings, Fixtures
and Equipment
See Section 1.11



6.3 Residential Hall Design

The Design Consultant should be aware that undergraduate residence halls are occupied by students nine months of the year, while graduate residence halls are occupied year-round. Undergraduate residence halls also provide housing for summer conferencing and sports camps, so access for survey and planning purposes must be coordinated with the Housing Office and Facilities Services during summer months and transition periods.

6.3.1 Review Guidelines – General

Initial planning and preliminary design will be conducted through the FPDC Project Manager and with the Housing Office. A Building Committee will be assembled that will act as the internal “client” for the project.

As the project moves toward the construction documentation and code review phases, it is required that the project construction documents be submitted to the university for an internal review process through the PFDC for compliance with university standards.

For residence hall renewal projects and new construction, planning begins at least two years in advance of construction.

After preliminary design is complete, additional departments may be brought into the Design Development and construction planning phases. Departments such as Facilities Services, University Food Services, and University Police may be included in the review process, and may act as in-house consultants for specific aspects of the project.

During the pre-construction phase mock-ups are constructed (and may include complete full-scale models of rooms) to aid the review committee in selecting room finishes and accessories, window types, light fixtures, heating units, piping enclosures, etc. a significant amount of effort is necessarily put into the design and documentation of mock-ups, for they are the tools that lead to final design decisions and to the aesthetic that ultimately forms the project.



6.3.2 Considerations for Residence Hall Design

1. General Approach

- A. In new construction and in residence hall renewal projects, providing opportunities for interaction between students and facilitating the development of a feeling of collegial unity is encouraged. However, the mix of social spaces with living spaces, the density of bed spaces in living spaces, the inclusion of educational spaces in a dormitory, and the type and number of support / utility spaces in a dorm, along with other design considerations, is highly dependent upon the purpose the residence hall serves.
- B. Residence halls primarily serving freshmen have special design parameters. It has been shown that student success in the first year of college is greatly enhanced by the creation of friendships and a feeling of being part of an identifiable group. The freshman residence hall design should support this need for socialization as part of the living environment in addition to the need for students to have a structured study environment as part of their living area. The larger residence hall environment should also be capable of encompassing group activities organized by the Residence Life organization designed to encourage a sense of community. Each freshman residence hall will typically contain a full complement of service and support spaces such as laundry, kitchen and lounge.
- C. In upper-class residence halls the individual's living space is typically larger (in terms of square feet per occupant) than in the freshman residence halls, and providing a variety of living arrangements is a desirable goal. Single-occupancy rooms are popular, with two-room doubles and three-room quads sought after as well. Students are typically self-directed in their studies at this point and, for some, privacy for work is an overriding concern. Along with providing a wide choice of living arrangements, each upper-class residence hall will typically contain a full complement of service and support spaces such as laundry, kitchen and lounge.
- D. The initial step in a residence hall renewal project is to determine a preliminary scope of work and to conduct a full-scale survey of the building. This survey should be performed after discussions with the Project Manager, the Residence Life maintenance manager, and Facilities Services Grounds and Building Maintenance Department, to assemble available information on systems in the building, and to gain insight on any known defects in a building. In interviews prior to surveying a building, the Design Consultant can be advised of any environmental issues that might affect the project. A report on existing conditions is produced from the survey, including information on the building finishes, envelope and systems. The report will be presented to the review committee, which may make suggestions for revisions or modifications before a final version of the report is produced.



Conduct full-scale survey prior to design of residence halls



- E. The report is used as a tool to develop the building program and to guide the professional in the schematic design process. Input from the design review committee is critical at this point in the process. The committee will prescribe the desired bed count, the mix of singles, doubles, and quads, the bathroom fixture ratio, etc. additional survey work may be needed to measure critical areas after initial planning and design is completed. Some core samples of building systems may be required to ascertain existing construction, and investigative demolition might be carried out in this effort.
- F. After schematic plans are approved by the review committee, the Design Consultant is to provide a furniture layout plan, which will be used to develop the design of electrical and mechanical systems in the residence hall rooms. This step is important in developing plans for new construction as well as in dormitory renewal.
- G. As electrical and mechanical systems are developed for the building (with the chases, duct shafts, etc. that these systems require), the Design Consultant will need to coordinate the mechanical systems with the furniture layout. The intent is to produce a plan that integrates building systems into the overall layout, without sacrificing utility and comfort to aesthetics, or vice versa. The Building Committee will be presented with the final building layout and furniture plan for approval before the project is carried into the Construction Documentation Phase.
- H. Room Numbering Requirements See Appendix 1.8-3 for room / space numbering system guidelines.

2. Exterior

A. Accessibility

- i. Some of MSU's residence halls were originally designed in ways that make it nearly impossible to provide a barrier-free access to all parts of a building. Nevertheless, one of the goals of the residence hall renewal projects is to create accessible routes to as many dormitory spaces as is reasonably possible, and to create accessible social and support spaces (See Section 1.9 Accessibility).
- ii. The project review committee will advise the Design Consultant on the level of accessibility desired in the project, based on options presented by the Design Consultant and influenced by campus-wide accessibility needs.
- iii. Code minimums, including both ADAAG and FHA requirements, must be met for accessible and adaptable units within a residence hall area.

B. Safety and Security

- Consideration for both vehicular and foot traffic is to be given to the routes into and along buildings, so that cul-de-sacs and dead-ends are eliminated. (The same considerations should apply to interior circulation.) See Section 1.12 for more information.



Door and Room
Number Standards
See Appendix 1.8-3

Accessibility
See Section 1.9

Security
See Section 1.12

Access Control
Systems
See Section 3.1

Exterior Finishes
See Section 3.6



C. Exterior Materials and Finishes

- i. Similarly to other campus buildings, exterior materials and finishes should be selected, specified and detailed for longevity, with an understanding that the university has a difficult time keeping up with exterior envelope maintenance. Exterior finishes should have a minimum 35 year life and maintenance items such as sealant joints should be kept to a minimum.
- ii. All exterior materials and finishes must be selected and detailed to meet the extreme weather conditions encountered in Bozeman. Special attention needs to be paid to south and west exposures which have abnormally high temperature fluctuations and freeze / thaw cycles.

D. Site Accessories

- See Site Section 2.0 for more information and requirements for site accessories. Note that Auxiliaries Services may not always choose to use campus standard site furnishings and accessories.

3. Interior Circulation

- Interior circulation must provide reasonable access to all areas of the dorm and must, at a minimum, meet the requirements of the current building and life-safety codes in effect.

4. Finishes: specify durable wall and floor finishes; research requirements for fire ratings in corridors, provide listed assemblies where needed. At a minimum, use reinforced gypsum board for walls. (Standard gypsum board wall with taped finishes are not to be used in residence halls). Hallways receive hard use during annual move-in and move-out of student residents. Where carpet is used, carpet tiles are preferred. Finished in place wood flooring should be avoided. Flooring at building entries should be carefully considered to minimize the carrying of snow and slush into the building. Hard surface floor materials must meet or, preferably, exceed, code requirements for slip resistance. Acoustic absorption must be a consideration in corridors serving student rooms.
5. Lighting: lighting can have a dramatic impact on the character of interior corridors. If at all possible corridors should have daylight. Differing types / sources of artificial light should be used to modulate the visual experience of long corridors.
6. Stairwells: stairwells should be considered in two categories, Public / Decorative Stairs and Secondary / Fire Stairs. In the buildings up to four stories it should be assumed and encouraged that the stairs will be a primary means of vertical circulation and the possibility of stairways acting as areas of social interaction should be considered. Public / Decorative Stairs should have finishes that are an extension of the public spaces surrounding them.

7. Elevators: elevators in residence halls must typically function primarily as passenger elevators but must be used for moving of student belongings into and out of rooms as well. Elevator cabs, therefore, should be designed larger than the minimum cab size. Car speed should be considered with respect to high usage during peak times, especially morning hours when students leave for breakfast and/or class in large numbers during short periods of time. Cab finishes must be durable yet decorative. Resistance to vandalism is a major concern. Mounting for, and provision of, moving blankets should be included (See Section 4.2 for more information).
8. Social Spaces and “Public” Common Rooms
 - A. The mix of social space in a residence hall often depends on whether it is intended as a freshman residence hall or if it is an upper-class residence hall, whether some similar spaces are provided nearby, etc., and should be determined in the preliminary design phase in consultation with the review committee for the residence hall. Some examples of typical common spaces are:
 - i. Lounges
 - ii. Kitchens and kitchenettes
 - iii. Laundries
 - iv. Living, study and common rooms
 - v. Game and rec rooms
 - B. Considerations for public spaces and common spaces include:
 - i. Finishes: specify durable wall and floor finishes, with consideration given to softer materials in areas such as living rooms and lounges. Acoustic absorption must be considered in areas that may tend to act as gathering points.
 - ii. Utilities: See Section 5.0 Building Systems
 - iii. Common rooms should have daylight and should have operable windows. Windows should typically have high enough sill that furniture can be placed against the window wall.
 - iv. Furnishings: common spaces should have furnishings that complement the function of the space. Typically, there should be a mix of furniture types and groupings. The choice is a programmatic decision, and should be made in consultation with the project design review committee (See Section 1.11 for more information).
 - i. Lighting: lighting fixtures and sources for common spaces should be designed to enhance the programmatic function of the space. Lighting should also fulfill a decorative function in these spaces.
9. Sleeping Rooms
 - A. Finishes: the same considerations listed for common rooms apply to individual sleeping rooms.



Furnishings, Fixtures and Equipment
See Section 1.11





- B. Doors and hardware: corridor doors will typically be fire-rated doors and should be equipped with hold-open hardware wired to the fire alarm system. Unrated doors with passage or privacy hardware may typically be used for doors interior to living units. Sleeping room doors in suites are equipped with privacy locks, as are bathrooms within units. Acoustic separation: considerable design effort should be given to acoustic separation of sleeping rooms, both room to room and floor to floor. Minimum rating of separation walls and floor / ceiling construction is STC 50, with 55 preferred. Additional care should be taken to prevent impact noise transmission in floor / ceiling assemblies.
- C. Windows: all sleeping rooms must have operable windows, awning windows or casement windows are preferred. The same considerations for common rooms apply to sleeping rooms. Sill height at windows should allow for placement of furniture against the wall with windows.
- D. Smoke detection: locate heads away from possible sources of interference or damage such as doors, wardrobes, ceiling-mounted bike hangers, bunk beds, light fixtures, etc. detectors shall have 36 inches minimum separation from air supply outlets.
- E. Fire suppression: concealed heads are preferred, either ceiling-mounted or sidewall type. If a dry standpipe is adjacent to a room, access doors for inspection of the standpipe might be required within the room.
- F. Furnishings: as listed above, the standard set of furniture for each occupant is a desk chair, a desk, a bed, and a dresser. Also a wardrobe and bookcase where not built in. the choice is a programmatic decision, and should be made in consultation with the project design review committee. (See Section 1.11 for more information).

10. Technology

- A. Along with all other areas of campus, technology must be integrated completely with the residential environment.
- B. All residence hall rooms as well as all common areas must be served by wireless internet access.
- C. Provisions should be made for group study areas that will also accommodate preparation for group presentations with appropriate technology such as flat screens with connections for laptop computers.
- D. Technology must be planned for lounges where group activities such as watching movies or video gaming will take place.
- E. If classrooms or conference rooms are incorporated into the dormitory, they should be designed to meet the requirements of the Classroom Design Guide.

6.3.3 Custodial Closets

Each residence hall will require, at minimum, a custodial storage room of approximately 100 square feet (and possibly larger in larger buildings) for paper products and cleaning supplies and equipment. Exact custodial requirements for each building are a program issue to be resolved during Design Development (Refer to Section 6.6 Custodial Closets and Storage for more information).

6.3.4 Recycling and Sustainable Design

Residence halls are learning environments with respect to sustainable design. Sustainable design principles should be a primary consideration from early in the design process. Sustainable design elements of the building should be celebrated in the design and may also have education components such as signage or “energy dashboards”.

Recycling is a key part of sustainable design in residence halls. Recycling facilities should be planned into room corridors and a central recycling area or dumpster should be planned for each building.

6.3.5 Signage Requirements

Prior to submitting signage design package the Design Consultant shall meet with the Project Manager to determine required locations and signage types (Refer to Section 1.10 Environmental Graphics for more information). Typical signage required in residence halls:

1. Emergency rooms evacuation signage
2. Room identification signage
3. Stair egress
4. Common area signage
5. Elevator
6. Electrical signage
7. Fire protection

6.3.6 Environmental Issues

Prior to undertaking renovation work in an existing residence hall, the university will arrange for a survey of the building to determine the possible presence of hazardous materials. The university will engage a separate consultant for any remedial consultation deemed prudent as the result of this survey, and will attempt to abate any hazardous material prior to the start of construction, using a separate contractor qualified to perform the abatement work.

Sustainable Building
Principles
See Section 1.6

Trash and Recycling
Areas
See Section 2.7

Environmental
Graphics
See Section 1.10

Hazardous Materials
See Section 4.10

Documentation and
Archiving
See Section 1.8

6.4 Family and Graduate Housing Design

MSU Family and Graduate Housing (FGH) is part of MSU Auxiliaries Services and is under the direction of the Director of Auxiliaries Services, the Chief Housing Officer, and the Assistant Director for Family and Graduate Housing (AD for FGH). FGH provides apartment style housing to student families, graduate students, and staff of the university. Current FGH housing complexes are McIntosh Court, Brannegan Court, Grant Chamberlin, Julia Martin West, Julia Martin East, Koch and Story Towers, Paisley Court, and the Westside Houses.

6.4.1 Design Requirements

1. There is no single standard for the design of Family and Graduate Housing units or complexes, but the following should be considered in the design of any new housing:
2. FGH is, by definition, apartment style housing with full kitchen facilities in each unit and separate bedroom(s), bathroom(s), and living space within each unit.
3. A mix of unit sizes needs to be provided, ranging from one to three bedrooms. The mix of units should be decided upon in consultation with the AD for FGH and the Design Review Committee.
4. Laundry facilities must be provided, either within each unit or dispersed within a complex of units. If laundry is not provided in each unit adequate washers and dryers should be available within a reasonable distance to each unit. Number of washers and dryers per living unit for dispersed laundry centers will be provided by the AD of FGH.
5. Accessible living units, meeting the requirements of ADAAG and FHA, must be provided interspersed throughout the complex. The number of accessible units as a percentage of all units should be arrived at in consultation with the AD for FGH and the Design Review Committee.
6. Ideally, each living unit should be provided with its own heating / cooling equipment. At minimum, each living unit must have individual thermostatic control.
7. Materials and detailing for FGH apartments must be chosen with an understanding that these units will receive hard use and must function with a relatively low level of maintenance. Built-in cabinets should have plywood boxes not particleboard. Counter tops should ideally be solid nosing. Hard surface flooring should be provided in entries, kitchens and bathrooms, with carpet at living space and bedrooms. Closet doors should be either swing doors or sliding doors, not bi-fold type.



-FGH is apartment style housing

-A mix of unit sizes

-Must meet ADAAG and FHA guidelines for accessibility

-Choose materials for longevity and maintainability

Exterior Materials
See Section 3

8. Similarly to other campus buildings, exterior materials and finishes should be selected, specified and detailed for longevity, with an understanding that the university has a difficult time keeping up with exterior envelope maintenance. Exterior finishes should have a minimum 25 year life and maintenance items such as sealant joints should be kept to a minimum.
9. All exterior materials and finishes must be selected and detailed to meet the extreme weather conditions encountered in Bozeman. Special attention needs to be paid to South and West exposures which have abnormally high temperature fluctuations and freeze / thaw cycles except for high rise housing, an FGH complex should provide both private and public open space associated with each living unit. Space / storage for outdoor toys and bicycles should be planned.
10. Additional storage space should be provided in the complex, dedicated to each living unit.
11. Parking must be provided for both residents and guests. Resident parking should be configured so that designated parking for each living unit is provided within reasonable proximity to the unit. Additionally, designated visitor parking should be provided within a reasonable distance to all units.
12. By definition, FGH is housing that must accommodate a variety of users, including families with children. In housing designed for family areas for play areas for children should be designed both within sight of each unit and in larger communal play areas for larger complexes as well. Streets, sidewalks and play areas should be designed to provide a safe environment for all users, especially children.
13. Landscaping is an integral part of the design of successful Family and Graduate Housing. Successful landscaping will provide areas of color and of shade, with the goal of fostering a sense of community. In larger complexes consideration should be given for communal gardens.



Safe environment for all users, especially children

Landscaping and Planting
See Section 2.2

Interior Signage Standard
See Section 1.10
See Appendix 1.10-2

6.5 Corridors

Corridors and hallways are important building elements, providing not only the means of travel throughout campus buildings but serving as the visual introduction to most campus buildings as well. Durable and maintainable materials are critical to the good design of corridors, but equally as important are the issues of noise transmission and lighting design.

In academic buildings it is important in the design of corridors to accommodate large numbers of students waiting for and exiting the classrooms. Corridors in academic buildings should also be designed to encourage interaction of students and to allow for groups of students and instructors to continue classroom discussions after a class has ended.

Academic building corridors should encourage interaction

Appearance over time and maintainability are key features of finishes



Corridors in faculty office areas should be designed to accommodate students waiting to meet with faculty members and should provide a quiet zone so as to allow faculty members to work without distraction.

Corridors in research buildings should provide “collision spaces” where researchers and graduate students can gather to discuss their work outside of the constraints of the laboratories.

6.5.1 Construction and Fire Rating

Building use and occupancy load on corridors affect the fire rating requirements for a corridor or hallway. The current version of the IBC must be reviewed for these requirements. Note that the installation of a fire suppression system in a building may reduce the requirements for fire rating of exit components.

6.5.2 Finishes

Maintainability and appearance over time are key concerns. Finishes are project specific and should be determined within the context of the building design, and with the consensus of the project team and the university’s review committee. Consideration should be given to the application of sustainable wall, floor, ceiling, and trim finishes.

Preferences for finishes from a maintenance and housekeeping perspective are:

1. Walls
 - A. Masonry: brick, ground-face or painted block, glazed block, ceramic or stone tile
 - B. Frame: abuse-resistant gypsum board decorated with a level 5 finish in corridors and common spaces, with areas of wood or other decorative panels as accents. The Design Consultant should attempt to incorporate breaks, reveals, or other architectural details to divide large expanses of painted surface, particularly in the vertical direction. This is especially true in high traffic areas, areas using high pigment paints, or locations that are especially subject to abuse.
2. Floors
 - Masonry: concrete, terrazzo, stone, quarry or ceramic tile (all properly sealed to resist staining); vinyl composition tile, rubber tile; carpet (in a color and pattern that can hide wear. Entrance mats: specify polypropylene carpet-type walk-off mats with flexible vinyl backing unless built-in recessed mats are designed.

3. Ceilings
 - A. Exposed: masonry, steel, or wood (meeting code requirements); suspended lay-in acoustic tile (in non-dormitory use)
 - B. Framed: gypsum board, with all required access panels indicated on reflected ceiling plans and MEP plans where minimal systems exist; all public-area access panels below 9'-0" A.F.F. are to have Best cylindrical locks (refer to Section 4.1).
4. Trim
 - There should be some form of base in corridors for housekeeping purposes, compatible with floor finish - tile, stone, wood, rubber. Review with Project Manager. Rubber base is preferred over vinyl base where appropriate.

6.5.3 Utilities

1. All utility piping and conduits should be concealed within finishes. Points requiring access should be 'centralized' as much as possible (including group valves, junction boxes, etc.) to minimize the need for multiple access doors or panels. The Design Consultant shall produce typical corridor cross-section drawings to illustrate all typically required coordination of piping, duct, conduit runs, and installation of devices. Maximize ceiling heights while providing for utility runs.
2. Power Outlets - Maximum 25 feet between outlets in corridors; provide outlets in stairs at each floor level. 20 amp dedicated circuit per corridor.
3. Lighting - Recessed in ceiling or wall-mounted sconces; standardize lamp types (26 Watt quad fluorescent, e.g., w/ common base configuration) to minimize need for storing multiple replacement types. Coordinate normal ambient lighting with emergency lighting; use campus emergency power network where available for emergency lighting. A list of replacement lamps is to be included in the closeout documentation required of the contractor.
4. Ventilation - Determine requirements and need for heating and ventilation in corridors early in project; review with Project Manager. Plan duct runs for ventilation and make-up air and coordinate with ceiling installation and other utilities. Consider impact of duct distribution on structural frame depth in corridor. Make-up air is generally required to be tempered.
5. Fire Alarm - Provide required smoke detection, pull stations and alarm signaling devices. Maintain required clearance between smoke detectors and HVAC supply diffusers. Coordinate device placement with other corridor systems and with architectural finishes by preparing elevation drawings showing pull stations, horn/strobes, hold-open devices, exit fixtures, etc. with other required devices, systems, and elements.



Preference for
concealed utilities
Power, Lighting,
Ventilation, and
Sprinklers
See Section
5.3, 5.4, 5.5

6. Sprinklers - Concealed pendant heads preferred; concealed sidewall heads are an option in new construction and major renovation, exposed piping and exposed sidewall heads are not acceptable.
7. Extinguishers - Coordinate location of hand-held fire extinguishers. Provide recessed cabinets for storage of extinguishers. Review proposed locations with Project Manager, and with local fire official as directed.
8. AED – AED’s are to be included in all new construction and major remodeling. Number and location of AED’s is to be coordinated through the Project Manager.

6.5.4 Doors and Hardware

Stair openings typically require rated assemblies (frame, door and hardware); doors must meet temperature-rise requirements. Provide detector-activated wall or floor hold-opens on stair doors and smoke doors to eliminate use of wedges and chocks. Coordinate hold-open devices with fire alarm system design. Review the need for rated assemblies in corridors in buildings with fire-suppression systems (See Section 4.5 Interior Doors) for requirements for hardware in corridors.

6.5.5 Miscellaneous

The Design Consultant should be aware of security and safety concerns: limits on dead-end corridors in codes; control of access to remote areas; provision of emergency phones in appropriate areas. Review the need for signage and accessories such as message boards in corridors. Drinking fountains are required by code, and water chillers are desirable; consider the possible inclusion of hot-water dispensers with water chillers.

6.6 Standards for Custodial Closets and Storage – Building Services Grounds and Building Maintenance

The need for space for custodial purposes must be addressed in the programming phase of design in a building project. It is important that early design review of custodial closets in storage rooms occur with the Environmental Service Manager. Each building will require a custodial storage room (See Appendix 6.6-1). Ideally, custodial storage rooms should have a door width of 40-inches or greater to allow for passage of larger cleaning machines. These closets are not to be programmed with building mechanical and electrical spaces. Exact janitorial requirements for each building are a program issue to be resolved during design development.



Example of AED
Automated External
Defibrillator

Buildings up to 10,000 square feet will require at least one custodial closet of approximately 35 square feet, and one of equal size on each additional floor level of the building.

Buildings up to 50,000 square feet will require two to three custodial closets, a minimum of one per floor level.

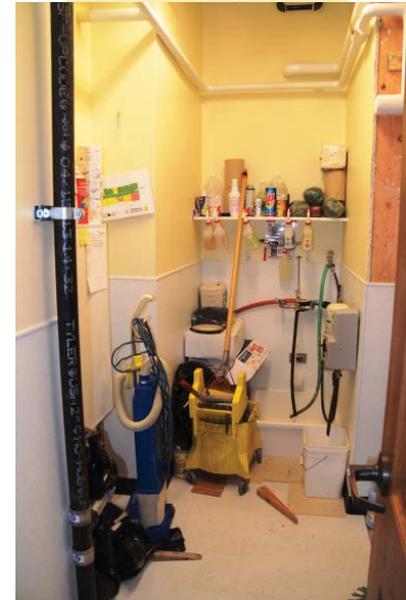
Buildings up to 100,000 square feet will need three to four custodial closets minimum, at least one per floor level; larger buildings should be programmed for additional closets at the rate of one per 25,000 square feet.

6.6.1 Design

Construction and Fire Rating:

Review need for fire-rated enclosure and door assembly, including door closer finishes.

1. Walls
 - Masonry: brick, block, glazed block, ceramic tile frame with level 4 GWB finish, gloss painted finish. A stainless steel backsplash shall be above floor receptor.
2. Floor
 - Concrete (properly sealed), terrazzo, ceramic or quarry tile coved base to match floor. No floor drain is required.
3. Ceiling
 - Exposed structure is preferred. If rated ceiling is required, plaster finish should be specified.
4. Utilities and Equipment
 - A. Receptors
 - Floor receptor with raised rim is preferred, 36-inch square, with 24-inch high stainless steel backsplash wall-mounted sink only; if receptor cannot be used faucet with hose connection, short length of hose; provide water-tight connections at receptor.
 - B. Power
 - GFI receptacle on wall away from water supply.
 - C. Lighting
 - 4 foot utility fluorescent with guard at ceiling, wall switch.



5. Ventilation
 - Exhaust ventilation with make-up air; review requirements for tempering make-up air.
6. Piping
 - Maintain headroom of 90-inches, piping, conduit, ductwork, etc. to be installed above that level.
7. Detectors
 - Smoke detection may be required; review use.
8. Sprinklers
 - Provide upright pendant with wire cage in buildings with suppression.
9. Shared dormitories not within the vicinity of a custodial closet provide hose bibs with hot and cold water under lavatory. Use hose bibs with key stops.
 - Accessories – in one closet per building (typically), install cleaning chemical dispenser over receptor friction-type mounting brackets for mops, brooms, etc. on wall over receptor (not under chemical dispenser) 12-14 inches stainless steel shelving high on third wall, 8 feet total if possible.

6.6.2 Custodial Supply Area

1. Construction and Fire Rating (same concerns as with custodial closets)
2. Install durable finishes, painted walls and ceiling.
3. Provide metal shelving, 16-inch deep minimum, 48 foot length (+/-), provide a minimum of 22-inch clear between shelving; maintain required clearance for sprinklers.
4. Meet minimum requirements for heating and ventilation.

6.7 Electrical Rooms

See Section 5.4 Power and Lighting

6.8 Mechanical Rooms

See Section 5.3 Heating Ventilation and Air Conditioning.

6.9 Restroom Design Criteria

6.9.1 General Design Criteria

Restroom requirements vary widely depending on the type and function of the building in which they exist. There are, however, common guidelines and requirements for restrooms across building types that shall be followed:

1. Restroom locations shall be easily located and visible.
2. Locate on the same floor as the population being served, with visibility to prevent crime and vandalism.
3. All Restrooms in new and remodeling projects are to fully comply with current IBC and ADAAG guidelines.
4. Locate where accessible and convenient to entire building population and visitors, able and disabled.
5. Locate within 75 feet from any workstation or area.
6. Minimum requirements are per the student and staff section of the current International Association of Plumbing and Mechanical Officials (IAPMO) guidelines, applicable current codes and Authority Having Jurisdiction (AHJ).
7. Design for overall campus occupancy ratio of 60 percent women to 40 percent men.
8. Consult Plumbing section of these guidelines for pipe sizing and for selection criteria for plumbing fixtures and faucets.
9. Provide wall-hung toilets and urinals as applicable.
10. Finishes shall be hard, durable, smooth, water resistant, and easily cleanable. Provide wainscot at five feet AFF minimum. Tile grout shall be tinted, not white. Counters with sinks should never be plastic laminate.
11. Restroom design elements and finishes in remodeling projects should reflect the design and materials in the building in which the remodeling takes place. This is especially important in historic buildings.
12. Provide depressed slab(s) sloped to drain(s) at one-eighth inch per one foot minimum in restrooms at all new construction.
13. Consider use of durable materials high recycled content.
14. Consult section of these guidelines that refers to selection of restroom accessories. Note that standards for accessories may vary between Academic and Auxiliaries buildings.
15. In restrooms that include showers, the following should be considered:
 - A. In residence halls each shower in shared shower rooms should have a separate space for changing and should have adequate places to set toiletry kits during showering and hooks for clothing
 - B. If possible, each shower should have its own drain.
 - C. ADA shower stalls can be either roll-in type or transfer type.
 - D. The preferred material for shower walls is one-quarter inch solid surface panels in as large panel sizes as possible.
16. Convert existing single-occupancy or single-stall restrooms in all MSU owned buildings from gender-specific to all gender facilities with privacy and security as noted in the guidelines. It is anticipated that conversion will usually be limited to revised signage.

ADA Requirements
See Appendix 1.9-3

6.9.2 Gender Specific/Multi-Stall Restroom Design Criteria

Construction, renovation, alteration and replacement of restroom facilities are subject to federal, state and local building codes. In general, the occupancy load of university buildings shall dictate the requirement for multi-stall restrooms. If/when gender-specific/multi-stall restrooms are provided, the guidelines and requirements across building types at MSU that should be followed include:

1. Separate by gender when more than 10 employees are to be served.
2. Design for ratio of women's toilets to men's toilets and urinals of no less than three women's to two men's restrooms.
3. Men's restrooms shall have a minimum of one urinal, one toilet and one lavatory; women's restrooms shall have a minimum two toilets and one lavatory
4. Provide floor mounted, ceiling supported, partitions with textured, anti-graffiti or graffiti resistant surfaces. Partitions should be solid phenolic resin type. Provide a coat hook on stall door interior. Provide dividers at urinals as well.

6.9.3 Gender-Neutral Restroom Design Criteria

Montana State University is committed to creating and sustaining a campus environment that supports and values all members of our community. MSU seeks to promote a friendly environment in which to live, work, and study. One aspect of creating an inclusive environment is the availability of safe, accessible, and convenient restroom facilities. Campus constituents may experience difficulty, inconvenience, or harassment when using gender specific restroom and facilities. Gender neutral facilities are necessary from the perspective of universal design and for people who may need personal assistance services, individuals that may face discomfort or discrimination in gender specific facilities, and families with small children.

As such, a minimum of one gender neutral restroom shall be included for all major renovations, additions, and for new construction as is reasonably feasible. These guidelines focus on providing a safe environment, consistent with MSU principles of community. Restroom design criteria and requirements vary widely depending on the type and function of the building in which they exist. The guidelines and requirements for gender neutral restrooms across building types at MSU that should be followed include:

1. In general, for small and medium renovations, requirements for gender neutral restrooms shall not be required. For major renovations or where major restroom renovations are part of the scope, inclusion of one gender neutral restroom if not already existing, should be included.
2. Where applicable, gender neutral restroom shall include a diaper changing table in addition to standard restroom fixtures/equipment.
3. Door hardware shall have a privacy latch. Ideally when the latch is in the locked position, the exterior hardware displays the word "occupied."

4. Restroom signage shall meet all federal, state, local and ADA signage requirements. Typically all gender restrooms will be signed as "RESTROOM" and include the ADA pictogram when those requirements are met.
5. Residential Facilities - Because of the variety of facilities that Residence Life deals with, the Consultant shall discuss with the User specific project requirements and criteria.
 - a. However it is expected that at least one gender neutral restroom be provided as part of major renovations or new construction.
6. In restrooms that include showers, the following should be considered:
 - a. Each shower in shower rooms should have a separate space for changing and should have adequate places to set toiletry kits during showering and hooks for clothing.
 - b. ADA shower stalls can be either roll-in type or transfer type.
 - c. The preferred material for shower walls is one-quarter inch solid surface panels in as large panel sizes as possible.

6.9.4 Changing Rooms

For new buildings, construct at least one gender inclusive changing room in each location in the building where locker rooms or changing rooms are provided. For major renovations, construct at least one gender inclusive private changing room in each location in any building where locker rooms or changing rooms are provided or when the locker room or changing room is renovated.

6.9.5 Showers

Construct gender inclusive showers in new buildings in which showers are provided. If the shower or showers are located within a locker room/changing room facility, the gender inclusive shower(s) shall be located so that the user need not leave the area to use the shower. Construct at least one gender inclusive shower in each location in any building where showers are provided when a major renovation occurs or when the existing showers are renovated. Locate shower within the locker room/changing room facility so that the user need not leave the area to use the shower.

6.9.6 Family Care Rooms

See 6.17 for Family Care Room Design Criteria.

6.11 Conference Rooms

This document provides design and construction criteria for conference rooms, meeting rooms and videoconference rooms.

6.11.1 Programming Phase

During the programming phase the purpose and use of the conference room must be determined, including:

1. Number of people the room needs to accommodate
2. Requirements regarding flexibility of use and programs to be served
3. Level of technology to be included for presentations, teaching and video conferencing



6.11.2 General Design Criteria

1. The room should be located away from noise-generating activities taking place either outside or within the building. The rooms shall be located away from loud machinery, vending machines, offices, labs, and traffic areas.
2. Ample space shall be provided in the room design for the programmed seating configuration, presentation space and support space such as furniture and equipment storage.
3. Adequate ceiling height shall be provided to allow an unobstructed view of properly sized information displays. Sight lines must be verified.
4. The front wall of the room behind the presenter / instructor area should have no protrusions (structural or otherwise) into the room so that chalkboard, marker boards, projection screens, or information displays can be installed across the entire wall of the presenter area.
5. The overall noise criterion of less than 30 is required. The maximum sound level shall not exceed 35dBA. A NC-25 is the goal for all presentation spaces.

6.11.3 Room Shape and Configuration

In general, MSU prefers flexibility in room orientation so end-users are able to rearrange furniture components to meet specific event requirements.

Rectangular shaped rooms are appropriate for many types of instructor-led presentations.

The following guidelines apply:

1. The length of the room should not exceed its width by more than 50 percent.
2. The presentation area and information displays should generally be located on the narrow wall of the room.
3. Rooms that are wider than they are deep usually present unacceptable viewing angles for information displays and for information written on the marker board.
4. Wide room configurations may be appropriate to support seminar or group interaction among audience participants. This is relevant when curved or semi-circular rows are set up to encourage communications and easy eye-contact between participants.



Carpentry and Frame
Wall Finishes
See Section 4.4

6.11.4 Room Surfaces and Finishes

1. In non-videoconference rooms the front wall (i.e. the wall at the presentation end of the room), should be hard surfaced (e.g., sheetrock, masonry or wood) with no special acoustical shaping or treatment.
2. In non-videoconference rooms the front three-quarters of each sidewall should be constructed of hard (acoustically-non absorbent) materials (e.g. sheetrock, masonry or wood). These walls should not employ fabric covering or any other acoustically absorbent finish.
3. In non-videoconference rooms install acoustically absorbent finish on the rear one-fourth of the sidewalls and the entire rear wall. The sound absorbent material should have an NRC rating of 0.60.
 - In non-videoconference rooms painted surfaces should be light in color and should be a durable finish.
4. In videoconference rooms all of the walls should be covered with acoustically absorbent materials with a NRC rating of 0.85.
 - A. Ceilings should be a light color.
 - B. In general, acceptable videoconference finishes have a maximum reflectance of 60 percent, no patterns or textures that will cause the video camera to produce a moiré in the picture and be tan, blue or teal in color.
 - C. In general, black or white surfaces should be avoided.
 - D. The floors shall be carpeted with an anti-static, high traffic, commercial grade carpeting.
 - E. Marker boards used in videoconference capable conference rooms and classrooms shall have a finish designed for use in videoconference facilities. Most marker board manufacturers offer a video-friendly finish.
 - F. The reflectance values of paints, vinyl coverings, laminates, and other finish materials should be selected to enhance ambient illumination and the illumination at work surfaces. The following values are recommended:
 - i. Ceilings 70 percent to 90 percent
 - ii. Walls 40 percent to 60 percent
 - iii. Floors 30 percent to 50 percent
 - iv. Desktops 35 percent to 50 percent
 - v. Marker boards 20 percent to 30 percent

6.11.5 Wall Construction

1. Walls shall be mechanically isolated from the building structure and shall be isolated at the top and bottom with a Neoprene seal or equivalent.
2. Walls shall go from slab to slab in order to reduce noise paths into the room.
3. In videoconference rooms double offset wall studs, sound channels or other wall construction should be used that will minimize the transfer of noise from surrounding spaces.

6.11.6 Windows

1. Large window areas provide light control and exterior noise problems and should be avoided.
2. All window treatments shall be opaque and capable of preventing outside light from reaching the information displays.
3. In large rooms a motorized window shading system that can be integrated with external audio-visual control systems is preferred.

6.11.7 Doors

1. Doors shall be located in the back of the room away from the presentation area in order to minimize disruption. In rooms that require two egress points, the doors should be located as far from the presentation area as possible.
2. Doors shall be sound-rated or at a minimum solid core to prevent noise from entering the room.
3. At video conference rooms, doors shall be equipped with acoustically rated compressive seals.
4. All doors shall be a minimum of three feet wide and shall be equipped with a vision. The area of the glass shall not exceed 100 square inches and shall be double-paned.
5. Because ventilation louvers permit sound transmission, doors shall not contain louvers.

Windows
See Section 3.3

Interior Doors
See Section 4.6

6.11.8 Ceilings

1. A minimum nine-foot ceiling height shall be utilized for rooms that are 24 feet or less in length. In rooms where the programmed seating requirements, presentations space and support space require a room deeper than 24 feet then ceiling height needs to be greater.
 - A. The length of the room determines the maximum usable size of the projection screens.
 - B. In a room with a flat floor the bottom of the projection area of the screen must be at least four feet above the finished floor.
2. A minimum of approximately half of the ceiling area should be acoustically absorbent.
3. Access hatches must be installed in the ceiling wherever gypsum board or plaster is used to facilitate access to otherwise inaccessible areas of the ceiling cavity.



Audio/Visual Systems
See Section 5.2

6.11.9 Projection Screens, Flat Screen Displays and Marker Boards

1. All conference rooms should accommodate computer based presentations. During the design phase the designer should consult with MSU ITC with regard to campus A/V standards.
2. Conference rooms designed for up to fifteen participants should consider the use of a flat screen display in lieu of projector and screen.
 - Connections should be provided at the table for laptop or tablet to display to the flat screen. Alternatively, a dedicated cable from the flat screen location can be provided if the table is close enough to the display.
3. Conference rooms designed for more than 15 participants may be too large for the use of a flat screen and should use a ceiling mounted projector with ceiling mounted motorized projection screen.
 - A. MSU ITC should be consulted for current standards for Audio /Visual equipment and the room should be designed around this equipment.
 - B. Ceiling mounted speakers and microphone should be considered.
 - C. Conference rooms with large windows should have motorized blinds.



4. If the conference room is large enough it may be necessary to install flat screen displays toward the rear of the room to augment the projection screen image.
5. Larger conference rooms should consider the installation of a speaker's podium housing computer, as well as lighting and Audio / Visual controls.
6. Conference rooms to be used for video conferencing must be fully designed for this purpose. With the assistance of the MSU Project Manager rooms to include video conferencing should be identified early in the design process. MSU ITC should be consulted for current campus standards regarding video conferencing equipment and controls. See information in this document regarding lighting, materials and finishes. In addition, current best practices such as IES "Fundamentals of Lighting for Videoconferencing" should be consulted.
7. Marker boards should be provided at the front wall of the conference room at minimum. Marker boards should be located so that they are not concealed when a projection screen is lowered. Consideration should be given to providing marker boards on side wall locations as well as the front wall.

6.11.10 Acoustical Considerations

1. Consider wall and ceiling treatments that improve intelligibility in the conference room.
 - A. The surface of the ceiling must be designed to accommodate the required acoustical properties of the room.
 - B. The area of the ceiling to be acoustical tile is a function of ceiling height.
 - C. A nine foot ceiling height typically requires that 40 to 50 percent of the total ceiling area to be acoustical tile.
 - D. A ceiling height of ten feet typically requires that 50 to 60 percent of the ceiling be acoustical tile and a ceiling height of 12 feet typically requires that 70 to 80 percent of the ceiling area be acoustical tile.
2. Ceiling tiles with a Noise Reduction Coefficient (NRC) of 0.65-0.85 and a minimum Sound Transmission Coefficient (STC) of 50 shall be used.
 - A. Overall noise criterion of less than 30 dBA is required, with the maximum sound level not to exceed 35 dBA.
 - B. In all conference rooms, use acoustically absorbent materials with an NRC rating of 0.85 or greater.

6.11.11 Mechanical Systems

System components (fans, ductwork and diffusers) shall be selected to meet the sound criteria of NC 20 to NC 25.

Design the classroom HVAC systems to operate as a separate zone with controls to operate independently from other spaces within building.

1. Place air-conditioning registers along the perimeter of the room and the air returns in the center, front or rear of the room.
2. Select air devices for low velocity to minimize airflow noise in the room.
3. If the mechanical room is in close proximity to the classroom, evaluate the requirement for sound attenuators based upon the classroom NC criteria in Section 2.10, to reduce the mechanical system noise to meet these guidelines.
4. Isolate equipment mounted adjacent to and above a classroom from vibration.
5. Do not locate supply air or return air devices close to projection screens.

6.11.12 Lighting Systems

Conference rooms, other than those designed for video conferencing, should have lighting measured at tabletop height of 40 to 50 foot-candles horizontal all across the seating area of the room and zero to eight foot-candles on the projections screen.

1. Conference rooms designed for videoconferencing should have:
 - A. Measured at tabletop height 40 foot-candles horizontal minimum all across the seating area of the room.
 - B. Measured from 40-inches to 80-inches above the finished floor 50 to 70 foot-candles vertical all across the seating area. This would be as you look towards the projection screen from the seating area.
 - C. From the presentation area looking towards the seating area a minimum of 40 horizontal foot-candles at the lectern work surface height.
 - D. Forty to 60 foot-candles vertical measured from 40-inch to 80-inch above the finished floor.
 - E. Zero to ten foot-candles on the projections screens.

- F. Wall wash on all but the projection screen wall should have a wash of 30 to 50 foot-candles.
 - Note to achieve the required vertical lighting goals the tabletop horizontal foot-candle lighting levels will typically be 40 percent higher than the achieved vertical foot-candle level. For instance, if there are 50 vertical foot-candles of light at a seating location there would typically be 70 horizontal foot-candles of light on the tabletop at that location.
- 2. Videoconference Capable rooms used for general meetings:
 - A. In most cases the extra lighting for videoconferencing is provided via separate dimmer or switched controls
 - B. Make sure that when these additional lighting fixtures are turned off that there is still a minimum of 40 horizontal foot-candles at tabletop height across the room.
- 3. The color temperature for all lighting fixtures should be the same. The color temperature target goal is 3200 degrees Kelvin. Color temperature in the range of 3000 to 3500 degrees Kelvin is acceptable as long as all the fixtures are the same.
- 4. In conference rooms equipped with standard recessed fluorescent luminaires and no down light fixtures the light fixtures within 6six feet of the projection screen should be on a separate switched circuit from the rest of the room lighting.
 - The fluorescent luminaires should have low surface brightness.
- 5. In videoconference capable conference rooms, asymmetrical fluorescent luminaires equipped with dimming ballasts should be provided. Asymmetrical luminaires direct the light away from the projection screens and provide adequate down light for general meetings and videoconferences.
 - A. A sufficient number of asymmetrical fluorescent luminaires shall be provided over the seating area to provide a range of 50 to 70 vertical foot-candles as you look towards the presentation area.
 - B. Use wall wash luminaires to light all but the presentation walls for videoconferences. Use wall wash fixtures to light markerboards.
- 6. Light Dimming capabilities are an integral part of all conference rooms and classrooms. In videoconference capable rooms the power requirements for the additional videoconference lighting often causes the rooms power requirements to exceed guidelines for “watts-per-square foot” ratings.



Information
Technology
See Section 5.1



6.11.13 Data and Telecom Requirements

All conference rooms are to have a minimum three data RJ-45 outlets and one analog audioconference telephone line outlet installed. These connections are to be installed in designated floor box locations in larger conference rooms and new construction or mounted on the front wall below the projection screen in smaller conference rooms or remodeled existing construction.

6.11.14 Furniture

Consideration should be given, depending on the anticipated usage of the room, to the use of several tables which can be combined into a single larger table, thus allowing more freedom to use the room for small group work.

1. Conference tables should allow eye contact between participants on both sides of the table, there should be an unobstructed view of a presenter as well as of the projection screen or flat screen and the marker board on the presentation wall.
 - A. Use of a boat shaped table is encouraged.
 - B. Special care should be given to ensure proper legroom around and near any table legs.
 - C. An allowance of 30-36 inches of space per person at the table edge should be assumed.
 - D. Height under the edge of the table should be coordinated with the arm height of the selected chairs.
 - E. Chairs should have casters and arms.
2. Larger conference rooms may need to have counter space for setting up handouts or food. Consideration should be given to installation of a sink if the room will be used for meetings where food will be served.
3. If an instructor / presenter podium is provided it may be custom designed to match the finishes in the room, but if it is the design must accommodate the standard size and access requirements established by MSU ITC for instructor podiums.

6.12 Food Service Facilities

The design of new or remodeled food service facilities is programmatically and technically complex. As such, any projects affecting food services must be closely coordinated and planned from inception with the Director of University Food Services.

Furniture, Fixtures
and Equipment
See Section 1.11

6.13 Athletic Facilities

The design of new or remodeled athletic facilities is programmatically and technically complex. As such any projects affecting athletic services must be closely coordinated and planned from inception with the following:

1. Project Manager
2. Director of Athletics
3. Event Coordinator
4. Director of Sports Facilities

6.14 Libraries

College and research libraries present increasingly complex challenges based on:

1. Providing and storing information in a multitude of formats and venues
2. Complex building use patterns – sometimes 24/7 access
3. Provide a variety of types and characters of space for student study. These spaces should vary from spaces for
 - A. quiet individual study
 - B. spaces for preparation of collaborative group presentation utilizing a variety of media.
4. Provision of traditional services and expanded services such as media production and presentation facilities
5. Students and faculty working in diverse collaborative ways
6. Partnerships with other campus services such as
 - A. information technology
 - B. writing help centers
 - C. centers for teaching excellence
7. Student and faculty expectations for reliable, pervasive technology
8. Shared space for seminars, lectures, art exhibits, concerts, and other campus functions
9. Open versus closed stacks
10. Remote storage
11. Automatic retrieval systems
12. Environmental concerns



6.14.1 Initial Considerations

Prior to beginning any work in any of the MSU Library spaces or starting work on a Library project the Design Team should meet with the MSU Project Team which must include the Dean of Libraries or his appointee. A Building Committee will be created for the project that will serve as the “client” throughout.

To begin the work of designing new library space, or remodeling existing library space, there are several important documents and resources that planners may wish to review. These include:

1. Institution and Library vision, mission and/or goals statements
2. Institution and Library strategic plans
3. Campus master plans
4. Campus history, culture and demographics
5. Library needs assessment and environmental scan
6. Documents from other Library projects
 - A. Concept documents
 - B. Building programs
 - C. Architectural plans
 - D. Construction budget
7. Standards
 - A. National, regional, and state standards and guidelines for library facilities
 - B. ADA (Americans with Disabilities Act) requirements <http://www.ada.gov/>
 - C. LEED (Leadership in Energy and Environmental Design) certification <http://www.usgbc.org/>
 - D. Tours of other libraries in construction or recently completed
 - E. Library building consultants <http://www.libraryconsultants.org>



Accessibility
See Section 1.9

Sustainability
See Section 1.6



6.14.2 Space Planning

Design Consultants must strive for nimble building and design programs that anticipate the evolving needs of the academic library community including planning for emerging technologies, evolving library collections and delivery systems, potential future expansion, changing user demographics, etc. As noted previously, there are many crucial factors to be considered in planning library space: Changing demographic trends (commuters, residential, distance learners, traditional, non-traditional, etc.)

1. Relationship between the Library and the advancement of the mission of the institution
2. Relationship between the Library and campus
3. Evolving curricula and pedagogical practices
4. Service delivery models
5. Changing role of the Library faculty and staff
6. Understanding the user (academic preparedness, learning preferences, etc.)
7. Expansive and disruptive technologies
8. Standards and guidelines
9. Design for users, collections and employees

6.14.3 Furniture, Fixtures and Equipment (FF&E)

When planning for furniture, fixtures and equipment (FF&E) it is important that planners consider the following factors:

1. Extensive consultation with Library administration and staff
2. Input from constituents / users, i.e. focus groups, charrettes or other patron input
3. Consideration given to bringing in a professional interior designer
4. Reusability (value consideration), flexibility (balance between order and chaos), portability (user control) and adaptability (recognition of constant change in the 21st century library)
5. Durability for 24/7 use in public areas. Check express warranties on products being considered
6. Conformance with the Library program: How well does the FF&E mesh with the desired project outcomes? The Library program (outcomes) should drive the FF&E, not the other way around.
7. Patron characteristics: Is the space designed to encourage extended usage, or in-and-out? Consider how the size of work surfaces, seating type, creature comforts such as lockers and furniture cubbies will influence length of stay.
8. Ergonomic and ADA considerations
9. Security issues juxtaposed with privacy interests. A security-based need which calls for open design will influence height of partitioning, design and degree of private study space, and private study area location and layout
10. Consideration of incorporating existing FF&E. Potential for refurbishmentAcoustics
11. Appropriate lighting for all spaces including task lighting. Balance of natural and artificial lighting



Furniture, Fixtures and Equipment
See Section 1.11



Information
 Technology
 See Section 5.1

HVAC
 See Section 5.3

Accessibility
 See Section 1.9

Services <http://www.ala.org/ala/mgrps/divs/acrl/standards/>

12. Importance of the “sit test” for seating. Provision of a variety of postures / heights suggestive of differing seating types (lounged, seated, café height, standing height)
13. Technology management: wire management, adequacy to support desired hosting hardware. Powered vs. non powered workstations.
14. Availability of power for patron use. Ability to support user devices brought into the space. Flexibility of power provision (floor grid, raised floor).
15. Sustainability considerations and energy efficiency; meeting “Design for Environment” guidelines
16. Delineation between “collaborative” versus “individual” user furnishings
17. Efficacy of design: Will the actual use reflect the intended use? (Example: A small 4-person table may realistically seat only two).
18. Wayfinding and signage should be thoughtful and intentional

6.14.4 Standards and Guidelines Issues

The Design Consultant in consultation with the Building Committee should seek out and examine standards and guidelines for Library planning, design and construction. Perhaps the most useful sections of these standards for designers of Library space include the following questions:

1. Does the Library provide well-planned, secure and sufficient space to meet the perceived needs of staff and users?
2. What are the perceptions of users regarding the provision of conducive study spaces, including a sufficient number of seats and varied types of seating?
3. Is there enough space for current Library collections and future growth of print resources?
4. Does the staff have sufficient workspace, and is it configured to promote efficient operations for current and future needs?
5. Does the Library’s signage facilitate use and navigation of the facilities?
6. Does the Library provide ergonomic workstations for its users and staff?
7. Are electrical and network wiring sufficient to meet the needs associated with electronic access?
8. Are building mechanical systems properly designed and maintained to control temperature and humidity at recommended levels?
9. Does the Library meet the requirements of the Americans with Disabilities Act?
10. Are facilities provided to distance learners considered in the context of the ACRL Guidelines for Distance Learning and Library?

6.15 Performance Venues

The programming, planning and design of performance venues for the MSU campus is a complex undertaking. Each space will be highly individual in terms of program and design.

Prior to beginning any work on a performance space, the Design Consultant should meet with the MSU Project Team which must include the Project Manager and the Dean of Arts and Architecture or an appointee. A Building Committee will be created for the project that will serve as the “client” throughout.

The common requirements will be:

1. Identification early in the programming stage of the projected needs and client groups for the space
2. Intensive investigation with the identified client groups in order to produce a program for the space including :
 - A. Budget
 - B. Types of performances to be accommodated
 - C. Numbers of seats
 - D. Technical and/or electronic components
3. Specialized consultants will most likely be required for elements of the design, such as:
 - A. Acoustics
 - B. Lighting
 - C. Seating systems
 - D. Audio / Visual
 - E. Stage specialties
4. In addition, the MEP consultants will have special considerations in the areas of structure and mechanical design pertaining to acoustics and noise suppression / isolation. The architect will also be required to provide specialized design and detailing in the areas of acoustics, sight lines, etc.

6.16 Offices

Many projects on the MSU campus will require the design or renovation of office space. Campus office space is occupied by a wide variety of users, including administrators, academic staff and faculty, research staff, and support staff. Most of these various office functions and uses will have common design elements.

Power and Lighting
See Section 5.4

Information
Technology
See Section 5.1

HVAC
See Section 5.3

6.16.1 Office Design Criteria

The following are all issues that shall be included for the design of campus offices:
Reference Appendix 6.16-1 Office Space Guidelines for size.

1. Basic office layout – closed offices, open offices, cubicles, etc.
2. Flexibility of space design for future reorganization / expansion
3. Departmental organization and requirement for access by students, staff, public, etc.
4. Relationship of offices for academic staff to teaching venues
5. Relationship of offices for research staff to their laboratories
6. Needs for related space such as conference / meeting rooms, filing areas, support spaces for supplies, copiers, break rooms, toilet rooms, etc.
7. Determine the requirement for acoustic separation between other office and adjacent spaces.
8. Special requirements for lighting and mechanical systems
9. Provision of natural light and natural ventilation
10. Integration of technology for computers, communication, presentations, etc.
11. Design issues related to new or existing furniture, millwork, etc.
12. Ergonomic design principles
13. In classroom buildings, generally classrooms will be designed on lower floors and offices designed on higher floors.

6.16.2 General Office Construction

The following are general guidelines related to construction of campus offices:

1. Offices generally should have painted drywall walls, suspended acoustic ceilings and carpeted floors.
2. Office lighting should have a relatively low level of ambient lighting combined with task lighting at the desk.
3. Enclosed offices should have walls extending to the structure above for acoustic privacy.
4. Offices should have glazed lites in the doors or borrowed lites so that someone can see if the office is occupied if the door is closed.
5. Open office areas should have special attention paid to acoustics and lighting
 - A. Workstations should have acoustic partitions
 - B. Ceilings and, if possible, wall areas should be sound absorbing
 - C. Lighting should provide a uniform level of ambient light, with low surface brightness. Work stations should have task lighting.
 - D. Electrical wiring and both line voltage and low voltage should be accommodated within the work stations and fed from the floor if possible for work stations not abutting walls.



6. Any custom or built-in cabinetry must adhere to the requirements of Section 4.4 Carpentry Standards and Frame Wall Finishes.
7. Coat hooks or coat racks should be provided in every office.
8. Windows should be operable for natural ventilation and must be provided with operable interior blinds.

6.17 Family Care Rooms

Recognizing the importance and benefits to families while on campus, MSU seeks to promote a family friendly environment in which to work and study. One suitable space for such purpose, a family care room, shall be included for all major renovations and for new construction, and is to be readily available during the time it is needed by faculty, staff or student.

MSU has two designated Family Care Rooms on campus and are located in 121 Hamilton Hall and 124 SUB. Both spaces are conducive of breast pumping and general care of infants. The following criteria shall be incorporated for the design of family care rooms, unless directed otherwise:

1. Size: 70 – 100 sf to accommodate the recommended furniture and equipment.
2. Location: Locate rooms in a safe, ADA-accessible area. If possible, the room should be located near an exterior door to provide access to designated parking spaces.
3. Privacy: Provide a user-operated, indicator dead bolt that displays an “occupied” message to discourage interruptions.
4. Sound Privacy: The room shall be designed to minimize the transmission of sound, both from room to adjacent space and from adjacent space to room, including but not limited to extending walls to structure above, sound attenuation within wall cavities, and sound-absorbing materials within the room.
5. Furniture: Provide a table or counter as a work surface for the pump and bottles to rest on in front of a task chair. Provide a comfortable, adjustable task chair with arms.
6. Electrical: At least one electrical outlet to power breast pumps. Refrigerators will not be provided in the space.
7. Plumbing: Provide a sink and faucet combination deep enough to wash bottles and pump parts.
8. Lighting: In addition to general lighting levels, provide task lighting over work areas and the ability to have lower lighting levels to create a calming setting.
9. HVAC: Temperature should be maintained year-round at a comfortable warm level. Locate individual thermostat in room for user control and thermal comfort.
10. Equipment: Provide an appropriate surface to allow for a baby-changing station. A wall-mounted changing station is preferable.
11. Accessories: Provide paper towel dispenser, coat hook and mirror.



END OF SECTION 6.0



7.0 HISTORIC BUILDINGS

7.1 Restoration

MSU has a breadth of historic campus buildings and structures that were built at the beginning of the 20th century. These structures and buildings represent a unique opportunity to strengthen the university's sense of place and tradition. Adaptive re-use planning will increase the development potential and importance of preserving existing campus historic structures. The LRCDP has set forth goals to identify, preserve and improve significant historic buildings and structures, as well as to set project budgets to accomplish quality project planning, design and construction through sustainable practices and include landscaping and infrastructure.

7.1.2 Historic Preservation

MSU campus buildings that were built fifty years ago, or longer, are considered Heritage Sites and are regulated by the State Historic Preservation Office (SHPO). The university has a Heritage Building and Sites Policy which states that:

MSU's Historically significant properties will be continuously preserved and maintained to present a positive appearance to alumni, visitors, students, and the public, and to protect the enduring value of the properties. Removal of or major alteration to any historically significant properties designated or determined to be of historic significance, designated as a Heritage Property or listed on the National Register must be recommended by the University Facilities Planning Board and approved by the University President and/or appropriate governing agency when applicable.

The University will document historic or potentially historic properties consistent with the Montana Antiques Act or BOR policies in a professionally competent and responsible manner and in consultation with the SHPO prior to implementing significant modifications or alterations.

The University will consider national and state recognized historic preservation principles and guidelines (i.e. Secretary of Interior's Standards for Preservation) when implementing adaptive re-use or reuse of historically significant properties, Heritage Properties, or Registered Properties under ownership and control of the University in the planning and implementation of projects when possible and feasible.

Campus Planning, Design and Construction is responsible for coordinating University activities and projects with the SHPO and the state Architecture & Engineering Division as necessary or appropriate, and will be supported in these efforts by Facilities Services staff and UFPB.

A Heritage Assessment is required to be done on any building considered a Heritage Site prior to any restoration, renovation or addition is to be designed and built. The Project Manager shall inform the Design Consultant if the building will require this assessment.



LRCDP
See Appendix 2.1-1

MSU Heritage
Building and Sites
Policy

7.2 Renovation Guideline Requirements

Renovation of Heritage buildings is often required to accommodate the growing population of students and faculty at MSU and the expansion of the university's mission. While the main objective is to not disturb the original architectural detailing of a Heritage Building there have been previous renovations that have not been sensitive enough to the original character of the building. When a renovation is undertaken, the Design Consultant, along with the Project Manager, shall review the original design and subsequent renovation renovations to identify areas that have been compromised and will require modification to bring the building back to its original design intent.

During the Design Development phase the designs for restoration or changes to the exterior of a building project must be presented to UFPB for approval.

The Design Consultant is encouraged to investigate use of the provisions of the International Existing Buildings Code, in conjunction with the IBC, and may provide additional flexibility in dealing with common constraints in renovating historic buildings.

7.2.1 Exterior Building Envelope

Heritage building renovations typically include upgrading the building's envelope, along with providing ADA accessibility. The style and detailing of upgraded materials is to match existing style and detailing but shall have upgraded technology. The following envelope items shall be taken into consideration when renovating any Heritage building:

1. Brick - Brick was the main building material used to construct the majority of Heritage buildings on campus.
 - A. Typical brick buildings 70 to 100 years old require full-scale repointing to ensure the building's longevity. Due to the advancement of brick and masonry grout design today's materials are much stronger than older materials.
 - B. The Design Consultant shall specify mortar design, similar to Cathedral Stone Projects Historic Pointing Mortar, to be of similar strengths as the original to ensure the mortar fails prior to the original brick.
 - C. Design Consultant shall specify the bricks to be made with similar strength characteristics as the original.
 - D. Brick sills and projected accents originally did not have protected top edges and joints, resulting in deterioration of mortar and brick. The Design Consultant along with the Project Manager shall investigate the appropriate means of protecting such sills and projections.

University Facilities
Planning Board
Website:

www.montana.edu.us/committees/ufbp

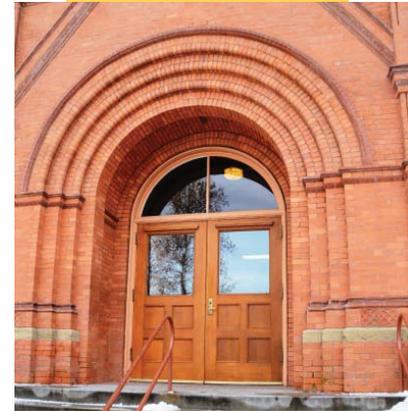


2. Campus restoration projects in the past have included work to grind joints out and install lead flashing to protect sill joints and projections. These details should be examined and included on all historic masonry restoration projects.
3. Concrete bricks used in some campus buildings, such as Linfield Hall, were a relatively new building material when implemented and do not have the strength of face brick of the same period. This has created an issue of repairing deteriorated sections.
 - A. Minor deteriorated sections may be parged with a minimal coat of historic patching mortar, such as Cathedral Stone Products Jahn M90, matching the existing color and texture. Such treatment shall be applied to individual bricks.
 - B. Major deteriorated sections must be removed completely and new concrete bricks installed.
 - C. The Design Consultant shall consult with manufacturers to determine readily available shapes and sizes to determine if replacement bricks will need to be custom ordered or over-sized and cut to fit.
4. Terra Cotta - Several of MSU's Heritage buildings have terra cotta decorative accents. When a building undergoes restoration great care should be given to restoring this terra cotta.
 - A. If the terra cotta is badly deteriorated molds should be taken and new terra cotta made to match the original.
 - B. In special cases other restoration methods may be considered such as the rebuilding and faux painting of terra cotta detail done on the south entry arch at Lewis Hall.
5. Windows - All historic renovations are to be done with wood windows made to mimic the original windows for sizes of rails, muntin size and configuration, and operation as closely as possible. Aluminum-clad wood windows and trim are acceptable, with exterior color to match the original as closely as possible.
 - A. New windows are to have insulated glass and meet all current standards for commercial class windows.
 - B. Typical window function of Heritage buildings is double-hung. There are some instances that the original function was sliding or awning.
 - C. Investigation to be done by the Design Consultant of Project Manager to determine the original exterior color of the windows.

6. Doors - If exterior entry doors are to be replaced, the new doors shall mimic original design and materials.
 - A. Wood doors will probably need to be custom made and should match the original doors in all dimensions and details.
 - B. Care should be taken to match the original wood species and cut.
 - C. New hardware may need to differ from the original in order to meet accessibility requirements, but the quality and finish should match the original.
 - D. Storefront doors to be replaced shall match the original frame, rail and stile dimensions, but may need to have updated ADA accessible hardware where required, and construction, including thermally broken frames
7. Roofing - Investigation needs to take place to determine historic roofing material and color.
 - A. Mimic historic material and color when possible, although project budget and material availability may affect the ability to restore original materials.
 - B. Investigation may determine the original roofing material contains hazardous components.
8. Wood siding and shingles – matching existing wood materials requires the same level of attention to investigate the original color and pattern.
 - Synthetic wood materials may be used in some instances, discuss potential placement of synthetic materials with the Project Manager.

7.2.2 Interior

Heritage building renovations typically include restoration or upgrading of interior surfaces, details, mechanical systems and lighting. The Design Consultant must determine the scope of the project and which parts of the building are to be renovated, then in consultation with the Project Manager determine the scope of possible restoration of original building materials and finishes. The following must be considered:





Department of the
Interior Historic
Preservation
Guidelines: www.nps.gov/tps/standards.htm



1. Heritage Site designation applies to interiors as well as exteriors of buildings.
2. Although many university buildings that have Heritage Site designation never had extensive interior detailing or distinctive materials, the character of the building interior in an important aspect and must be respected.
 - A. In the Schematic Design phase, the Design Consultant should put together a plan that specifically addresses the design intent for maintaining historic elements and character in the project.
 - B. This plan must be approved by the Project Manager and the Building Committee.
 - C. This plan shall be submitted to SHPO by CPDC for review and comment as early in the design process as possible.
 - D. At the Design Development phase the design for interior public spaces shall be presented to the UFPB for approval.
3. Restoration of public spaces such as lobbies and corridors must take precedence over restoration of other interior spaces. In many cases original building materials are not readily available or may not be used due to restrictions on hazardous materials, but the following guidelines should be followed:
 - A. Where the function of the building area to be renovated has changed since the building was constructed or will change as part of the renovation, attention should be given to maintaining or mimicking the scale and character of spaces original to the building to as great an extent as possible.
 - B. Renovation should follow the original design intent in terms of materials, finishes and colors where possible.
 - C. Changes to lighting required to meet current energy codes must be sensitive not only to fixture type and style, but should attempt to achieve lighting color and intensity levels that are similar to the original.
 - D. New mechanical, sprinkler and plumbing systems installed in a Heritage building must be carefully designed and detailed so as to be as unobtrusive as possible.
 - E. Exposed piping and ductwork not original to the building are not acceptable.

7.2.3 Mid-Century Heritage Buildings

There are an increasing number of university buildings which were built in the 1950's and 1960's which come under the guidelines for Heritage buildings. These buildings are fundamentally different in design than buildings from the early decades of the 20th century and they sometimes have very different building materials and details. Renovation of these buildings requires a respect for the design principles that created them as well as an understanding of and appreciation for the construction detailing.

Typically these buildings utilize new construction materials that came into broad use after World War II, such as aluminum. They also utilize larger areas of glass in window systems that have little in common with individual wood frame windows in older buildings, and use traditional materials such as brick and terra cotta in new ways that reflect the fact that they are not load bearing. These building typically have flat roofs that were designed for the installation of sheet membranes instead of built-up tar and paper roofing.

The Design Consultant is encouraged to engage in a thorough examination of these design and construction issues and to provide leadership to the Building Committee in the importance of recognizing the differences inherent in a renovation project on any of these building.

7.3 Additions General Guideline Requirements

1. Additions to Heritage buildings are often required to meet the needs of changing curriculum and increased student and faculty population. There are two ways the Design Consultant may approach an addition to a Heritage building.
 - A. Additions shall be done in such a way as to mimic original design, but not confuse the new with original.
 - B. Additions shall be done with modern materials making a complete departure from the original, while using design elements such as massing and rhythm to remain sympathetic to the original design.
2. The U.S. Department of Interior has a guideline to be followed when adding onto Heritage buildings.
 - A. The Design Consultant shall be familiar with the requirements set forth in that document.
 - B. The requirements may or may not be achievable for restoration work, since true historic quality restoration may be outside of the MSU's project budget but the intent of these guidelines must be maintained where possible.
3. Investigation shall be done by the Design Consultant to determine the original colors and materials used on both the exterior and interior of the Heritage building.
 - A. A building addition, even an addition which makes a complete stylistic departure from the original, should be designed to coordinate comfortably with original colors and materials.
 - B. Previous renovations or additions to the building that may have departed from historic colors may need to be modified in order to create a harmonious overall result.

Interior spaces of new building additions must be of a piece with the exterior, although care should be taken in the design of the interior of additions that are a departure from the original on the exterior. The scale and modulation of space as a user moves from the space within the Heritage building to the space within the addition should be similar enough that the addition does not overwhelm or completely conflict with the original.

END OF SECTION 7.



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Montana State University

Design Guidelines 2015 Appendices

Campus Planning,
Design & Construction
Montana State
University
PO Box 172760
Bozeman, MT 59717-2760
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Fax: 406 994-5665
Location: Rm 113, Plew



Approved May 18, 2015
by MSU President
Dr. Waded Cruzado



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Appendix 1.6-1 - Sustainability Resources

Following is a list of resources available to the Design Consultant on University projects in pursuit of the LEED and sustainability goals outlined in the Design Guidelines document:

- **ASTM E2432 - Standard Guide for the General Principles of Sustainability Relative to Building.** http://enterprise.astm.org/filtrex40.cgi?+REDLINE_PAGES/E2432.htm
- **ASHRAE 189.1-2011 - Standard for the Design of Green Buildings, except Low-Rise Residential Buildings.** <https://www.ashrae.org/resources--publications/bookstore/standard-189-1>
- **ASHRAE GreenGuide: The Design, Construction, and Operation of Sustainable Buildings.** <https://www.ashrae.org/resources--publications/bookstore/ashrae-greenguide>
- **Decision Support Tools for Green Buildings.** <http://www.wbdg.org/tools/gbt.php>
- **USGBC LEED - Leadership in Energy and Environmental Design.** <http://www.usgbc.org/leed>
- **IGCC-2012 International Green Construction Code, International Code Council.** <http://www.iccsafe.org/cs/igcc/pages/default.aspx>
- **GreenSpec Directory.** www.buildinggreen.com
- **Sustainable Facilities Tool.** <http://sftool.gov/>
- **Green Globes - Green Building Initiative.** <http://www.greenglobes.com/>
- **Whole Building Design Guide: Decision Support Tools for Green Building.** <http://www.wbdg.org/tools/gbt.php>

Appendix 1.7-1 Project Responsibility Checklist

List of Acronyms Used

BIM	Building Information Management
CPDC	Campus Planning Design & Construction
DC	Design Consultant
GIS	Geographic Information Systems
LCCA	Life Cycle Cost Analysis
PM	Project Manager
SRM	Safety & Risk Management
UFPB	University Facilities Planning Board

Tasks During Design Consultant Pre-Contractual

Responsibility & Date Completed

DC	MSU	N/A
----	-----	-----

Item #	Task Description	DC	MSU	N/A
1	Establish pertinent project control numbers <input type="checkbox"/> MSU PPA# <input type="checkbox"/> State A/E Project# (if applicable) <input type="checkbox"/> Funding source(s)/Index #			
2	Determine Basis of Selection for Design Consultant <input type="checkbox"/> Direct select <input type="checkbox"/> Short list to state			
3	Determine Method contemplated for award of construction contract: <input type="checkbox"/> Informal Bid <input type="checkbox"/> Advertised Bid <input type="checkbox"/> Alternate Delivery Method			
4	Review Program requirements with Design Committee for completeness and suitability.			
5	Review with University Architect relationship of project to Campus Master Plan			
6	Include sustainability in Scope of Work; outline preliminary sustainability goals and targets (refer to Section 1.6)			
7	Determine Project schedule for contracting (designer and contractor), design, bidding, construction and occupancy			

8	Determine if cost estimating is required (Reference A/E Contract Article VII (d), (8,9))			
	Cost estimate is to be provided by:			
	1. A/E			
	2. CM			
	3. Independent			
	4. Not provided			
9	Complete RFP or confirm scope with state A&E if advertised			
10	Meet with MSU Project Manager to discuss A/E agreement, including:			
	a. Standard University General Conditions			
	b. Standard University Professional Services Agreement			
	c. MSU Design and Construction Standards			
	d. Project Description			
	e. Requirement for BIM as part of design documentation f. Other			
11	Meet with Project Manager and Design Committee to agree on scope of Programming effort			
12	Discuss Schedule, cost and need for existing condition survey, including hazardous materials			
13	Complete execution of A/E Agreement, including contract date			

Tasks During Pre-Schematic Phase

Responsibility & Date Completed

14	Review and agree upon Task Description with respect to any proposed concept designs			N/A
15	Sustainability Charrette: Project Team education and goal-setting			
	<input type="checkbox"/> review site sustainability issues in relation to campus master plan			
	<input type="checkbox"/> explore options with respect to life cycle implications			
	<input type="checkbox"/> meet with Facilities Sustainability Manager to discuss sustainability issues for project			
	<input type="checkbox"/> consider siting, orientation and design parameters/assumptions			
	<input type="checkbox"/> determine Project Sustainability Goals and targets to include in program (refer to Section 1.6)			

Item #

Task Description

A/E

MSU

N/A

16	Review State High-Performance Building Standards with respect to Project (refer to Section 1.6)			
17	Review University commissioning process and commissioning goals (refer to Section 1.6)			
18	Meet with Facilities Engineering Department to review project utility interconnects and regional campus MEP parameters			
19	Consult with PM and University Architect to determine needs for site plan and University Planning Board review (refer to Section 1.1)			
20	If classroom design is contemplated, meet with PM and University Classroom Committee during programming (refer to Section 6.2)			
21	If dormitory design is contemplated, meet with PM and University Housing Office to ascertain program review committee constituency (refer to Section 6.3)			
22	Meet with Facilities Engineering Department to ascertain types of MEP systems to be installed (refer to Sections 5.3, 5.4, 5.5)			
23	Discuss vehicular traffic around proposed site, including deliveries, accessibility requirements, university grounds vehicular access, etc			
24	For CMGC projects: Assist University with selection of CMGC <input type="checkbox"/> Assist with preparation of project description and schedule <input type="checkbox"/> Schedule and attend CMGC interviews as applicable			
25	For CMGC projects: Initiate CMGC pre-construction services contract			

Tasks During Schematic Design Phase

**Responsibility
& Date Completed**

Item #	Task Description	A/E	MSU	N/A
26	Update Programming information. Review all data supplied, including program, budget, legal, site, code, space and special owner requirements. Verify design complies with established requirements			

Item # Task Description A/E MSU N/A

27	Project Meetings to determine / refine program and sustainability goals with:			
	<input type="checkbox"/> MSU Project Manager			
	• MSU project Design Committee			
	<input type="checkbox"/> Facilities Services			
	<input type="checkbox"/> Facilities Engineering			
	<input type="checkbox"/> Safety & Risk Management			
	<input type="checkbox"/> Others as identified			
28	Establish Project Schedule, including completion dates for each phase. Review with PM. Provide to owner and consultants			
29	Review requirements for site survey and/or site analysis and testing (such as borings, perc tests, etc.) necessary for proper execution of site work and request such information from the University.			
30	Review site land and utility surveys.			
31	Prepare functional space diagrams			
32	Prepare basic design documents to include:			
	<input type="checkbox"/> Site plan with vertical sections through site, as required			
	<input type="checkbox"/> Principal floor plans			
	<input type="checkbox"/> General Descriptive views			
	<input type="checkbox"/> Illustrative sketches, models or renderings as required			
33	Submit information to University for review and comment to clarify expectation of deliverables			
34	If CMGC is on board, start preparing cost estimates			
35	Prepare Schematic Design documents in conformance with MSU Facilities Department Design Standards Manual (latest Release) and the phased submission requirements listed within each respective section			
36	Submit Schematic Design documents (drawings, descriptions, including MEP design intent, calculations, outlines and statements of probable construction costs) to University.			
37	Review and update project budget			
38	Review and update schedule of completion dates for this and all subsequent phases			

39	Present project to project Design Committee, and UFPB, if required, and receive authorization to proceed to Design Development			

Tasks During Design Development Phase

Item #	Task Description	Responsibility & Date Completed		
		A/E	MSU	N/A
40	Update list of existing equipment and/or owner-supplied eqpt. and respective utility requirements to be incorporated in project			
41	Confirm all systems requiring owner-supplied labor and materials			
42	Meet with planning associate to discuss room numbering (see Section 1.8.2)			
43	Discuss need for any phasing of project and site logistics; review project schedule to ensure/ include adequate time for sustainability activities (construction monitoring, commissioning, other documentation, training)			
44	"Pre-meeting" to review code issues with City of Bozeman building department			
45	Prepare preliminary draft of the Project Manual. Have consultants prepare their portions and coordinate. Identify sustainable strategies/ development in specification. Solicit CMGC input regarding materials and constructability issues			
46	Prepare DD documents in conformance with MSU Design Standards Manual (latest release) and the Consultant Agreement.			
47	Submit 100% DD (35% CD) Documents to PM for review by project Design Committee and Facilities Engineering and Trades review			
48	Attend DD review session with Facilities Services & Building Committee. Provide narrative design presentation			

Item #	Task Description	A/E	MSU	N/A
49	Provide timely and coordinated responses to all DD review comments prior to submission of all future Construction Documents			
50	Identification of alternates generated in review of DD documents			
51	Review of unreconciled budget items. Attend Budget Reconciliation meeting with CMGC.			
52	Attend Building Committee meeting to discuss DD review and authorization to proceed to Construction Documents phase			
53	Site Logistics meeting			
54	Review the project program and verify compliance with the final DD documents			
55	Review scope of items to be provided by owner or otherwise not included in construction documents			

Tasks During Construction Document Phase

Item #	Task Description	Responsibility & Date Completed		
		A/E	MSU	N/A
56	Prepare CDs in conformance with MSU Design Standards Manual (latest Release)			
57	Prepare 65% CDs, including Project Manual with all final sections represented, in conformance with MSU Design Standards Manual (latest release) and MSU Consultant Services Agreement			
58	Present 65% design summary, with updated budget and project schedule, to Building Committee			
59	Attend all 65% CD review session with Facilities Service & Building committee. Provide narrative design presentation.			
60	Provide timely and coordinated responses to all CD review comments prior to submission of all future documentation			

Item #	Task Description	A/E	MSU	N/A
61	Identification of add/deduct alternates generated in review of 65% Construction Documents			
62	Review of unreconciled budget items in submissions from CMGC. Attend Budget Reconciliation meeting			
63	Prepare 95% CDs in conformance with MSU Design Standards Manual (latest Release) and the phased submission requirements listed within each respective section and with MSU Consultant Services Agreement.			
64	Present 65% design summary, with updated budget and project schedule, to Building Committee			
65	Attend all 65% CD review session with Facilities Service & Building committee. Provide narrative design presentation.			
66	Provide timely and coordinated responses to all CD review comments prior to submission of all future documentation			
67	Determine alternates to be documented and priced, alternates to be agreed and approved by Building Committee			
68	Prepare documents for filing of permits and approvals			
69	Coordination of final Project Manual			
70	Attend Pre-Bid Conference to review contractor responsibilities including: <ul style="list-style-type: none"> <input type="checkbox"/> Waste Management Plan implementation <input type="checkbox"/> Materials certificate collection <input type="checkbox"/> Health & Safety Plan Implementation <input type="checkbox"/> Site Management / Protection <input type="checkbox"/> Commissioning data collection <input type="checkbox"/> Contractor parking / access to site <input type="checkbox"/> Noise Issues <input type="checkbox"/> Considerations regarding the Academic Calendar 			
71	Evaluation of budget and schedule impacts for proposed substitutions and add/deduct alternates			
72	Review all discipline scope documents prepared by CMGC and propose changes			

Item #	Task Description	A/E	MSU	N/A
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84	Punch list preparation and follow-up			
85	Inspect project for substantial completion, provide notification to government agencies who require inspection prior to occupancy			
86	Provide written certification of substantial completion			

Tasks During Project Close-Out

**Responsibility
& Date Completed**

Item #	Task Description	Responsibility & Date Completed		
		A/E	MSU	N/A
87	Review submitted Operations and Maintenance Manuals/ Programs as required			
88	Review submitted Record Drawings from contractors			
89	Compile and submit As-Built Drawings per MSU FPDC Design Manual and MSU Consultant Agreement			
90	Review systems training requirements and attend selected MEP training sessions			
	<input type="checkbox"/> Fire Alarm			
	<input type="checkbox"/> ATC			
	<input type="checkbox"/> Mechanical Systems			
91	Review Final Commissioning Report			
92	Schedule end-of-warranty walk-throughs prior to 1 year post-C of O date, attend walk-throughs, and document issues			

END OF CHECKLIST



Computer Aided Drawing (CAD) Standard

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Montana State University Computer Aided Drawing (CAD) Standard

Ownership

Montana State University (MSU) shall at all times have sole ownership of all drawings, documents and specifications, electronic or otherwise, produced by any Consultant or Contractor, intended for use in connection with a project (reference the current *Standard Form of Agreement Between Owner and Architect / Engineer*, paragraph 1.10, Ownership of Documents).

Use of MSU CAD Plans

Upon request, MSU may provide the Consultant with the most currently available drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

The Consultant is solely responsible for verifying that drawings provided do not contain errors that might compromise a project. Field verification of existing conditions is always recommended.

Model Space

All building information is to be drawn in model space at 1:1 scale (actual size). Plan views of buildings will be made with north up.

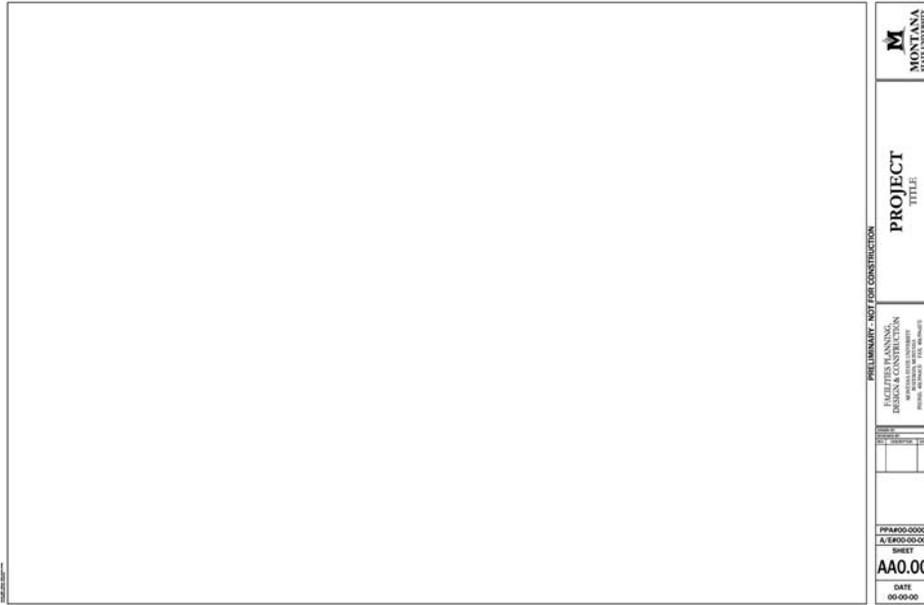
Paper Space

All drawing borders / title blocks are to be in paper space (Layout View). Drawings in paper space will be oriented for the most effective use of media space. It is recommended that the long axis of the drawing be aligned with the long axis of the plotting media. Assure that the north arrow is present and that it is oriented to true north.

In the absence of a long axis that would dictate orientation on the media, orient the drawing with north at the top of the page.

Drawing Border

Montana State University Facilities provides a standard border / title block that will be used on all Montana State University drawings. The border and associated text will not be altered, except that the Architect / Engineer may add their logo and stamp to the border as required.



An Architectural “D” (MSU_Border_D) or “E” (MSU_Border_E) size standard border / title block will be used for most drawing projects (“D” size recommended for most projects).

An 8-1/2” x 11” (MSU_Border_A) and 11” x 17” (MSU_Border_B) size standard border / title block are provided for special projects only.

The following Table 1 shows the font types and sizes of text for the Architectural “D” standard border / title block.

Table 1 – Architectural D Standard Border / Title Block			
Border / Title Block Area	Font	Height	Rotation
PROJECT	Garamond Bold	7/16”	90°
TITLE	Garamond	1/4”	90°
SHEET	Franklin Gothic Medium w/.8 width factor	1/2”	0°
PRLIMINARY - NOT FOR CONSTRUCTION	Franklin Gothic Medium	7/32”	90°
FACILITIES PLANNING, DESIGN & CONSTRUCTION	Garamond	7/32”	90°
MONTANA STATE UNIVERSITY, BOZEMAN, MT	Garamond	1/8”	90°
DRAWN BY, REVIEWED BY, REV., DESCRIPTION, DATE	Franklin Gothic Book	3/32”	0°
PPA NUMBER	Franklin Gothic Medium	3/16”	0°
A/E NUMBER	Franklin Gothic Medium	3/16”	0°
DATE	Franklin Gothic Medium	3/16”	0°

Drawing Title

The drawing title will reflect the project name used in the log, PPA or State A / E project file.

Electronic Drawing Name

The electronic name of the drawing file will consist of the following:

XXXXXXXXXX_AAN_NN

The project code. For example the log number, PPA number or State A&E number of the project

XXXXXXXXXX_AAN_NN

The sheet number as defined in this document. As an example, sheet A1.01 in PPA project 08-0018, would have the electronic drawing name 08-0018_A1_01.dwg.

Sheet Number

The drawing will use a six character alpha-numeric sheet number as defined in the following sections.

Discipline Designator

AAN_NN

The discipline designator, which consists of one alphabetical character and a hyphen (Level 1 Designator) or two alphabetical characters (Level 2 Designator). The discipline designator will be chosen from the following table:

Level 1 Designator	Level 2 Designator	Description	Content
G-		All General	All or any portion of subjects in the following Level 2 Designators
	GI	General Information	Drawing index, code summary, symbol legend, orientation maps
	GC	General Contractual	Phasing, schedules, contractor staging areas, fencing, haul routes, erosion control, temporary and special requirements
	GR	General Resource	Photographs, soil borings
H-		All Hazardous Materials	All or any portion of subjects in the following Level 2 Designators

Table 2 – Discipline Designator

Level 1 Designator	Level 2 Designator	Description	Content
	HA	Asbestos	Asbestos abatement, identification, or containment
	HC	Chemicals	Toxic chemicals handling, removal or storage
	HL	Lead	Lead piping or paint removal
	HP	PCB	PCB containment and removal
	HR	Refrigerants	Ozone depleting refrigerants
V-		All Survey / Mapping	All or any portion of subjects in the following Level 2 Designators
	VA	Aerial Survey	
	VF	Field Survey	
	VH	Hydrographic Survey	
	VI	Digital Survey	
	VU	Combined Utilities	
B-		All Geotechnical	
C-		All Civil	All or any portion of subjects in the following Level 2 Designators
	CB	Civil Beach Renourishment	Beach disposal and renourishment
	CD	Civil Demolition	Structural removal and site clearing
	CE	Civil Ecosystem Restoration	Environmental restoration
	CF	Civil Flood Control	Levees, spillways, pump stations
	CG	Civil Grading	Excavation, grading, drainage, erosion control, retention ponds
	CI	Civil Improvements	Pavers, flagstone, exterior tile, furnishings, retaining walls, and water features
	CN	Civil Navigation	Navigation, harbors, dredging
	CO	Civil Operation and Maintenance	Repair and upgrade to O&M structures
	CP	Civil Paving	Roads, driveways, parking lots
	CH	Civil Shore Protection	Erosion protection structures on shoreline
	CR	Civil Recreation	Recreation facilities
	CS	Civil Site	Plats, topographic, dimension control
	CX	Civil Security	Security related work
	CT	Civil Transportation	Waterways, wharves, docks, trams, railways, airfields and people movers
	CU	Civil Utilities	Water, sanitary sewer, storm sewer, power, communications, natural gas and steam systems
L-		All Landscape	All or any portion of subjects in the following Level 2 Designators
	LD	Landscape Demolition	Protection and removal of existing landscape
	LI	Landscape Irrigation	
	LP	Landscape Planting	
A-		All Architectural	All or any portion of subjects in the following Level 2 Designators
	AS	Architectural Site	
	AD	Architectural Demolition	Protection and removal
	AE	Architectural Elements	General architectural
	AI	Architectural Interiors	

Table 2 – Discipline Designator

Level 1 Designator	Level 2 Designator	Description	Content
	AF	Architectural Finishes	
	AG	Architectural Graphics	
S-		All Structural	All or any portion of subjects in the following Level 2 Designators
	SD	Structural Demolition	Protection and removal
	SS	Structural Site	
	SB	Structural Substructure	Foundations, piers, slabs and retaining walls
	SF	Structural Framing	Floors and roofs
I-		All Interiors	All or any portion of subjects in the following Level 2 Designators
	ID	Interior Demolition	
	IN	Interior Design	
	IF	Interior Furnishings	
	IG	Interior Graphics	Murals and visuals
Q-		All Equipment	All or any portion of subjects in the following Level 2 Designators
	QA	Athletic Equipment	Gymnasium, exercise, aquatic and recreational
	QB	Bank Equipment	Vaults, letter units, ATMs, drive-through
	QC	Dry Cleaning Equipment	Washers, dryers, ironing and dry cleaning
	QD	Detention Equipment	Prisons and jails
	QE	Educational Equipment	Chalkboards, library
	QF	Food Service Equipment	Kitchen, bar, service, storage and processing
	QH	Hospital Equipment	Medical, exam and treatment
	QL	Laboratory Equipment	Science labs, planetariums, observatories
	QM	Maintenance Equipment	Housekeeping, window washing and vehicle servicing
	QP	Parking Lot Equipment	Gates, ticket and card access
	QR	Retail Equipment	Display, vending and cash register
	QS	Site Equipment	Bicycle racks, benches, playgrounds
	QT	Theatrical Equipment	Stage, movie, rigging systems
	QV	Video / Photographic Equipment	Television, darkroom and studio
	QY	Security Equipment	Access control and monitoring, surveillance
F-		All Fire Protection	All or any portion of subjects in the following Level 2 Designators
	FA	Fire Detection and Alarm	
	FX	Fire Suppression	Fire extinguishing systems and equipment
P-		All Plumbing	All or any portion of subjects in the following Level 2 Designators
	PS	Plumbing Site	Extensions and connections to civil utilities
	PD	Plumbing Demolition	Protection, termination and removal
	PP	Plumbing Piping	Piping, valves and insulation
	PQ	Plumbing Equipment	Pumps and tanks

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	PL	Plumbing	Domestic water, sanitary and storm drainage, fixtures
D-		All Process	All or any portion of subjects in the following Level 2 Designators
	DS	Process Site	Extension and connection to civil utilities
	DD	Process Demolition	Protection, termination and removal
	DL	Process Liquids	Liquid process systems
	DG	Process Gases	Gaseous process systems
	DP	Process Piping	Piping, valves, insulation, tanks, pumps, etc.
	DQ	Process Equipment	Systems and equipment for thermal, electrical, materials handling, assembly and manufacturing, nuclear, power generation, chemical, refrigeration and industrial processes
	DE	Process Electrical	Electrical exclusively associated with a process and not the facility
	DI	Process Instrumentation	Instrumentation, measurement, recorders, devices and controllers (electrical and mechanical)
M-		All Mechanical	All or any portion of subjects in the following Level 2 Designators
	MS	Mechanical Site	Utility tunnels and piping between facilities
	MD	Mechanical Demolition	Protection, termination and removal
	MH	Mechanical HVAC	Ductwork, air devices and equipment
	MP	Mechanical Piping	Chilled and heating water, steam
	MI	Mechanical Instrumentation	Instrumentation and controls
	MY	Mechanical Hydraulic Systems	Pump stations, spillways, slide gates
E-		All Electrical	All or any portion of subjects in the following Level 2 Designators
	EA	Electrical Airfield Lighting and Nav aids	Visual air navigation systems
	ES	Electrical Site	Exterior electrical systems (power, lighting, auxiliary)
	EC	Electrical Cathodic Protection	Cathodic protection systems
	EG	Electrical Grounding	Grounding, lightning protection devices
	ED	Electrical Demolition	Protection, termination and removal
	EP	Electrical Interior Power	Interior power
	EL	Electrical Interior Lighting	Interior lighting
	EI	Electrical Instrumentation	Controls, relays, instrumentation and measurement devices
	EY	Electrical Interior Auxiliary Systems	Alarms, nurse call, security, CCTV, PA, music, clock and program
T-		All Telecommunications	All or any portion of subjects in the following Level 2 Designators
	TD	Telecommunications Demolition	Protection, termination and removal
	TA	Audio Visual	Cable, music and CCTV systems
	TC	Clock and Program	Time generators and bell program systems
	TI	Intercom	Intercom and public address systems

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	TM	Monitoring	Monitoring and alarm systems
	TN	Data Networks	Network cabling and equipment
	TS	SCADA	Supervisory Control and Data Acquisition (SCADA) systems and equipment
	TT	Telephone	Telephone systems, wiring and equipment
	TY	Security	Access control and alarm systems
R-		All Resource	All or any portion of subjects in the following Level 2 Designators
	RC	Resource Civil	Surveyor's information and existing civil drawings
	RS	Resource Structural	Existing facility structural drawings
	RA	Resource Architectural	Existing facility architectural drawings
	RM	Resource Mechanical	Existing facility mechanical drawings
	RE	Resource Electrical	Existing facility electrical drawings
X-		Other Disciplines	
Z-		Contractor / Shop Drawings	
O-		Operations	

Sheet Type Designators

AAN_NN

The sheet type designator, which consists of one numerical character. The sheet type designator will be chosen from the following table:

Table 3 – Sheet Type Designators	
Sheet Type	Designator
General (symbols, legend, notes, etc.)	0
Plans (horizontal views)	1
Elevations (vertical views)	2
Sections (sectional views)	3
Large-Scale Views (plans, elevations, or sections that are not details)	4
Details	5
Schedules and Diagrams	6
User Defined	7
User Defined	8
3D Representations (isometrics, perspectives, photographs)	9

Sheet Sequence Number

AAN_**NN**

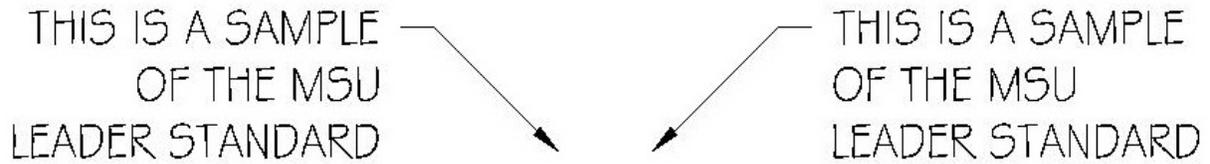
The sheet sequence number, consisting of one to two numerical characters.

Dimensioning

Dimensions will use the standard AutoCAD "Stylus BT" font, and print with 3/32" text size in paper space. The following are standards for MSU dimensioning:

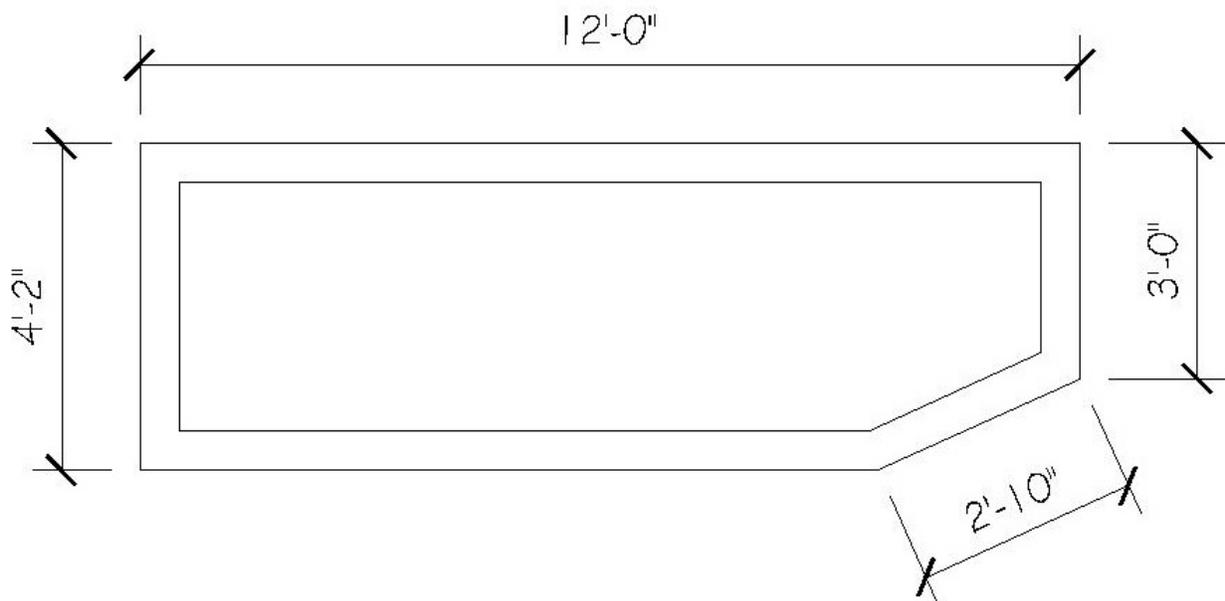
Leaders

Leaders will use the arrow style "closed filled arrow" aligned with the middle of the top line of text. Use the quick leader (qlleader) command to insert leaders.



Dimensions

Dimensions will use the arrow style "architectural tick". Text will be printed above the dimension line.

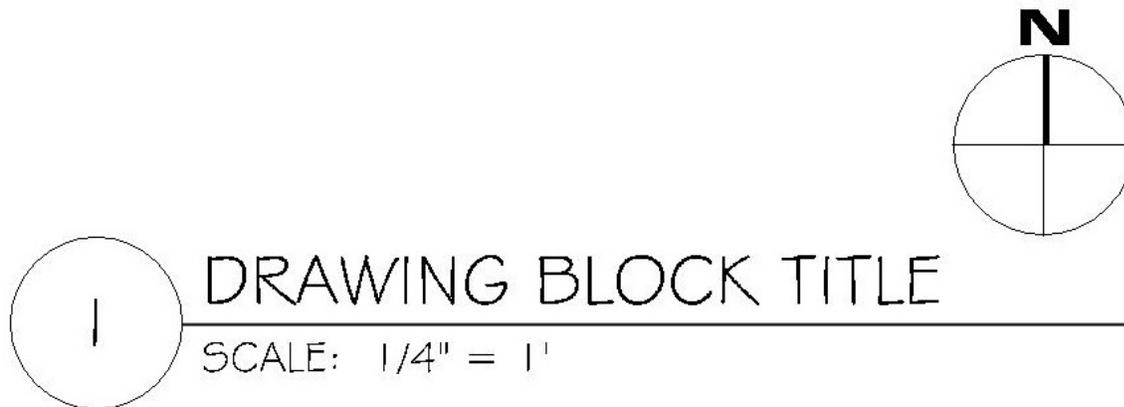


North Arrow

Drawings will use the standard AutoCAD “North Arrow M” to indicate true north.

Drawing Title Block

Drawings will use the standard AutoCAD “Title Mark”.



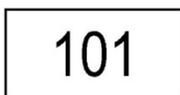
Room Numbers

Room numbers for current buildings shall be provided by the MSU CADD technician.

Room numbers for new buildings shall be based on the MSU Room Numbering Standard. This document can be found on the MSU Facilities Planning web site at:

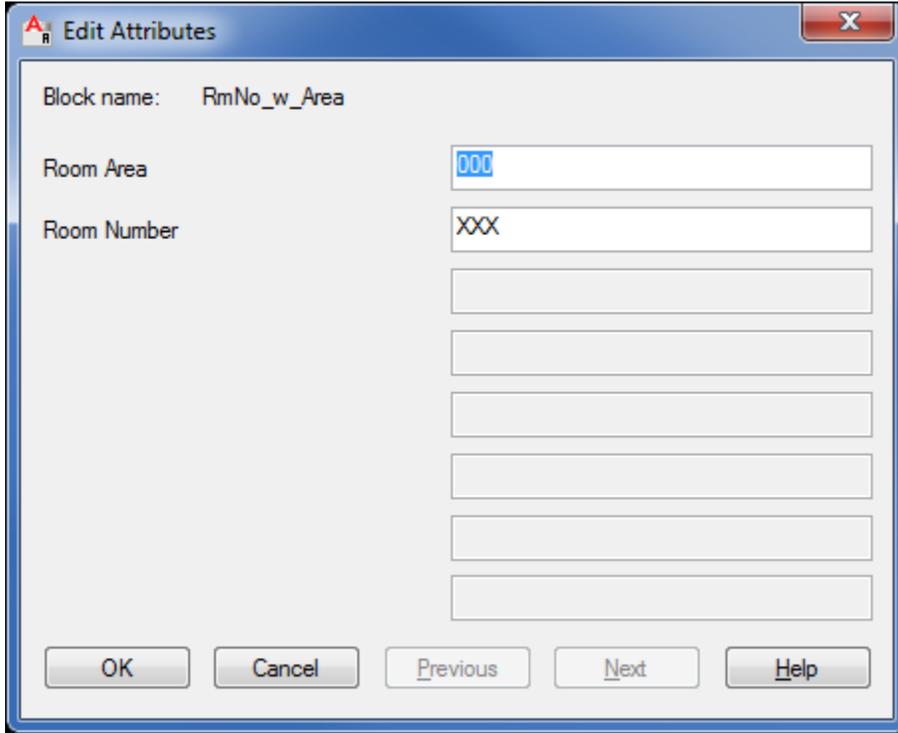
<http://www.facilities.montana.edu/pdc/planning/files/MSURoomNumberingStandard.pdf>

Building room numbers will be added using a standard block like the MSU block RmNo_w_Area. The room number block will be drawn in the A-Area-Iden drawing layer.



The room number block will have extractable attributes that include the room area and room number.

Room area will be calculated using a polyline drawn in the A-Area-Line drawing layer. The polyline will reflect the floor area of the room and extend half way through door openings.



Layers

The following table (Table 4) shows the recommended layers to be used for MSU drawings:

Table 4 – MSU Drawing Layers

Name	On	Freeze	Lock	Color	Linetype	Width (mm)	Plot Style	Plot	New VP Freeze	Description
0	ON	THAW	OFF	white	Continuous	Default	7	ON	THAW	0
A-ANNO-DIMS	ON	THAW	OFF	213	Continuous	.25	213	ON	THAW	Dimensions
A-ANNO-LEGN	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Display theme legends
A-ANNO-NOTE	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Notes, leaders, etc.
A-ANNO-REVS	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Revisions
A-ANNO-SCHD	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Schedule tables
A-ANNO-SCRN	ON	THAW	OFF	250	Continuous	.25	250	ON	THAW	A-Anno-Scrn
A-ANNO-SYMB	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Annotation marks
A-ANNO-TEXT	ON	THAW	OFF	50	Continuous	.30	50	ON	THAW	A-Anno-Text
A-AREA-IDEN	ON	THAW	OFF	171	Continuous	.30	171	ON	THAW	Room numbers, tenant identifications, area calculations
A-AREA-LINE	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Room area polyline
A-AREA-LINE-GROS	ON	FREZ	OFF	60	Continuous	.18	60	ON	FREZ	Building gross area polyline.
A-AREA-LINE-OTBW	ON	FREZ	OFF	80	Continuous	.18	80	ON	FREZ	Open to below area polyline.
A-AREA-MASS	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Massing elements
A-AREA-MASS-GRPS	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Massing groups
A-AREA-MASS-SLCE	ON	THAW	OFF	51	DASHED2	.25	51	ON	THAW	Massing slices
A-AREA-SPACE	ON	THAW	OFF	32	Continuous	.35	32	ON	THAW	Spaces
A-AREA-SPCE-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Space numbers
A-AREA-ZONE	ON	THAW	OFF	34	Continuous	.70	34	ON	THAW	Zones
A-AREA-ZONE-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Zone tags
A-BLDG-OTLN	ON	THAW	OFF	118	Continuous	.20	118	ON	THAW	Building outline
A-CLNG	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Ceiling Objects
A-CLNG-GRID	ON	THAW	OFF	72	Continuous	.35	72	ON	THAW	Ceiling grids
A-CLNG-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Ceiling tags
A-DELT-IDEN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail marks
A-DETL-FINE	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Detail - fine lines
A-DETL-HIDE	ON	THAW	OFF	242	HIDDEN2	.18	242	ON	THAW	Hidden lines
A-DETL-MEDM	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Detail - medium lines
A-DETL-PATT	ON	THAW	OFF	190	Continuous	.18	190	ON	THAW	Detail - hatching
A-DETL-THIN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail - thin lines
A-DETL-WIDE	ON	THAW	OFF	212	Continuous	.35	212	ON	THAW	Detail - wide lines
A-DIMENSION	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Dimensions
A-DOOR	ON	THAW	OFF	31	Continuous	.20	31	ON	THAW	Doors

A-DOOR-IDEN	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Door tags
A-ELEV	ON	THAW	OFF	111	Continuous	.25	111	ON	THAW	Elevations
A-ELEV-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Elevations marks
A-ELEV-LINE	ON	THAW	OFF	141	Continuous	.18	141	ON	THAW	Elevation definition lines
A-ELEV-PEPL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	People
A-EQPM	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment
A-EQPM-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment tags
A-FLOR-APPL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Appliances
A-FLOR-CASE	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Casework
A-FLOR-CASE-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Casework tags
A-FLOR-EVTR	ON	THAW	OFF	172	Continuous	.35	172	ON	THAW	Elevators
A-FLOR-HRAL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Stair handrails
A-FLOR-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Finish tags
A-FLOR-STRS	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Stairs
A-FLOR-TPTN	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Toilet partitions
A-GLAZ	ON	THAW	OFF	151	Continuous	.20	151	ON	THAW	Windows
A-GLAZ-ASSM	ON	THAW	OFF	71	Continuous	.20	71	ON	THAW	Window assemblies
A-GLAZ-CURT	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Curtain walls
A-GLAZ-CURT-UNIT	ON	THAW	OFF	51	Continuous	.25	51	ON	THAW	Curtain wall units
A-GLAZ-IDEN	ON	THAW	OFF	151	Continuous	.35	151	ON	THAW	Window tags
A-LEADER	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Leader lines
A-POLY	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	AEC polygons
A-ROOF	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Rooflines
A-ROOF-LEVL	ON	TAHW	OFF	150	Continuous	.20	150	ON	THAW	Roof level
A-ROOF-SLAB	ON	THAW	OFF	12	Continuous	.35	12	ON	THAW	Roof slabs
A-ROOF-SPCL	ON	THAW	OFF	96	Continuous	.18	96	ON	THAW	Roof specialties
A-SECT	ON	THAW	OFF	73	Continuous	.35	73	ON	THAW	Miscellaneous sections
A-SECT-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Section marks
A-SECT-LINE	ON	THAW	OFF	181	Continuous	.18	181	ON	THAW	Section lines
A-SLAB	ON	THAW	OFF	192	Continuous	.35	192	ON	THAW	Slabs
A-WALL	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls
A-WALL-CHAS	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Chases
A-WALL-FULL-EXTR	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls - exterior
A-WALL-FULL-INTR	ON	THAW	OFF	53	Continuous	.30	53	ON	THAW	Walls - interior
A-WALL-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Wall tags
A-WALL-OPEN	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Wall openings
AS-CTRL	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Control points
AS-PROP	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Property
AS-TINN	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Triangulated irregular network

AS-TOPO	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Topography
C-SITE	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site
C-SITE-PKNG	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Parking symbols
C-SITE-UTIL	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site utilities
C-SITE-VHCL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Vehicles
C-STRM	ON	THAW	OFF	150	Continuous	.25	150	ON	THAW	Drainage
DEPOINTS	ON	THAW	OFF	white	Continuous	Default	7	OFF	THAW	Default Non-Plotting Layer
E-ELEC	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Electrical
E-ELEC-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Electrical tags
E-ELEC-SWCH	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Electrical switches
E-LITE-CLNG	ON	THAW	OFF	33	Continuous	.35	33	ON	THAW	Ceiling lights
E-LITE-WALL	ON	THAW	OFF	53	Continuous	.35	53	ON	THAW	Wall lights
E-PATT	ON	THAW	OFF	134	Continuous	.18	134	ON	THAW	Electrical hatching
E-POWR-DEMO	ON	THAW	OFF	230	Continuous	.35	134	ON	THAW	Electrical demolition
E-POWR-EXST	ON	THAW	OFF	62	Continuous	.25	134	ON	THAW	Electrical existing
E-POWR-NEW	ON	THAW	OFF	210	Continuous	.35	134	ON	THAW	Electrical new
E-WALL-POWR	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Electrical power
G-ANNO-MASK	ON	THAW	OFF	170	Continuous	.18	170	ON	THAW	AEC Masking objects
G-ANNO-MATC	ON	THAW	OFF	214	Continuous	.70	214	ON	THAW	Match lines
G-ANNO-NPLT	ON	THAW	OFF	140	Continuous	.18	140	OFF	THAW	Sheet view viewports
G-ANNO-TITL	ON	THAW	OFF	233	Continuous	.35	233	ON	THAW	Drawing title text
G-ANNO-TITL-SCAL	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Graphical scales
G-ANNO-TTLB	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Border and title block
G-ANNO-VIEW	ON	THAW	OFF	161	Continuous	.18	161	OFF	THAW	G-Anno-View
G-GRID-NPLT	ON	THAW	OFF	200	DASHED2	.18	200	ON	THAW	Layout grids
I-FURN	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Furniture
I-FURN-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Furniture tags
M-PATT	ON	THAW	OFF	134	Continuous	.18	211	ON	THAW	Mechanical hatching
M-DUCT-DEMO	ON	THAW	OFF	240	Continuous	.35	211	ON	THAW	Mechanical demolition
M-DUCT-EXST	ON	THAW	OFF	51	Continuous	.25	211	ON	THAW	Mechanical existing
M-DUCT-NEW	ON	THAW	OFF	80	Continuous	.35	211	ON	THAW	Mechanical new
P-FLOR-FIXT	ON	THAW	OFF	131	Continuous	.20	131	ON	THAW	Plumbing fixtures
P-FLOR-FIXT-IDEN	ON	THAW	OFF	231	Continuous	.20	231	ON	THAW	Plumbing fixture tags
P-FLOR-SPCL	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Plumbing specialties
P-PATT	ON	THAW	OFF	134	Continuous	.18	90	ON	THAW	Plumbing hatching
P-PIPE-DEMO	ON	THAW	OFF	191	Continuous	.35	90	ON	THAW	Plumbing demolition
P-PIPE-EXST	ON	THAW	OFF	32	Continuous	.25	90	ON	THAW	Plumbing existing
P-PIPE-NEW	ON	THAW	OFF	130	Continuous	.35	90	ON	THAW	Plumbing new
S-BEAM	ON	THAW	OFF	240	Continuous	.20	240	ON	THAW	Structural beams

S-BEAM-IDEN	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Structural beam tags
S-COLS	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Columns
S-COLS-BRCE	ON	THAW	OFF	32	DASHED	.70	32	ON	THAW	Structural braces
S-COLS-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Structural column tags
S-GRID	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Column grids
S-GRID-IDEN	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Plan grid bubbles
T-COMM	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Communications
T-CTRL	ON	THAW	OFF	230	Continuous	.18	230	ON	THAW	Control systems

Note: Other layers may be added as required. Refer to the complete National Cad Standard (NCS) for appropriate layer names. When adding layers, select a color number above 30 and set the appropriate line weight.

Plotting

Starting with AutoCAD Architecture 2010, drawings will be plotted using the Plot Style Table “MSU 1-30 AIA 31-255 LWT by Object”. This plot style uses legacy line weights by color for colors 1 through 30 (see Table 5). Colors 31 through 249 will plot black at the line weight of the object (usually specified in the layer properties). Colors 250 (60%), 251 (50%), 252 (40%), 253 (30%), 254 (20%) will plot black at the screening level indicated.

In order to plot in color, a layer color must be selected from the True Color or Color Books tab in the Layer Properties Manager.

Table 5 – Legacy Line Weights			
Color Number	Color Name	Line Weight (mm)	Screening
1	Red	.45	100%
2	Yellow	.25	100%
3	Green	.60	100%
4	Cyan	.70	100%
5	Blue	.50	100%
6	Magenta	.35	100%
7	Black (White)	.80	100%
8	Gray	.40	100%
9	White (Black)	.15	100%
10	-	.13	100%
11	-	.025	100%
12	-	.09	100%
13	-	.13	10%
14	-	.05	100%
15	-	.025	100%
16	-	.05	100%
17	-	.25	100%
18	-	.25	100%
19	-	.25	100%
20	-	.05	20%
21	-	.25	100%
22	-	.025	100%
23	-	.25	100%
24	-	.25	100%
25	-	.25	100%
26	-	.25	100%
27	-	.25	100%
28	-	.25	100%
29	-	.25	100%
30	-	.25	30%

Plans Providing Survey Information

All surveys drawings will be prepared using the spatial reference, *Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic*. The National Geodetic Survey publishes NAD 83 coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m.

Raw data collected during surveys will be provided to MSU upon request.

MSU Utility Information

Upon request, MSU may provide the Consultant with the most currently available utility drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

It is the responsibility of the Consultant to confirm all utility information.

Prior to digging on the MSU campus, contact the MSU Facilities Work Control at 406-994-2107. Work Control will coordinate the locate with the MSU Utility Protection Coordinator (406-994-7301).

Locates on the MSU campus are not free. Be able to provide a billing number with the locate request.

Give (3) working days notice.

Provide a map of the area and / or mark the area with white paint or flags (on top of snow, use pink paint or flags).

Consultants will document the location of underground utility features before they are covered up. This information will be provided in the as-built drawing set at project closeout.

Published by:

**Facilities Planning, Design & Construction
Plew Physical Plant
6th Avenue and Grant Street
Bozeman, MT 59717-2760**

To make additions or corrections:

**CADD Technician
406-994-7089**

Information contained in this manual is based in part from:

**United States National CAD Standard - Version 4.0
National Institute of Building Sciences 1999-2007
1090 Vermont Avenue, NW, Suite 700
Washington, DC 20005-4905**

A1.8-1 **CAD Quality Assurance Checklist** (submitted by consultant)

Any and All CAD drawings delivered either upon closeout any project or interim submittals must be accompanied by submission of the following checklist. When a checklist has been signed and submitted, the vendor (architect, engineer, contractor, etc.) is assuring that all materials adhere to the standards and guidelines set forth in this document.

1.1 FILE FORMAT AND SETUP

- Electronic File Format
- Scale, Units, & Tolerances
- Fonts and Text Styles
- Blocks
- Title Blocks
- Policy on Model Space and Paper Space
- One CAD file per plot (Paper space tab)
- Policy on External Reference Files (XREFs)
- Policy on Notes
- Plot Files

1.2 LAYERING

- CAD Standards/Layering Compliance
- Standard Layer List
- Layer Name Formatting
- General Rules about Naming and Uses
- Layer Attributes (Lineweights, Colors, Linetypes)

1.3 CAD & SCANNED FILE NAME CONVENTIONS

- Building and Floor Identification Codes
- Discipline Identification Codes
- Drawing Type Codes
- Drawing Numbers

1.4 POLICY ON CAD FILE FORMAT

- Full AutoCAD Standards Compliance

1.5 POLICY ON SCANNED FILE TRANSLATION

- The scans shall be preferably in .PDF format, where legally permissible
- If PDF not available the scan shall be no less than a .tif format with 400dpi, where legally permissible
- Files must be uncompressed

1.6 POLICY TRANSMITTAL / METADATA

- Transmittal contains all required information

CAD Drawings Acceptance, Quality Control and Assurance Checklist (MSU use)

Failure to meet requirements will result in refusal of drawings

Project:

Date:

Checked by:

CAD File Library Audit	Yes	No
<i>Please check the appropriate field</i>		
Is a FILE DESCRIPTION INDEX present on the transfer media?		
Does the FILE DESCRIPTION INDEX describe and match the file directory and subdirectory structure on the transfer media?		
Does the FILE DESCRIPTION INDEX describe and match the file structure for each subdirectory on the transfer media?		

Background Architectural Drawing Visual Audit	PASS	FAIL	COMMENTS
Doors			
Windows			
Exterior Walls			
Interior Walls			
Columns			
Ramp/Stairs			
Bathrooms			
Fixtures			
Closets (Comm/Data)			
Montana State University Approved Room Numbers			

OVERAL CAD AUDIT	PASS	FAIL	COMMENTS
External Reference Structure			
Accuracy of Measurements			
Drawing Orientation UCS			
Drawing Orientation WCS			
Scale / Units			
Layering			
Fonts			
Polylines (Closed)			

Data is Accepted	Yes	No

APPENDIX 1.8-2 Record Document Requirements

Project Record Documents The Contractor shall maintain at the site two construction reference sets of all specifications, drawings, approved shop drawings, change orders and other modifications, addenda, schedules and instructions, in good order.

The record drawings shall be two sets of the drawings on which the contractor must record all “red line” changes during the course of construction and will include references to change order numbers, field directives, etc., and their dates,. This record set shall be maintained separate and apart from documents used for construction reference. This set will be available for review by the Design Consultant and the Project Manager at all times.

All as-built conditions shall be kept current and the Contractor shall not permanently conceal or cover any work until all required information has been recorded. The Design Consultant shall review the record drawings at each regular construction meeting to determine if the Contractor is recording the as-built conditions as they occur.

All survey and exterior underground utilities shall be recorded using the spatial reference, *Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic*. The National Geodetic Survey publishes NAD 83 coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m. coordinate system.

In marking any as-built conditions, the Contractor shall ensure that such drawings indicate by measured dimension to building corners or other permanent monuments the exact locations of all piping, conduit or utilities concealed in concrete slabs, behind walls or ceilings or underground. Record drawings shall be made to scale and shall also include exact locations of valves, pull boxes and similar items as required for maintenance or repair service.

As-Built Documentation Prior to final completion and as a condition of final payment, the project consultant, architect or engineer shall be responsible for providing MSU with the items listed below:

- (1) A fully complete and accurate set of all As-Built drawings in the current version of AutoCAD. These drawings shall reflect all “red line” information recorded in the course of construction. Accepted alternates shall be shown and those not accepted shall be deleted from the As-Built drawing set. The complete drawing revision history shall be documented. All Xref information shall be bound to each As-Built drawing.
- (2) If a building information modeling (BIM) program is used to create the project drawings, that BIM model will be provided to MSU.
- (3) A complete plot set of the As-Built drawings shall be provided in portable document format (PDF). The PDF set shall be created at the same document size required for the construction documents (MSU standard is for architectural D size, 24” x 36”, unless otherwise approved). In addition, three paper As-Built drawings sets shall be provided at that same size.
- (4) The complete set of project specifications in PDF and Microsoft Word formats. In addition, three paper sets shall be provided bound in three ring binders.
- (5) A fully complete and accurate set of O&M manuals for the project in PDF format. In addition, three paper sets shall be provided bound in three ring binders.
- (6) A completed Microsoft Excel spreadsheet (format provided by MSU) with project warranty information.
- (7) A completed Microsoft Excel spreadsheet (format provided by MSU) with project room finish information.
- (8) A paper color copy and PDF scan of the contractor’s “red-lined” record documents.

All electronic format documents shall be provided on Microsoft Windows compatible CD or DVD media.

All electronic format documents shall be provided to MSU without any form of copy protection.

All items shall be provided to MSU not more than 60 days after the date of final acceptance.

MSU Facilities Room Numbering Standards
Modified Floor Level Designation Section 3 - 9/23/09

- **Draft Rules from February 8, 2008 meeting- JB, VCD, WB, GG**
- **Modified Draft document presented - March 20, 2008**
- **Agreed to this set of Rules on April 8, 2008**
- **Applied Rules to Hosaeus Fitness Center, SUB, ABB, Gaines, and Cooley projects, approved by JB. An exception was applied to Hamilton, approved by WB.**
- **Added loading dock and accessible single corridor exception – October 21, 2008**

The purpose of this document is to establish a uniform system of numbering rooms and other spaces in university facilities. Numbering standards ensure continuity within the buildings and helps maintain the integrity of campus facilities management. The numbering standards will coincide with campus signage designed to facilitate visitors, occupants, maintenance, and emergency responders.

This numbering document reflects industry standards. It is not intended to be static or inclusive and will be updated periodically. The numbering scheme is logical, flexible, comprehensible, and compliments a signage or wayfinding system, which together provides clear and obvious flow for all occupants, visitors, and service providers.

MSU's customized room numbering system incorporates institutional standards, peer university practices, and nationally-accepted methodology and adds value to the facilities because it:

- Facilitates pedestrian movement in a logical and customary flow
- Allows flexibility for future building adaptations or renovations
- Eliminates arbitrary room number assignments
- Establishes a facility-to-facility consistency for efficient building management and control
- Connects room numbering standards to signage that guides people to their destinations
- Improves database information using room number codification that clarifies space use with number
- Establishes continuity with uniform room numbering throughout campus

The following are numbering standards:

1. General

MSU requires that all building interior space, assignable and non-assignable, has an identification number.

Major renovation, additions and new construction are required to use the MSU room numbering standards. Minor renovations or additions to an existing building may continue to use existing room numbering system.

2. Building Numbering

MSU uses a building numbering scheme that incorporates up to a four digit number followed by up to a two-digit alpha suffix.

MSU does not have a centralized numbering system therefore entities within MSU and the MUS may use a different identification numbers for the same buildings. It would require coordination and cooperation to consolidate all users systems and data to adopt a unified system of capital identification.

3. Floor Level Designation- Identification of Floors and Levels

The first floor is identified as the location of the major pedestrian entrance level and should be at the same level as the outside grade or the lower level of a split-level entry. Each floor of a building is designated with a two character (not digit) floor level code. The first floor is entered as “space 1”; the second floor as “space 2”; the tenth floor as “10”, etc. Below the first floor, the basement is identified as B1, sub-basements are B2, etc.

4. Room Numbering

The basic room number consists of four digits. The first two digits identify the floor and the last two identify the room in sequence from 1-99 on that floor.

5. Use of Alphabetic Suffixes for Rooms Accessed via other Rooms (Suites)

Unlike rooms accessed from main corridors, those rooms that are accessed from other rooms (referred to as suites) are identified with a letter suffix. Example: 0301A, 0301B, 0301C, and 0301D. Suite offices shall follow the same counterclockwise direction when possible.

6. Applied Room Numbers

In a building with only one dividing corridor, the room numbers should follow in an ascending order from one end of the building to the other in a counter clockwise direction.

7. Direction and Progression

Room numbering should reflect a general location within the facility, one that relates to circulation elements and is consistent from floor to floor.

The location of the main entrances, secondary entrances, interior stairs, and elevators are the keys to pedestrian movement. Orientation through the building should maintain the same sense of direction (begin to the right) and continue counter clockwise in a sequential order (ascending) and alternate odd numbers on the right and corresponding even numbers on the left.

Single corridor: In a building with only one dividing corridor, the numbers should flow in an ascending order, beginning counter clockwise from the main entrance, and shall alternate odd and even room numbers down the corridor from one end of the building to the other resulting in a corridor with all odd numbers on one side and even numbers on the other.

Exceptions can be made for existing buildings that have been adapted for reuse and the original or historic main entrance is no longer functioning as the most used entrance and/or the ADA accessible entrance (e.g. Hamilton Hall). Direction and progression standards will apply to the accessible entrance.

Race track corridor: In a “race track” or looped corridor design, the numbering continues the same as a single corridor (begin at the entrance with the lowest number and ascend around the loop alternating odd and even and back to the entrance). If the race track corridor connects to another set of rooms – the numbering is split at the entrance with odd ascending on the right and even numbers ascending on the left.

8. Numbering Gaps

Sufficient room numbers shall be reserved to allow large spaces to be divided into smaller spaces. Room numbers will be skipped for large square footage spaces such as lecture, classrooms, or meeting rooms over 500 sq feet. This is to allow for adaptive reuse in the future that renovated large spaces into multiple smaller spaces that require room numbers. Gaps keep the room numbers corresponding (odd and even) as the numbers ascend.

9. Stacking Numbers (continuity per floor throughout the building)

Numbering systems on all floors should be similar. To the greatest extent possible, rooms with the same digits in the last position should be located in the same vertical stack in the building.

10. Unique Numbers - Each Room Should Have Only One Number.

Each room or space in a facility must have a unique number identification. Each room should have only one room number regardless of the number of doors opening into it from the main corridor.

11. Numbering Mechanical and Service Spaces

Rooms that contain mechanical equipment and accessed from a corridor are included in the sequence of room numbers and will have a two-digit alpha suffix that identifies the space (Ex. 123 EL). The door signage may include the room number and the room use or just the room use. The plans will reflect the room number and the room use.

Service rooms (e.g. restrooms) that are accessed from a corridor are included in the sequence of room numbers and will have a two-digit alpha suffix that identifies the space

(Ex. 1330 RR). The door signage will only include the room use; the plans will include both room number and room use.

CU - custodial/housekeeping/janitorial

ME - mechanical

PC - plumbing chase

RR - restroom

EL – electrical

CH - chase

TR – telecommunications

TU – tunnel

GR – garbage/trash collection room/recycling

LD – loading dock

LR – laundry room

XR – exterior Rooms (non-assignable rooms only accessible from the outside of a building)

12. Numbering Circulation Spaces

Circulation spaces (e.g. corridors, stairways, elevators) are non-assignable space that requires number identification. Circulation spaces, like Mechanical and Service, include a two-digit alpha identifier for the type of circulation space. All circulation spaces follow the same room numbering rules – with the exception that the space numbers begin with “99” and descend in order for each circulation type – so that corridors start with 99, lobbies start with 99, etc. for every floor.

CO - corridor

LB - lobby

CM - commons

VE - vestibule

Unlike corridors and lobbies, elevators and stairways require posted signage. Elevators and stairways are vertically connected space. Signage refers to the entire stairs and elevator as a vertical circulation unit. In addition to the “99” circulation space number rule (which identify the floor) and the stacking element, staircases and elevators use the two-digit alpha-numeric suffix to identify the space and the number in the building (Ex. “199 S1” is the first stairs in the circulation system located on the first floor and the sign at the stair entrance will be “Stairway 1.” The suffix for elevators is “E” – and the numbering order is counter clockwise sequence of stairs in the building; the same rules apply to elevators. The signage, database, and plans will have the same complete information. Ex. 199S1, 99S1, 699S1 are different levels of the S1 stair.

S1, S2, S3, S4, S5, S6, S7, S8, S9, S0 - Stairways

E1, E2, E3, E4, E5, E6, E7, E8, E9, E0 - Elevators

13. Penthouse Spaces

Penthouse spaces following the same room numbering rules for mechanical spaces.

14. Schedule

At the end of Schematic Design, all rooms and other spaces in facilities shall be numbered in accordance with the guidelines. In an extraordinary situation only, an alternative numbering scheme may be approved with sufficient justification.

15. Authority

All room numbering controversies are resolved by Campus Planning, Design & Construction.

P:\Room Numbering Standard\MSU room numbering april 8 08.doc

Note: This document is available on the MSU Facilities Planning Design & Construction website at:
<http://www.montana.edu/us/pdc/arch/caddstandards.php>



Computer Aided Drawing (CAD) Standard

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Montana State University Computer Aided Drawing (CAD) Standard

Ownership

Montana State University (MSU) shall at all times have sole ownership of all drawings, documents and specifications, electronic or otherwise, produced by any Consultant or Contractor, intended for use in connection with a project (reference the current *Standard Form of Agreement Between Owner and Architect / Engineer*, paragraph 1.10, Ownership of Documents).

Use of MSU CAD Plans

Upon request, MSU may provide the Consultant with the most currently available drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

The Consultant is solely responsible for verifying that drawings provided do not contain errors that might compromise a project. Field verification of existing conditions is always recommended.

Model Space

All building information is to be drawn in model space at 1:1 scale (actual size). Plan views of buildings will be made with north up.

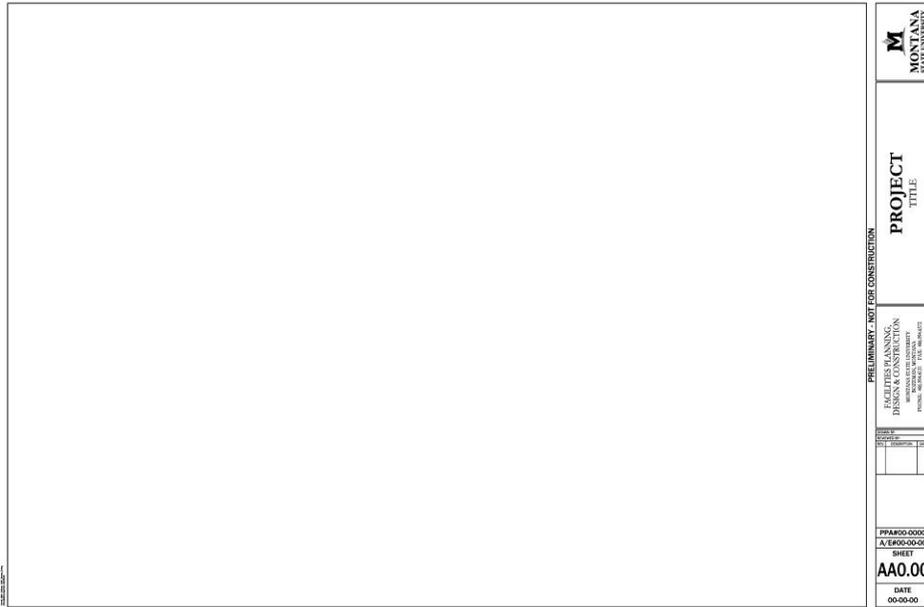
Paper Space

All drawing borders / title blocks are to be in paper space (Layout View). Drawings in paper space will be oriented for the most effective use of media space. It is recommended that the long axis of the drawing be aligned with the long axis of the plotting media. Assure that the north arrow is present and that it is oriented to true north.

In the absence of a long axis that would dictate orientation on the media, orient the drawing with north at the top of the page.

Drawing Border

Montana State University Facilities provides a standard border / title block that will be used on all Montana State University drawings. The border and associated text will not be altered, except that the Architect / Engineer may add their logo and stamp to the border as required.



An Architectural “D” (MSU_Border_D) or “E” (MSU_Border_E) size standard border / title block will be used for most drawing projects (“D” size recommended for most projects).

An 8-1/2” x 11” (MSU_Border_A) and 11” x 17” (MSU_Border_B) size standard border / title block are provided for special projects only.

The following Table 1 shows the font types and sizes of text for the Architectural “D” standard border / title block.

Table 1 – Architectural D Standard Border / Title Block			
Border / Title Block Area	Font	Height	Rotation
PROJECT	Garamond Bold	7/16”	90°
TITLE	Garamond	1/4”	90°
SHEET	Franklin Gothic Medium w/.8 width factor	1/2”	0°
PRLIMINARY - NOT FOR CONSTRUCTION	Franklin Gothic Medium	7/32”	90°
FACILITIES PLANNING, DESIGN & CONSTRUCTION	Garamond	7/32”	90°
MONTANA STATE UNIVERSITY, BOZEMAN, MT	Garamond	1/8”	90°
DRAWN BY, REVIEWED BY, REV., DESCRIPTION, DATE	Franklin Gothic Book	3/32”	0°
PPA NUMBER	Franklin Gothic Medium	3/16”	0°
A/E NUMBER	Franklin Gothic Medium	3/16”	0°
DATE	Franklin Gothic Medium	3/16”	0°

Drawing Title

The drawing title will reflect the project name used in the log, PPA or State A / E project file.

Electronic Drawing Name

The electronic name of the drawing file will consist of the following:

XXXXXXXXXX_AAN_NN

The project code. For example the log number, PPA number or State A&E number of the project

XXXXXXXXXX_AAN_NN

The sheet number as defined in this document. As an example, sheet A1.01 in PPA project 08-0018, would have the electronic drawing name 08-0018_A1_01.dwg.

Sheet Number

The drawing will use a six character alpha-numeric sheet number as defined in the following sections.

Discipline Designator

AAN_NN

The discipline designator, which consists of one alphabetical character and a hyphen (Level 1 Designator) or two alphabetical characters (Level 2 Designator). The discipline designator will be chosen from the following table:

Level 1 Designator	Level 2 Designator	Description	Content
G-		All General	All or any portion of subjects in the following Level 2 Designators
	GI	General Information	Drawing index, code summary, symbol legend, orientation maps
	GC	General Contractual	Phasing, schedules, contractor staging areas, fencing, haul routes, erosion control, temporary and special requirements
	GR	General Resource	Photographs, soil borings
H-		All Hazardous Materials	All or any portion of subjects in the following Level 2 Designators

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	HA	Asbestos	Asbestos abatement, identification, or containment
	HC	Chemicals	Toxic chemicals handling, removal or storage
	HL	Lead	Lead piping or paint removal
	HP	PCB	PCB containment and removal
	HR	Refrigerants	Ozone depleting refrigerants
V-		All Survey / Mapping	All or any portion of subjects in the following Level 2 Designators
	VA	Aerial Survey	
	VF	Field Survey	
	VH	Hydrographic Survey	
	VI	Digital Survey	
	VU	Combined Utilities	
B-		All Geotechnical	
C-		All Civil	All or any portion of subjects in the following Level 2 Designators
	CB	Civil Beach Renourishment	Beach disposal and renourishment
	CD	Civil Demolition	Structural removal and site clearing
	CE	Civil Ecosystem Restoration	Environmental restoration
	CF	Civil Flood Control	Levees, spillways, pump stations
	CG	Civil Grading	Excavation, grading, drainage, erosion control, retention ponds
	CI	Civil Improvements	Pavers, flagstone, exterior tile, furnishings, retaining walls, and water features
	CN	Civil Navigation	Navigation, harbors, dredging
	CO	Civil Operation and Maintenance	Repair and upgrade to O&M structures
	CP	Civil Paving	Roads, driveways, parking lots
	CH	Civil Shore Protection	Erosion protection structures on shoreline
	CR	Civil Recreation	Recreation facilities
	CS	Civil Site	Plats, topographic, dimension control
	CX	Civil Security	Security related work
	CT	Civil Transportation	Waterways, wharves, docks, trams, railways, airfields and people movers
	CU	Civil Utilities	Water, sanitary sewer, storm sewer, power, communications, natural gas and steam systems
L-		All Landscape	All or any portion of subjects in the following Level 2 Designators
	LD	Landscape Demolition	Protection and removal of existing landscape
	LI	Landscape Irrigation	
	LP	Landscape Planting	
A-		All Architectural	All or any portion of subjects in the following Level 2 Designators
	AS	Architectural Site	
	AD	Architectural Demolition	Protection and removal
	AE	Architectural Elements	General architectural
	AI	Architectural Interiors	

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	AF	Architectural Finishes	
	AG	Architectural Graphics	
S-		All Structural	All or any portion of subjects in the following Level 2 Designators
	SD	Structural Demolition	Protection and removal
	SS	Structural Site	
	SB	Structural Substructure	Foundations, piers, slabs and retaining walls
	SF	Structural Framing	Floors and roofs
I-		All Interiors	All or any portion of subjects in the following Level 2 Designators
	ID	Interior Demolition	
	IN	Interior Design	
	IF	Interior Furnishings	
	IG	Interior Graphics	Murals and visuals
Q-		All Equipment	All or any portion of subjects in the following Level 2 Designators
	QA	Athletic Equipment	Gymnasium, exercise, aquatic and recreational
	QB	Bank Equipment	Vaults, letter units, ATMs, drive-through
	QC	Dry Cleaning Equipment	Washers, dryers, ironing and dry cleaning
	QD	Detention Equipment	Prisons and jails
	QE	Educational Equipment	Chalkboards, library
	QF	Food Service Equipment	Kitchen, bar, service, storage and processing
	QH	Hospital Equipment	Medical, exam and treatment
	QL	Laboratory Equipment	Science labs, planetariums, observatories
	QM	Maintenance Equipment	Housekeeping, window washing and vehicle servicing
	QP	Parking Lot Equipment	Gates, ticket and card access
	QR	Retail Equipment	Display, vending and cash register
	QS	Site Equipment	Bicycle racks, benches, playgrounds
	QT	Theatrical Equipment	Stage, movie, rigging systems
	QV	Video / Photographic Equipment	Television, darkroom and studio
	QY	Security Equipment	Access control and monitoring, surveillance
F-		All Fire Protection	All or any portion of subjects in the following Level 2 Designators
	FA	Fire Detection and Alarm	
	FX	Fire Suppression	Fire extinguishing systems and equipment
P-		All Plumbing	All or any portion of subjects in the following Level 2 Designators
	PS	Plumbing Site	Extensions and connections to civil utilities
	PD	Plumbing Demolition	Protection, termination and removal
	PP	Plumbing Piping	Piping, valves and insulation
	PQ	Plumbing Equipment	Pumps and tanks

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	PL	Plumbing	Domestic water, sanitary and storm drainage, fixtures
D-		All Process	All or any portion of subjects in the following Level 2 Designators
	DS	Process Site	Extension and connection to civil utilities
	DD	Process Demolition	Protection, termination and removal
	DL	Process Liquids	Liquid process systems
	DG	Process Gases	Gaseous process systems
	DP	Process Piping	Piping, valves, insulation, tanks, pumps, etc.
	DQ	Process Equipment	Systems and equipment for thermal, electrical, materials handling, assembly and manufacturing, nuclear, power generation, chemical, refrigeration and industrial processes
	DE	Process Electrical	Electrical exclusively associated with a process and not the facility
	DI	Process Instrumentation	Instrumentation, measurement, recorders, devices and controllers (electrical and mechanical)
M-		All Mechanical	All or any portion of subjects in the following Level 2 Designators
	MS	Mechanical Site	Utility tunnels and piping between facilities
	MD	Mechanical Demolition	Protection, termination and removal
	MH	Mechanical HVAC	Ductwork, air devices and equipment
	MP	Mechanical Piping	Chilled and heating water, steam
	MI	Mechanical Instrumentation	Instrumentation and controls
	MY	Mechanical Hydraulic Systems	Pump stations, spillways, slide gates
E-		All Electrical	All or any portion of subjects in the following Level 2 Designators
	EA	Electrical Airfield Lighting and Nav aids	Visual air navigation systems
	ES	Electrical Site	Exterior electrical systems (power, lighting, auxiliary)
	EC	Electrical Cathodic Protection	Cathodic protection systems
	EG	Electrical Grounding	Grounding, lightning protection devices
	ED	Electrical Demolition	Protection, termination and removal
	EP	Electrical Interior Power	Interior power
	EL	Electrical Interior Lighting	Interior lighting
	EI	Electrical Instrumentation	Controls, relays, instrumentation and measurement devices
	EY	Electrical Interior Auxiliary Systems	Alarms, nurse call, security, CCTV, PA, music, clock and program
T-		All Telecommunications	All or any portion of subjects in the following Level 2 Designators
	TD	Telecommunications Demolition	Protection, termination and removal
	TA	Audio Visual	Cable, music and CCTV systems
	TC	Clock and Program	Time generators and bell program systems
	TI	Intercom	Intercom and public address systems

Level 1 Designator	Level 2 Designator	Description	Content
	TM	Monitoring	Monitoring and alarm systems
	TN	Data Networks	Network cabling and equipment
	TS	SCADA	Supervisory Control and Data Acquisition (SCADA) systems and equipment
	TT	Telephone	Telephone systems, wiring and equipment
	TY	Security	Access control and alarm systems
R-		All Resource	All or any portion of subjects in the following Level 2 Designators
	RC	Resource Civil	Surveyor's information and existing civil drawings
	RS	Resource Structural	Existing facility structural drawings
	RA	Resource Architectural	Existing facility architectural drawings
	RM	Resource Mechanical	Existing facility mechanical drawings
	RE	Resource Electrical	Existing facility electrical drawings
X-		Other Disciplines	
Z-		Contractor / Shop Drawings	
O-		Operations	

Sheet Type Designators

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The sheet type designator, which consists of one numerical character. The sheet type designator will be chosen from the following table:

Sheet Type	Designator
General (symbols, legend, notes, etc.)	0
Plans (horizontal views)	1
Elevations (vertical views)	2
Sections (sectional views)	3
Large-Scale Views (plans, elevations, or sections that are not details)	4
Details	5
Schedules and Diagrams	6
User Defined	7
User Defined	8
3D Representations (isometrics, perspectives, photographs)	9

Sheet Sequence Number

AAN_**NN**

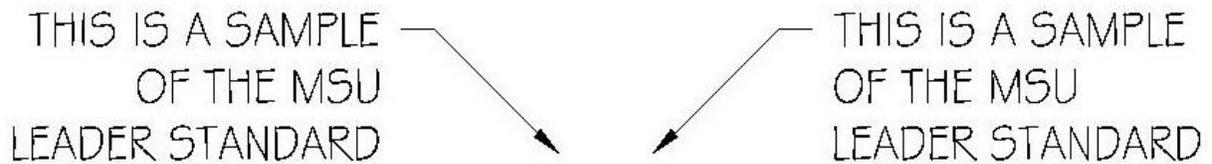
The sheet sequence number, consisting of one to two numerical characters.

Dimensioning

Dimensions will use the standard AutoCAD "Stylus BT" font, and print with 3/32" text size in paper space. The following are standards for MSU dimensioning:

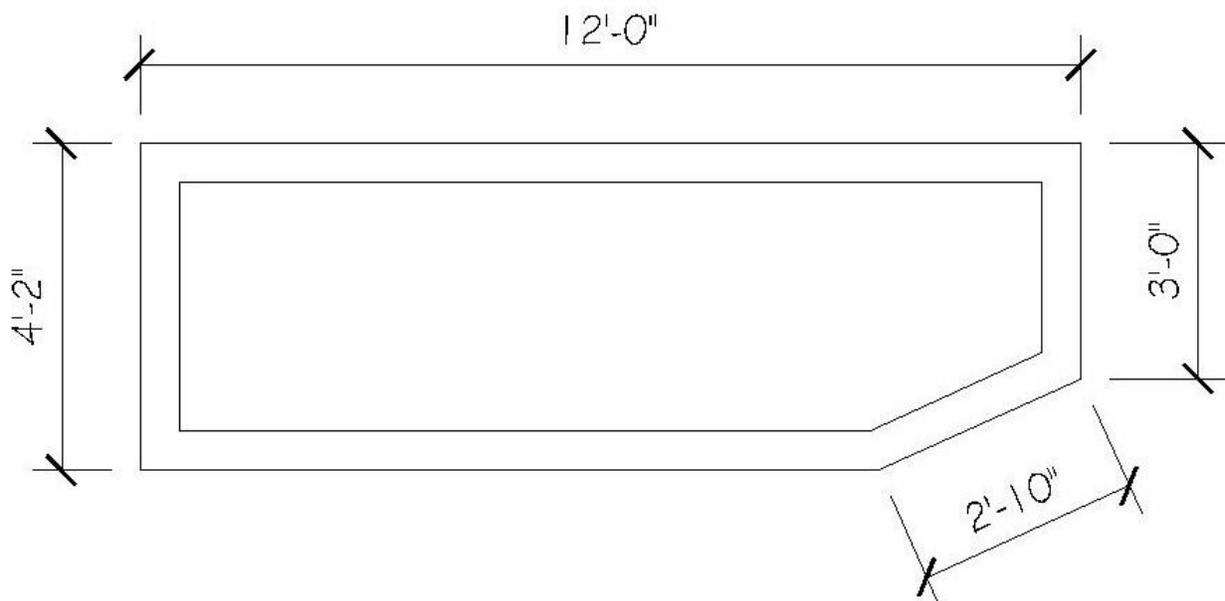
Leaders

Leaders will use the arrow style "closed filled arrow" aligned with the middle of the top line of text. Use the quick leader (qlleader) command to insert leaders.



Dimensions

Dimensions will use the arrow style "architectural tick". Text will be printed above the dimension line.

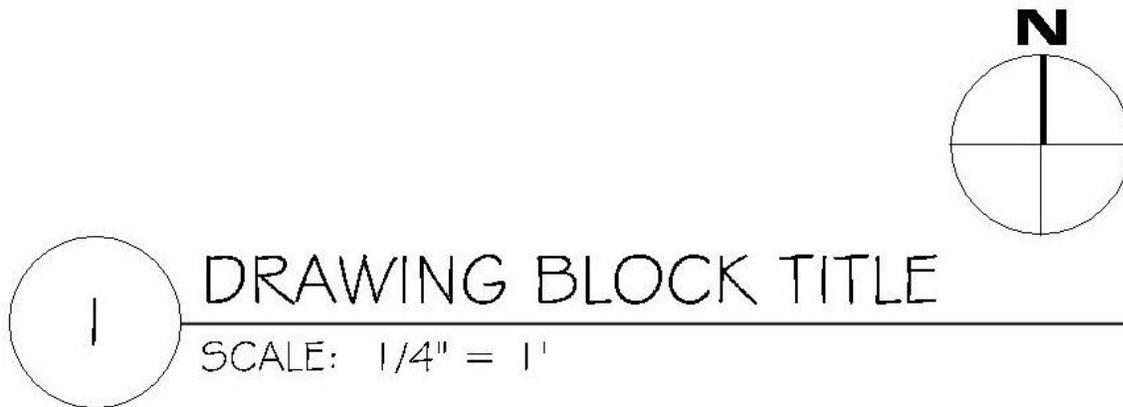


North Arrow

Drawings will use the standard AutoCAD “North Arrow M” to indicate true north.

Drawing Title Block

Drawings will use the standard AutoCAD “Title Mark”.



Room Numbers

Room numbers for current buildings shall be provided by the MSU CADD technician.

Room numbers for new buildings shall be based on the MSU Room Numbering Standard. This document can be found on the MSU Facilities Planning web site at:

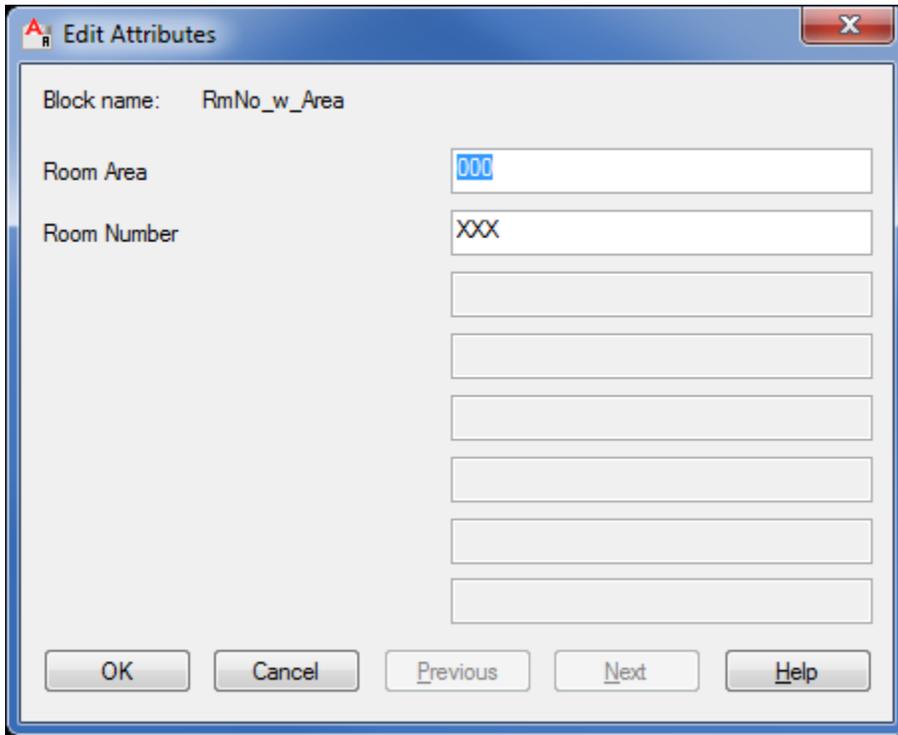
<http://www.facilities.montana.edu/pdc/planning/files/MSURoomNumberingStandard.pdf>

Building room numbers will be added using a standard block like the MSU block RmNo_w_Area. The room number block will be drawn in the A-Area-Iden drawing layer.



The room number block will have extractable attributes that include the room area and room number.

Room area will be calculated using a polyline drawn in the A-Area-Line drawing layer. The polyline will reflect the floor area of the room and extend half way through door openings.



Layers

The following table (Table 4) shows the recommended layers to be used for MSU drawings:

Table 4 – MSU Drawing Layers

Name	On	Freeze	Lock	Color	Linetype	Width (mm)	Plot Style	Plot	New VP Freeze	Description
0	ON	THAW	OFF	white	Continuous	Default	7	ON	THAW	0
A-ANNO-DIMS	ON	THAW	OFF	213	Continuous	.25	213	ON	THAW	Dimensions
A-ANNO-LEGN	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Display theme legends
A-ANNO-NOTE	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Notes, leaders, etc.
A-ANNO-REVS	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Revisions
A-ANNO-SCHD	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Schedule tables
A-ANNO-SCRN	ON	THAW	OFF	250	Continuous	.25	250	ON	THAW	A-Anno-Scrn
A-ANNO-SYMB	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Annotation marks
A-ANNO-TEXT	ON	THAW	OFF	50	Continuous	.30	50	ON	THAW	A-Anno-Text
A-AREA-IDEN	ON	THAW	OFF	171	Continuous	.30	171	ON	THAW	Room numbers, tenant identifications, area calculations
A-AREA-LINE	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Room area polyline
A-AREA-LINE-GROS	ON	FREZ	OFF	60	Continuous	.18	60	ON	FREZ	Building gross area polyline.
A-AREA-LINE-OTBW	ON	FREZ	OFF	80	Continuous	.18	80	ON	FREZ	Open to below area polyline.
A-AREA-MASS	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Massing elements
A-AREA-MASS-GRPS	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Massing groups
A-AREA-MASS-SLCE	ON	THAW	OFF	51	DASHED2	.25	51	ON	THAW	Massing slices
A-AREA-SPACE	ON	THAW	OFF	32	Continuous	.35	32	ON	THAW	Spaces
A-AREA-SPCE-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Space numbers
A-AREA-ZONE	ON	THAW	OFF	34	Continuous	.70	34	ON	THAW	Zones
A-AREA-ZONE-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Zone tags
A-BLDG-OTLN	ON	THAW	OFF	118	Continuous	.20	118	ON	THAW	Building outline
A-CLNG	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Ceiling Objects
A-CLNG-GRID	ON	THAW	OFF	72	Continuous	.35	72	ON	THAW	Ceiling grids
A-CLNG-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Ceiling tags
A-DELT-IDEN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail marks
A-DETL-FINE	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Detail - fine lines
A-DETL-HIDE	ON	THAW	OFF	242	HIDDEN2	.18	242	ON	THAW	Hidden lines
A-DETL-MEDM	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Detail - medium lines
A-DETL-PATT	ON	THAW	OFF	190	Continuous	.18	190	ON	THAW	Detail - hatching
A-DETL-THIN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail - thin lines
A-DETL-WIDE	ON	THAW	OFF	212	Continuous	.35	212	ON	THAW	Detail - wide lines
A-DIMENSION	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Dimensions
A-DOOR	ON	THAW	OFF	31	Continuous	.20	31	ON	THAW	Doors

A-DOOR-IDEN	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Door tags
A-ELEV	ON	THAW	OFF	111	Continuous	.25	111	ON	THAW	Elevations
A-ELEV-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Elevations marks
A-ELEV-LINE	ON	THAW	OFF	141	Continuous	.18	141	ON	THAW	Elevation definition lines
A-ELEV-PEPL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	People
A-EQPM	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment
A-EQPM-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment tags
A-FLOR-APPL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Appliances
A-FLOR-CASE	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Casework
A-FLOR-CASE-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Casework tags
A-FLOR-EVTR	ON	THAW	OFF	172	Continuous	.35	172	ON	THAW	Elevators
A-FLOR-HRAL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Stair handrails
A-FLOR-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Finish tags
A-FLOR-STRS	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Stairs
A-FLOR-TPTN	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Toilet partitions
A-GLAZ	ON	THAW	OFF	151	Continuous	.20	151	ON	THAW	Windows
A-GLAZ-ASSM	ON	THAW	OFF	71	Continuous	.20	71	ON	THAW	Window assemblies
A-GLAZ-CURT	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Curtain walls
A-GLAZ-CURT-UNIT	ON	THAW	OFF	51	Continuous	.25	51	ON	THAW	Curtain wall units
A-GLAZ-IDEN	ON	THAW	OFF	151	Continuous	.35	151	ON	THAW	Window tags
A-LEADER	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Leader lines
A-POLY	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	AEC polygons
A-ROOF	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Rooflines
A-ROOF-LEVL	ON	TAHW	OFF	150	Continuous	.20	150	ON	THAW	Roof level
A-ROOF-SLAB	ON	THAW	OFF	12	Continuous	.35	12	ON	THAW	Roof slabs
A-ROOF-SPCL	ON	THAW	OFF	96	Continuous	.18	96	ON	THAW	Roof specialties
A-SECT	ON	THAW	OFF	73	Continuous	.35	73	ON	THAW	Miscellaneous sections
A-SECT-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Section marks
A-SECT-LINE	ON	THAW	OFF	181	Continuous	.18	181	ON	THAW	Section lines
A-SLAB	ON	THAW	OFF	192	Continuous	.35	192	ON	THAW	Slabs
A-WALL	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls
A-WALL-CHAS	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Chases
A-WALL-FULL-EXTR	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls - exterior
A-WALL-FULL-INTR	ON	THAW	OFF	53	Continuous	.30	53	ON	THAW	Walls - interior
A-WALL-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Wall tags
A-WALL-OPEN	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Wall openings
AS-CTRL	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Control points
AS-PROP	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Property
AS-TINN	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Triangulated irregular network

AS-TOPO	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Topography
C-SITE	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site
C-SITE-PKNG	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Parking symbols
C-SITE-UTIL	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site utilities
C-SITE-VHCL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Vehicles
C-STRM	ON	THAW	OFF	150	Continuous	.25	150	ON	THAW	Drainage
DEPOINTS	ON	THAW	OFF	white	Continuous	Default	7	OFF	THAW	Default Non-Plotting Layer
E-ELEC	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Electrical
E-ELEC-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Electrical tags
E-ELEC-SWCH	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Electrical switches
E-LITE-CLNG	ON	THAW	OFF	33	Continuous	.35	33	ON	THAW	Ceiling lights
E-LITE-WALL	ON	THAW	OFF	53	Continuous	.35	53	ON	THAW	Wall lights
E-PATT	ON	THAW	OFF	134	Continuous	.18	134	ON	THAW	Electrical hatching
E-POWR-DEMO	ON	THAW	OFF	230	Continuous	.35	134	ON	THAW	Electrical demolition
E-POWR-EXST	ON	THAW	OFF	62	Continuous	.25	134	ON	THAW	Electrical existing
E-POWR-NEW	ON	THAW	OFF	210	Continuous	.35	134	ON	THAW	Electrical new
E-WALL-POWR	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Electrical power
G-ANNO-MASK	ON	THAW	OFF	170	Continuous	.18	170	ON	THAW	AEC Masking objects
G-ANNO-MATC	ON	THAW	OFF	214	Continuous	.70	214	ON	THAW	Match lines
G-ANNO-NPLT	ON	THAW	OFF	140	Continuous	.18	140	OFF	THAW	Sheet view viewports
G-ANNO-TITL	ON	THAW	OFF	233	Continuous	.35	233	ON	THAW	Drawing title text
G-ANNO-TITL-SCAL	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Graphical scales
G-ANNO-TTLB	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Border and title block
G-ANNO-VIEW	ON	THAW	OFF	161	Continuous	.18	161	OFF	THAW	G-Anno-View
G-GRID-NPLT	ON	THAW	OFF	200	DASHED2	.18	200	ON	THAW	Layout grids
I-FURN	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Furniture
I-FURN-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Furniture tags
M-PATT	ON	THAW	OFF	134	Continuous	.18	211	ON	THAW	Mechanical hatching
M-DUCT-DEMO	ON	THAW	OFF	240	Continuous	.35	211	ON	THAW	Mechanical demolition
M-DUCT-EXST	ON	THAW	OFF	51	Continuous	.25	211	ON	THAW	Mechanical existing
M-DUCT-NEW	ON	THAW	OFF	80	Continuous	.35	211	ON	THAW	Mechanical new
P-FLOR-FIXT	ON	THAW	OFF	131	Continuous	.20	131	ON	THAW	Plumbing fixtures
P-FLOR-FIXT-IDEN	ON	THAW	OFF	231	Continuous	.20	231	ON	THAW	Plumbing fixture tags
P-FLOR-SPCL	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Plumbing specialties
P-PATT	ON	THAW	OFF	134	Continuous	.18	90	ON	THAW	Plumbing hatching
P-PIPE-DEMO	ON	THAW	OFF	191	Continuous	.35	90	ON	THAW	Plumbing demolition
P-PIPE-EXST	ON	THAW	OFF	32	Continuous	.25	90	ON	THAW	Plumbing existing
P-PIPE-NEW	ON	THAW	OFF	130	Continuous	.35	90	ON	THAW	Plumbing new
S-BEAM	ON	THAW	OFF	240	Continuous	.20	240	ON	THAW	Structural beams

S-BEAM-IDEN	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Structural beam tags
S-COLS	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Columns
S-COLS-BRCE	ON	THAW	OFF	32	DASHED	.70	32	ON	THAW	Structural braces
S-COLS-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Structural column tags
S-GRID	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Column grids
S-GRID-IDEN	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Plan grid bubbles
T-COMM	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Communications
T-CTRL	ON	THAW	OFF	230	Continuous	.18	230	ON	THAW	Control systems

Note: Other layers may be added as required. Refer to the complete National Cad Standard (NCS) for appropriate layer names. When adding layers, select a color number above 30 and set the appropriate line weight.

Plotting

Starting with AutoCAD Architecture 2010, drawings will be plotted using the Plot Style Table “MSU 1-30 AIA 31-255 LWT by Object”. This plot style uses legacy line weights by color for colors 1 through 30 (see Table 5). Colors 31 through 249 will plot black at the line weight of the object (usually specified in the layer properties). Colors 250 (60%), 251 (50%), 252 (40%), 253 (30%), 254 (20%) will plot black at the screening level indicated.

In order to plot in color, a layer color must be selected from the True Color or Color Books tab in the Layer Properties Manager.

Table 5 – Legacy Line Weights			
Color Number	Color Name	Line Weight (mm)	Screening
1	Red	.45	100%
2	Yellow	.25	100%
3	Green	.60	100%
4	Cyan	.70	100%
5	Blue	.50	100%
6	Magenta	.35	100%
7	Black (White)	.80	100%
8	Gray	.40	100%
9	White (Black)	.15	100%
10	-	.13	100%
11	-	.025	100%
12	-	.09	100%
13	-	.13	10%
14	-	.05	100%
15	-	.025	100%
16	-	.05	100%
17	-	.25	100%
18	-	.25	100%
19	-	.25	100%
20	-	.05	20%
21	-	.25	100%
22	-	.025	100%
23	-	.25	100%
24	-	.25	100%
25	-	.25	100%
26	-	.25	100%
27	-	.25	100%
28	-	.25	100%
29	-	.25	100%
30	-	.25	30%

Plans Providing Survey Information

All surveys drawings will be prepared using the spatial reference, *Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic*. The National Geodetic Survey publishes NAD 83 coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m.

Raw data collected during surveys will be provided to MSU upon request.

MSU Utility Information

Upon request, MSU may provide the Consultant with the most currently available utility drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

It is the responsibility of the Consultant to confirm all utility information.

Prior to digging on the MSU campus, contact the MSU Facilities Work Control at 406-994-2107. Work Control will coordinate the locate with the MSU Utility Protection Coordinator (406-994-7301).

Locates on the MSU campus are not free. Be able to provide a billing number with the locate request.

Give three working days notice.

Provide a map of the area and / or mark the area with white paint or flags (on top of snow, use pink paint or flags).

Consultants will document the location of underground utility features before they are covered up. This information will be provided in the As-Built drawing set at project closeout.

Published by:

**Facilities Planning, Design & Construction
Plew Physical Plant
6th Avenue and Grant Street
Bozeman, MT 59717-2760**

To make additions or corrections:

**CADD Technician
406-994-7089**

Information contained in this manual is based in part from:

**United States National CAD Standard - Version 4.0
National Institute of Building Sciences 1999-2007
1090 Vermont Avenue, NW, Suite 700
Washington, DC 20005-4905**

Appendix 1.9-1 - Campus Accessibility Map

The current Campus Accessibility Map can be found at –

<http://www.montana.edu/accessibility/accessibilitymap.pdf>

At this site are not only a campus plan, but accessibility plans for all campus buildings as well.

Appendix 1.9-2 - Campus Standard Assistive Listening System

Montana State University Campus Standard – Assistive Listening Systems

The following system, or approved equal, is to be installed in all new and remodeled classrooms on the MSU campus that have more than 49 seats:

As manufactured by Listen Technologies Corp., Bluffdale, UT:

Fixed installation in rooms containing installed audio systems (including smart carts):

Stationary FM transmitter	LT-800-072
Universal Antenna Kit	LA-122

Portable unit, to be used in rooms without installed audio systems:

Portable Transmitter	LT-700-072
Lavlier Microphone	LA-261
Body Pack Lanyard	LA-330

Receivers for both fixed and portable systems:

FM Receiver	LR-400-072
Single Ear Bud	LA-161
Dual Ear Bud	LA-162
Ear Speaker	LA-164
Neck Loop	LA-166

Note: A minimum number of receivers is to be provided, equal to 4% of the total number of seats in the room, but not less than 2. The Building Supervisor for the building containing the classroom is to designate an individual to be in charge of securing these receivers, keeping batteries charged, keeping units sanitized, and making them available to users of the room as requested.

Note: A full set of each of the above accessory devices need to be provided for 1/2 the total number of receivers, but not less than 2 of each.

Signage:

Standard signage is to be installed within the room, adjacent to each major entry of the room containing the assistive listening system, identifying the system and providing the FM frequency on which the system operates. FPDC will provide the graphics for the standard signage.



ACCESSIBILITY PROGRAM DOCUMENT

Project Name: _____
Location: Montana State University
Prepared by: _____
Distribution: _____

PPA No.: _____
Date: _____

Preface:

The Accessibility Program Document as defined in Montana State University Design Standards, Chapter 1.9 shall serve as a comprehensive tool that both documents existing conditions and gives consideration to design and construction decisions concerning accessible features of project.

For emphasis and clarity of purpose the following excerpt from Chapter 1.9 Accessibility is provided as a preface to Program Document:

Accessibility goals for each project shall be established during the programming or pre-schematic phase of each project. The University's goal for all addition and renovation projects is to provide accessible facilities in areas served by accessible entries and along accessible routes, and to provide those entries and routes whenever feasible as part of the project.

For all projects, new and / or renovation, the Designer in conjunction with the Project Manager and the University Accessibility Consultant, shall meet as required to review all project-specific goals at the programming phase of the project. The result of the meeting(s) shall include the Accessibility Program Document. This document shall serve to identify and coordinate access considerations with adjacent portions of the building(s) and campus. The primary goal of the Accessibility Program Document shall include at a minimum, the following:

Connection of the new or existing building with the existing campus accessible routes and or transportation features. These include but are not limited to the Bobcat Transit and the Campus Accessibility Map. (See Appendix 1.5-1) If applicable, modification of existing entrances to provide accessible ingress Access to Primary Function spaces in the building Access to accessible Toilet facilities in the building Access to all public services in the building Identification of existing non-compliant conditions as related to the Project Program If applicable, workplace considerations as appropriate for the building type If applicable, accommodations for Housing

Montana State University – Accessibility Program Document

(Project name)

Issued:

		Note, Reference, Action	EXTERIOR ACCESSIBLE ROUTES
<p>Connection of the new or existing building with the existing campus accessible routes and or transportation features. These include but are not limited to, and include the Integration of the project to the accessible routes as identified on the Campus Accessibility Map. (Refer also to Appendix 1.9-1):</p>			
A) Connection to Public Rights of Way			
1.01	Existing Condition	The existing connection to:	
	Proposed Design	The new and existing buildings shall have an accessible connection directly to the existing adjacent public Rights of Way:	
	Evaluation Required		
B) Connection to Campus Pedestrian Pathways			
1.02	Existing Condition		
	Proposed Design		
	Evaluation Required		
C) Design / Modification to existing parking areas serving the project			
1.03	Existing Condition		
	Proposed Design		
	Evaluation Required		

Montana State University – Accessibility Program Document

(Project name)

Issued:

		Note, Reference, Action	EXTERIOR ACCESSIBLE ROUTES
D) Connection to building from parking areas serving the project.			
1.04	Existing Condition		
	Proposed Design		
	Evaluation Required		
1.05	Existing Condition		
	Proposed Design		
	Evaluation Required		
E) Connection to Streamline bus system			
1.06	Existing Condition	For any new or renovation project, consideration shall be given as to a route of travel to the Streamline bus system and the location of existing stops on that system.	
	Proposed Design		
	Evaluation Required		
F) Connection of new/renovated building to adjacent buildings			
1.07	Existing Condition		
	Proposed Design		
	Evaluation Required		

Montana State University – Accessibility Program Document

(Project name)

Issued:

		Note, Reference, Action	BUILDING ENTRANCES
For new construction, all primary entrances to the building or project shall be accessible. If applicable, modification of existing Entrance(s) to provide an accessible route into the building should be considered.			
2.01	Existing Condition		
	Proposed Design		
	Evaluation Required		

		Note, Reference, Action	ACCESS TO PRIMARY FUNCTION SPACES
Design approach to building circulation to provide access to Primary Function spaces in the building including vertical circulation.			
3.01	Existing Condition	For new construction portion of project.	
	Proposed Design	All routes of travel to all public site features on the building site, all routes to building entrances and all routes of travel within any new construction shall meet the criteria for accessible routes of travel.	
	Evaluation Required		
3.02	Existing Condition		
	Proposed Design		
	Evaluation Required		

Montana State University – Accessibility Program Document

(Project name)

Issued:

	Note, Reference, Action	ACCESS TO AND USE OF TOILET FACILITIES
		Design approach to building circulation to provide access to and use of Toilet Facilities in the building.
4.01	Existing Condition	
	Proposed Design	
	Evaluation Required	
4.02	Existing Condition	
	Proposed Design	
	Evaluation Required	
4.03	Existing Condition	
	Proposed Design	
	Evaluation Required	

Montana State University – Accessibility Program Document

(Project name)

Issued:

Note, Reference, Action		ACCESS TO PUBLIC SERVICES
Design approach to provide access to all public services in the building		
5.01	Existing Condition	
	Proposed Design	
	Evaluation Required	

Note, Reference, Action		IDENTIFICATION OF NON-COMPLIANT FEATURES
For renovation work to existing buildings or spaces, and or site conditions adjacent to the new construction. Identification of existing non-compliant conditions as related to the Project Program and or other primary function spaces within the building and those specific building features listed above in this document. These items should then be evaluated by the Design Team to determine if the existing conditions should be incorporated into the project scope. See Appendix 1.9-5 for more information.		
6.01	Not Project Specific, Existing Condition:	<p>For Renovation work within a building, work performed shall meet requirements for accessibility. There are however, for projects which the project area does not include the entire building, often significant building components outside the project area which are not accessible. For this project, while further survey is required, these services and features could include but not be limited to the following:</p> <ul style="list-style-type: none"> • Access to and accommodation within assembly spaces • Access to dining areas with or without fixed seating • Access to assistive listening devices as appropriate for the space program • Access to service counters and or service windows
	Proposed Design	
	Evaluation Required	

Montana State University – Accessibility Program Document

(Project name)

Issued:

		Note, Reference, Action	DESIGN CONSIDERATIONS FOR WORKPLACES
		<p>If applicable, Identification of workplace space considerations as appropriate for the building type. If applicable, Identification of spaces or equipment within the building for which accessibility may not be achievable or appropriate. Unless specifically identified as above, all spaces shall be accessible. Unless specifically identified as above, all operating features and fixtures shall be accessible.</p>	
7.01	Special Considerations	It should also be noted that certain pieces of equipment are of such a unique nature that to design of the operating features to be accessible may not be achievable.	
	Proposed Design	Any equipment for which accessibility of operating features is not achievable shall be identified and brought to the attention of the University.	
	Evaluation Required		
7.02	Special Considerations	Based on the program of some of the unique aspects of the operations within this building, there may therefore be some spaces for which not all of the equipment within the space will contain accessible features.	
	Proposed Design	<ul style="list-style-type: none"> • Except as specifically identified in the Construction Code, all spaces shall be designed as to provide an accessible route of travel into and through all spaces. • Any space, that in the opinion of the Design Consultant should not be designed as to be accessible, shall be specifically brought to the attention of Montana State University for concurrence prior to proceeding on that design course. 	
	Evaluation Required	Any issues relating to aspects of unique design features or equipment as identified above shall be evaluated by the University Design Team for validation of the approach by the design team prior to continuing to the next design phase.	
7.03	Special Considerations	For each space, at least one of each type of specialty fixture shall be accessible.	
	Proposed Design	For each space, Specialty Fixtures shall be accessible as identified above, including but not limited to: Emergency Showers and Eye Wash Stations.	
	Evaluation Required		

Montana State University – Accessibility Program Document

(Project name)

Issued:

	Note, Reference, Action	DESIGN CONSIDERATIONS FOR WORKPLACES
7.04	Special Considerations	For each space, at least one of each type of plumbing fixtures, fume hoods or work area, shall be accessible.
	Proposed Design	For each space, Fixtures shall be accessible as identified above, including but not limited to: Sinks, and work counters, shall be installed to comply with accessible clearances and reach ranges. Alternatively, such items listed above shall be installed in such a way that modifying the installation so as to be accessible is achievable by the University at minimal cost and in a reasonable time frame as to accommodate the needs of the potential users of the building or space.
	Evaluation Required	Approach relating to fixtures or work areas as identified above, shall be evaluated by the University Design Team for validation of the approach by the design team prior to continuing to the next design phase.

END OF REPORT

FPDC

Montana State University Interior Signage Standard

This catalog contains samples of standard signs available for Montana State University projects.

Facilities Planning, Design & Construction
6th Avenue & Grant Street, P.O. Box 172760
Bozeman, MT 59717-2760



MONTANA
STATE UNIVERSITY



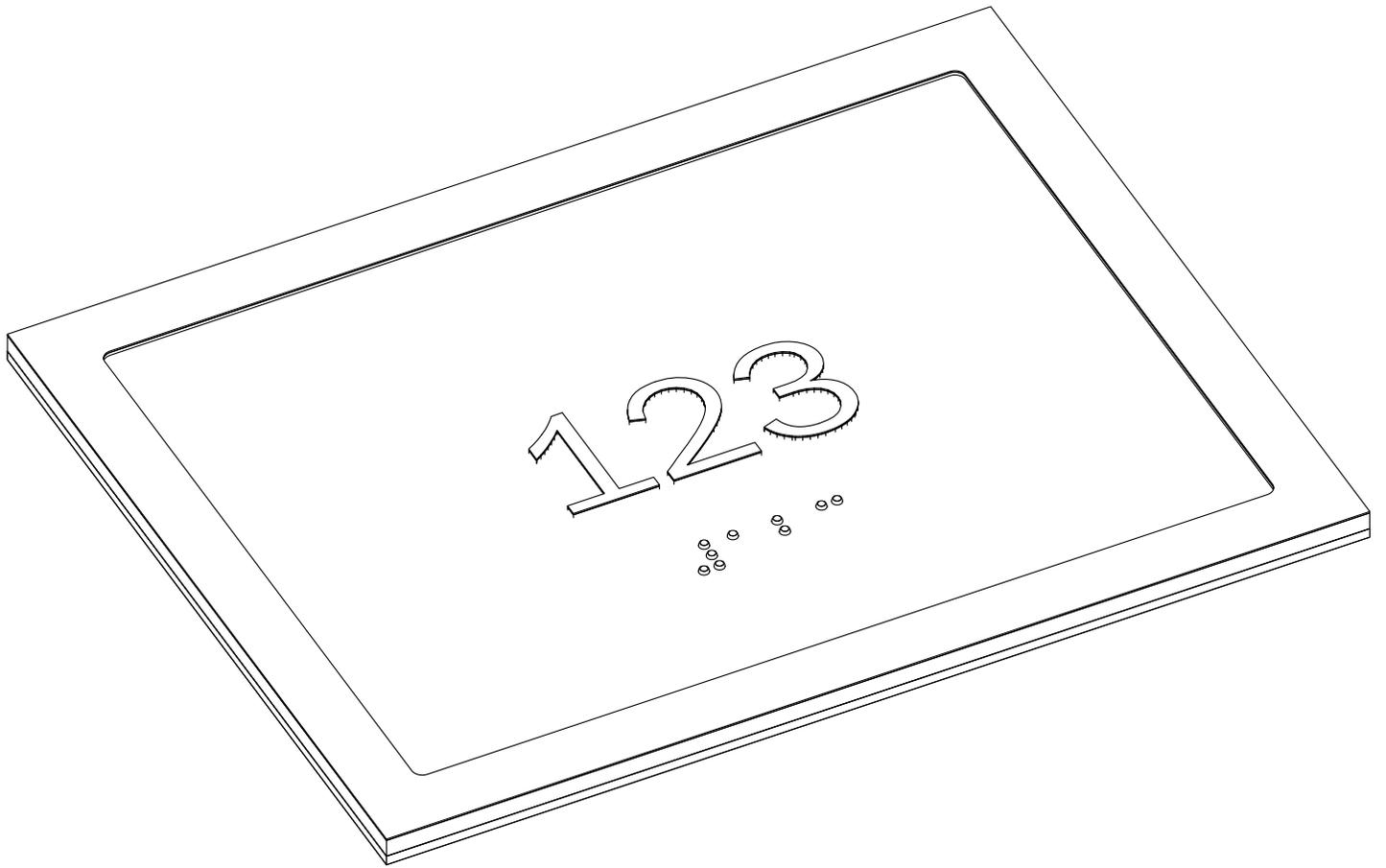
INTERIOR PANEL SIGN
TYPE: A1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
SPEC. SECTION

2007
DATE



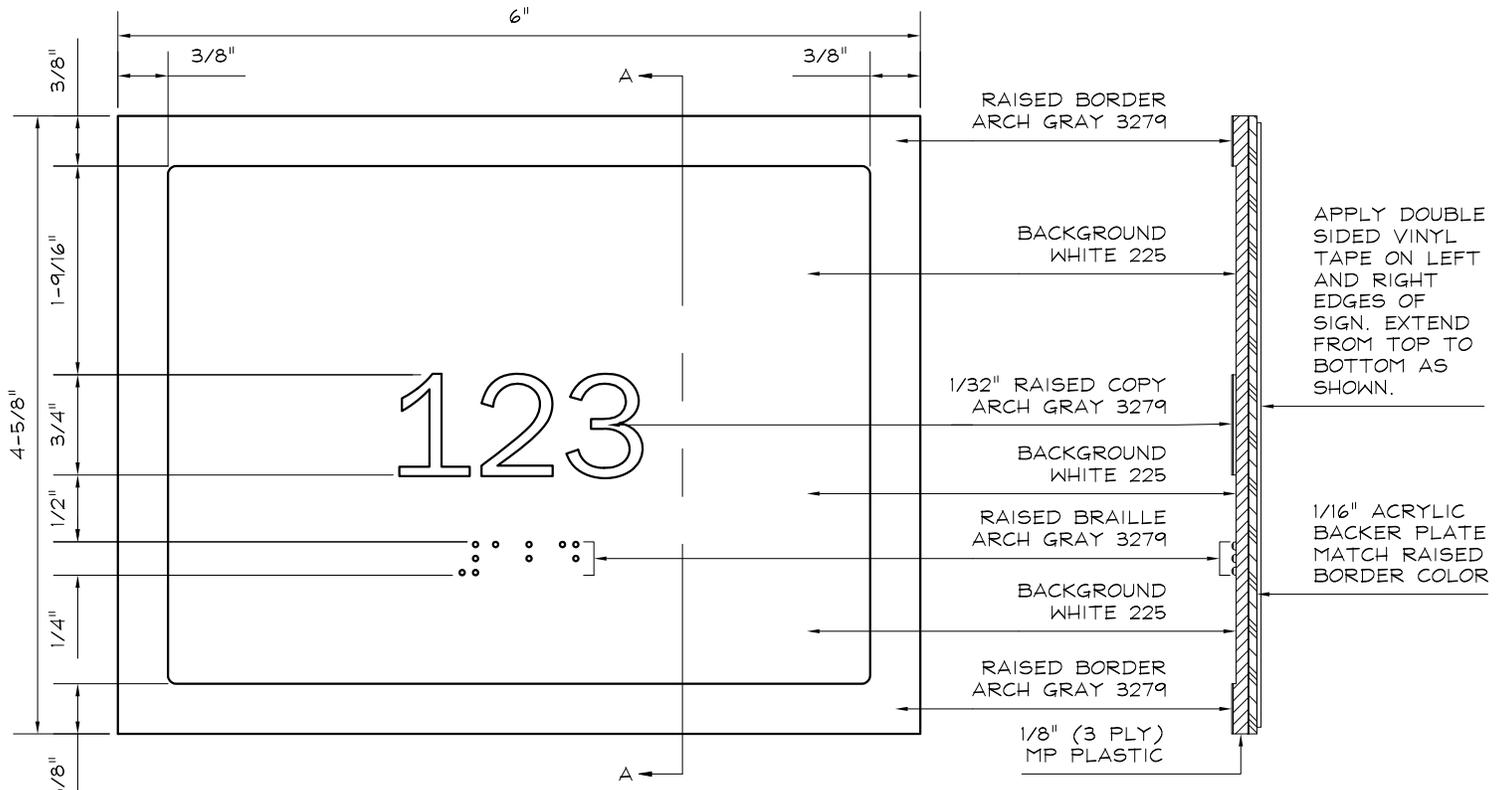
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TYPE: A1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

2007
DATE



NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.

NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.7 x SCALE

INTERIOR PANEL SIGN
TYPE: A1

10431

SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007

DATE

A1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



INTERIOR PANEL SIGN
TYPE: A2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
SPEC. SECTION

2007
DATE



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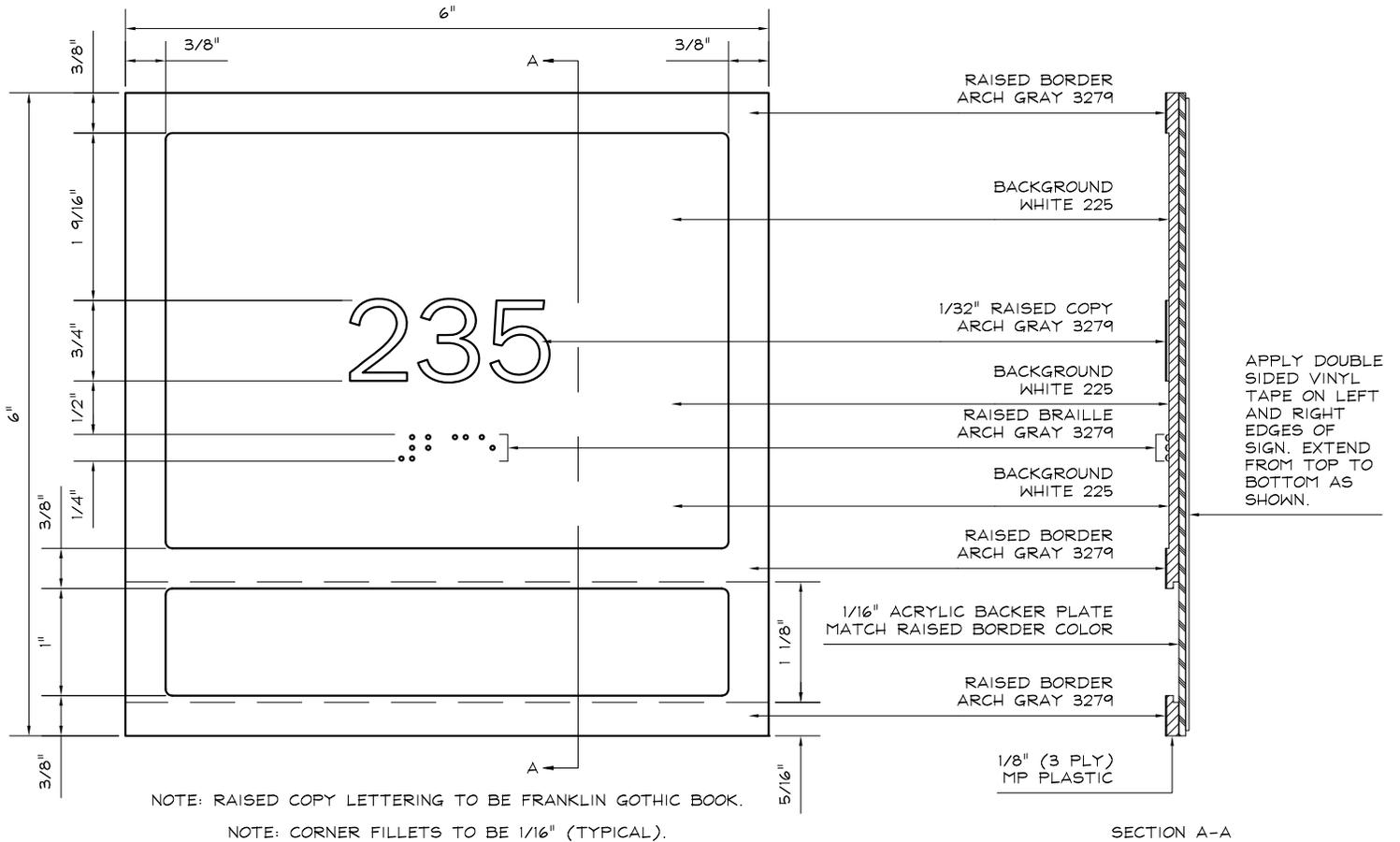
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TYPE: A2**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

A2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.6 x SCALE

INTERIOR PANEL SIGN
TYPE: A2

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

A2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



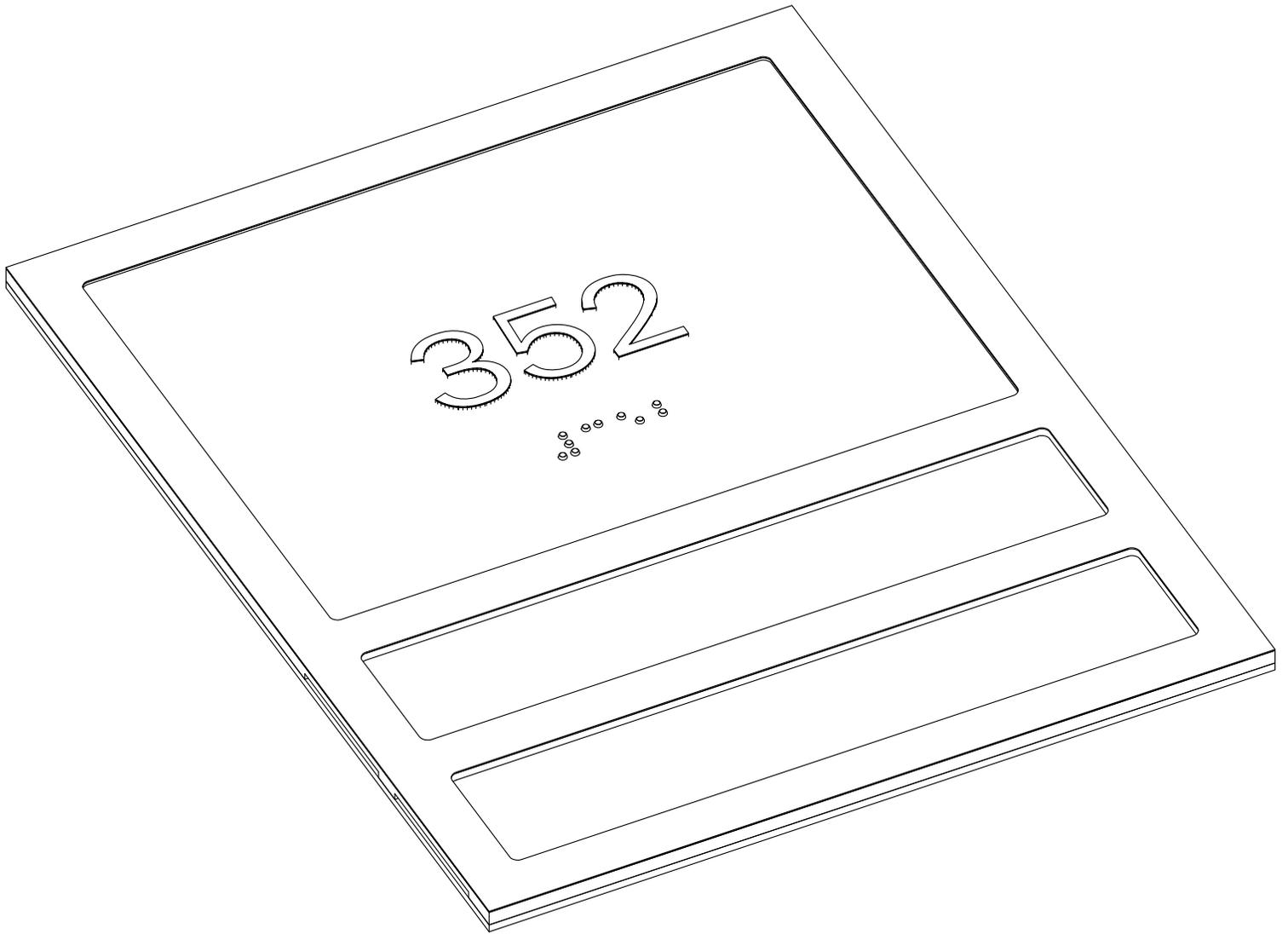
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TYPE: A3

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
SPEC. SECTION

2007
DATE



0.9 x SCALE

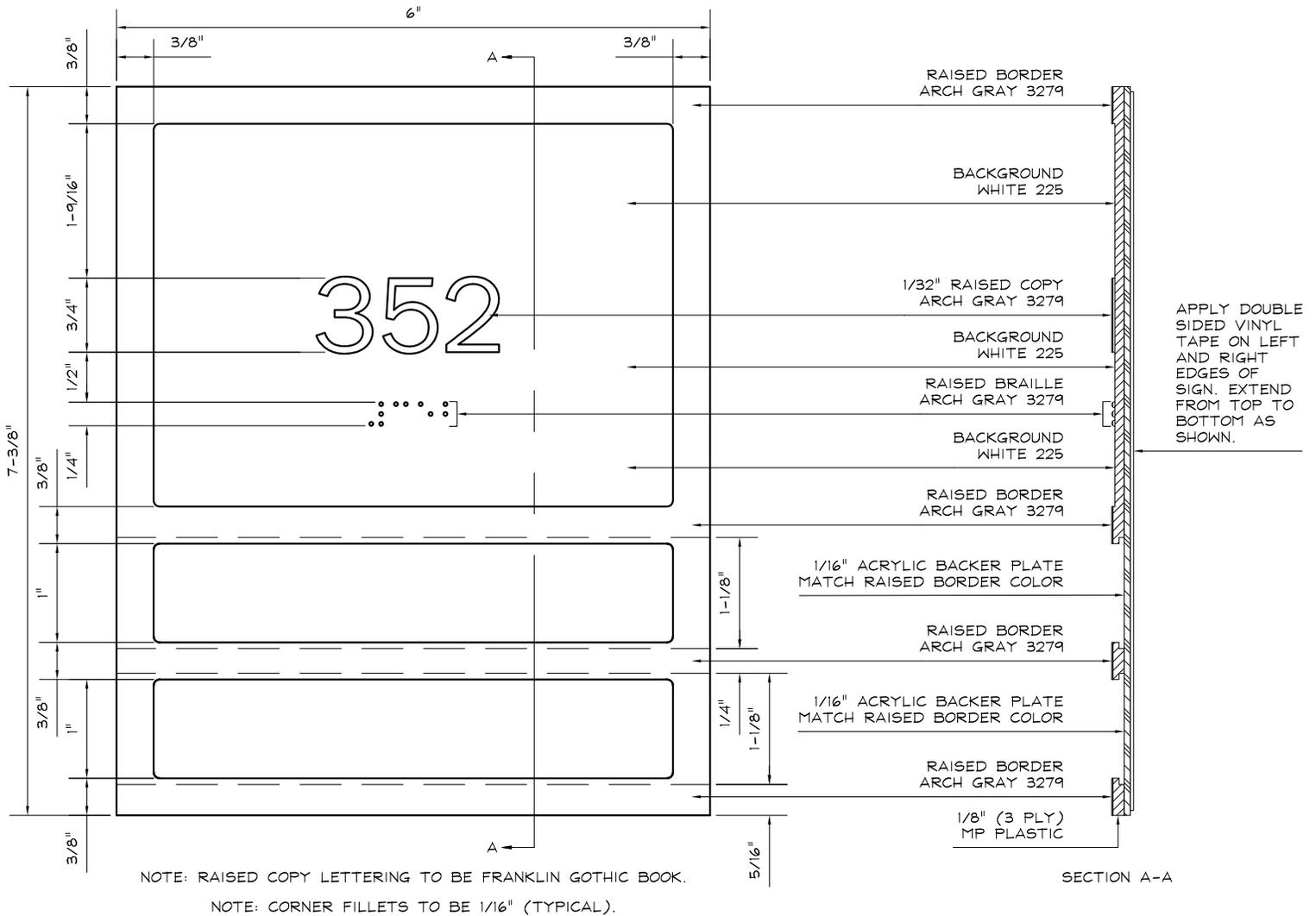
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TYPE: A3**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

A3-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.6 x SCALE

INTERIOR PANEL SIGN
TYPE: A3

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A3-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

2007
DATE



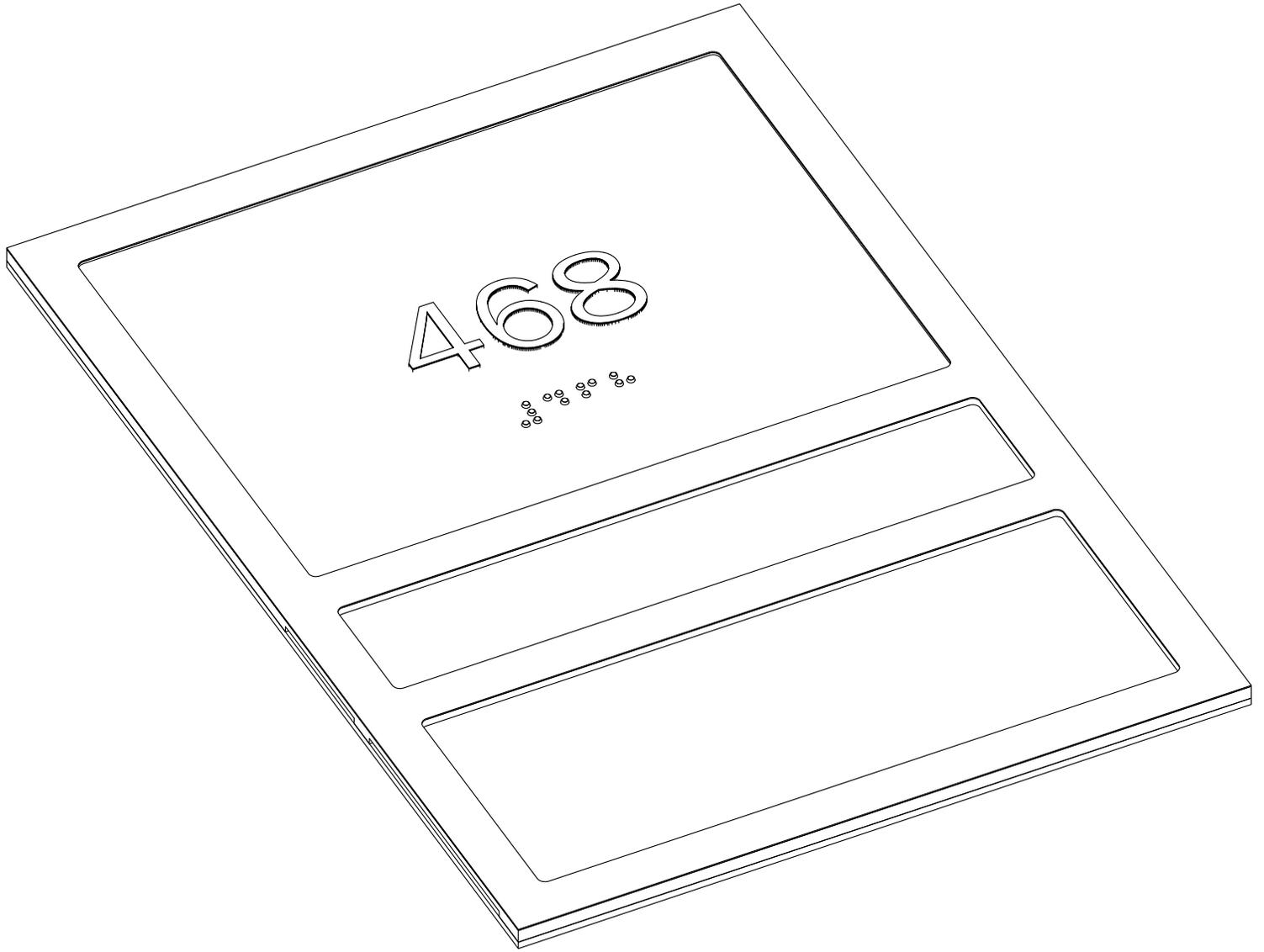
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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A4-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
SPEC. SECTION

2007
DATE



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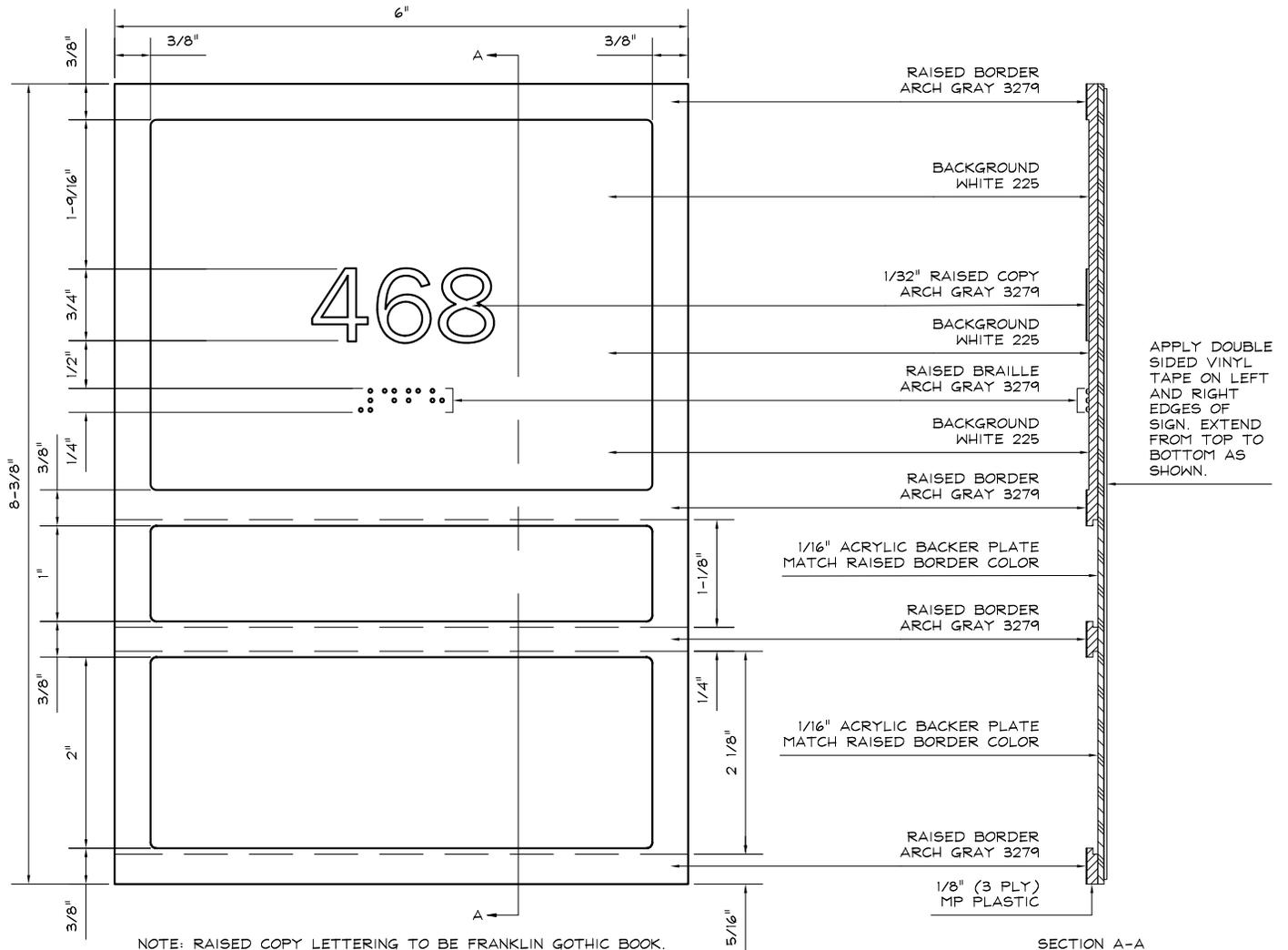
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TYPE: A4**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A4-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

2007
DATE



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 NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

0.55 x SCALE

INTERIOR PANEL SIGN
TYPE: A4

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
 SPEC. SECTION

2007
 DATE

532



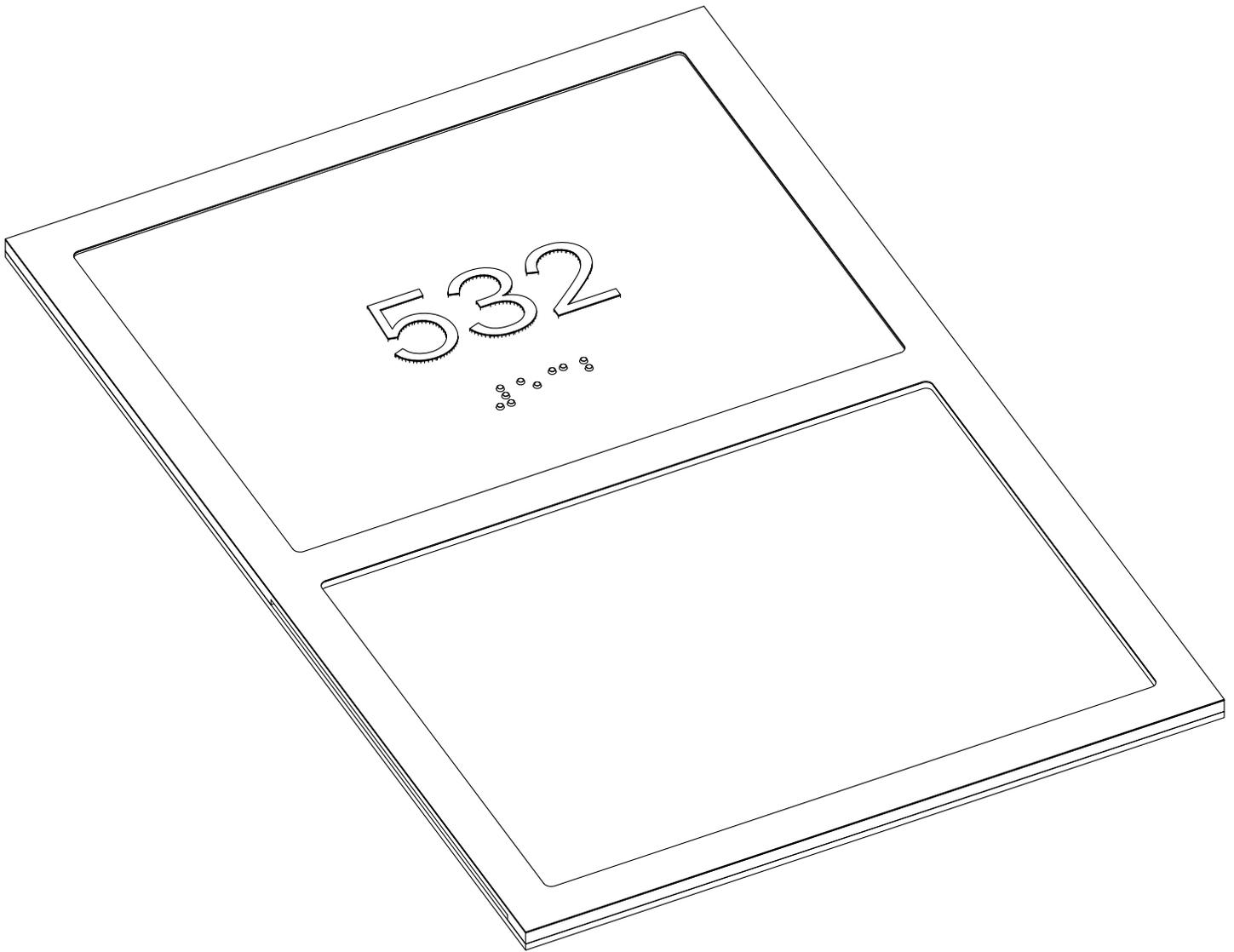
INTERIOR PANEL SIGN
TYPE: A5

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A5-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
SPEC. SECTION

2007
DATE



0.8 x SCALE

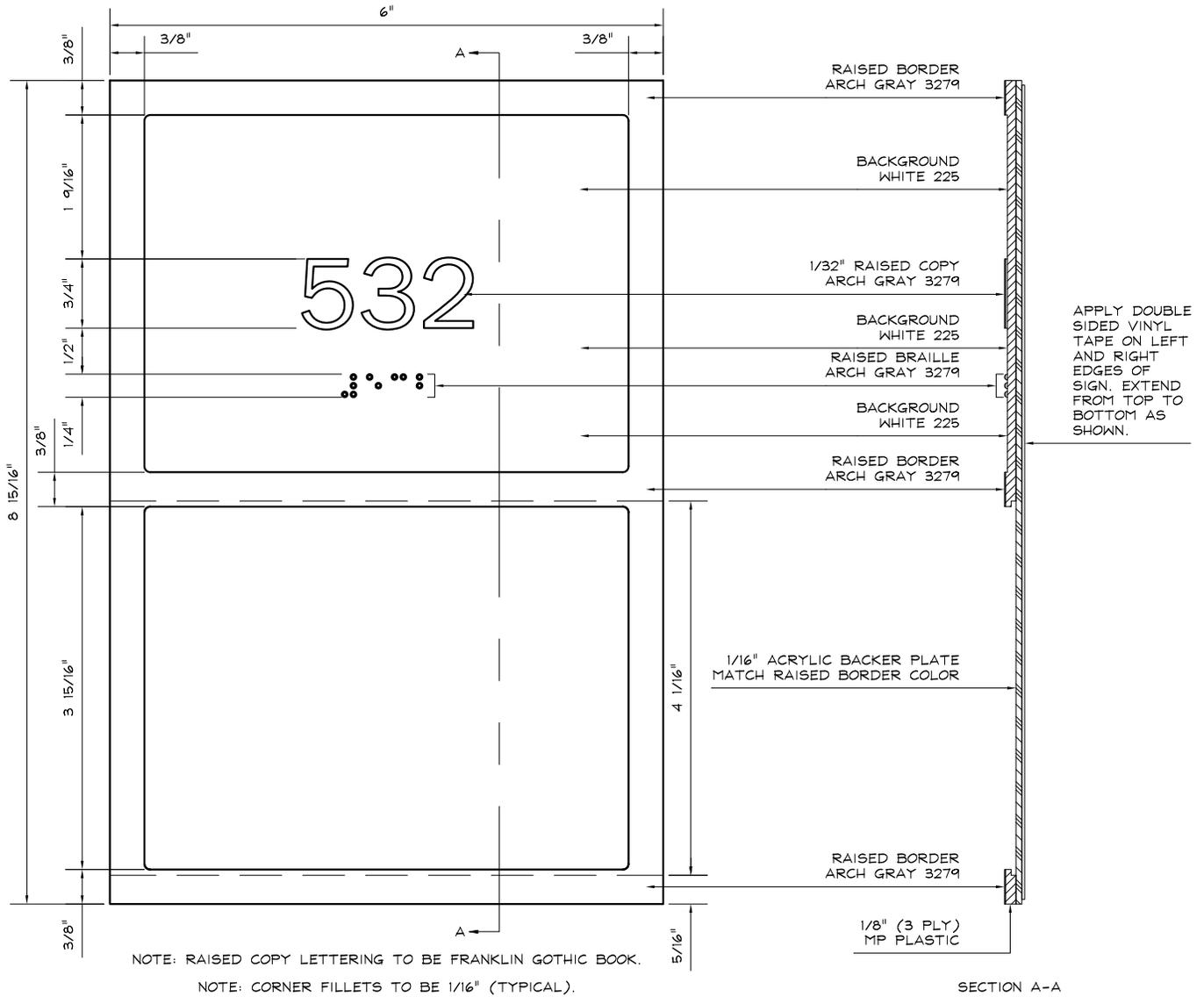
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TYPE: A5**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A5-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

2007
DATE



0.55 x SCALE

INTERIOR PANEL SIGN
TYPE: A5

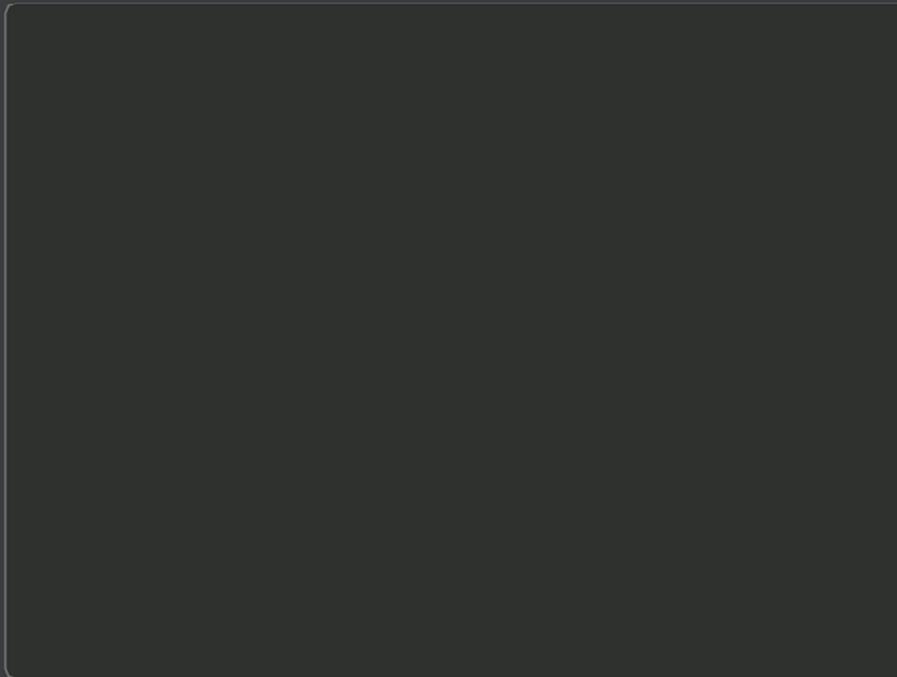
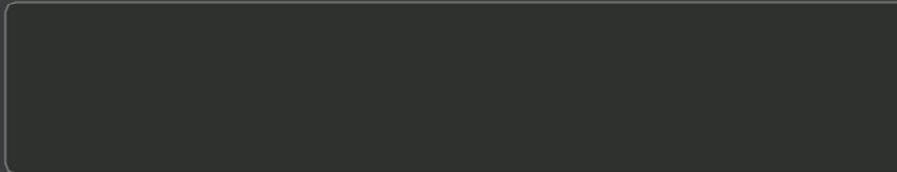
FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A5-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

2007
DATE

648



0.9 x SCALE

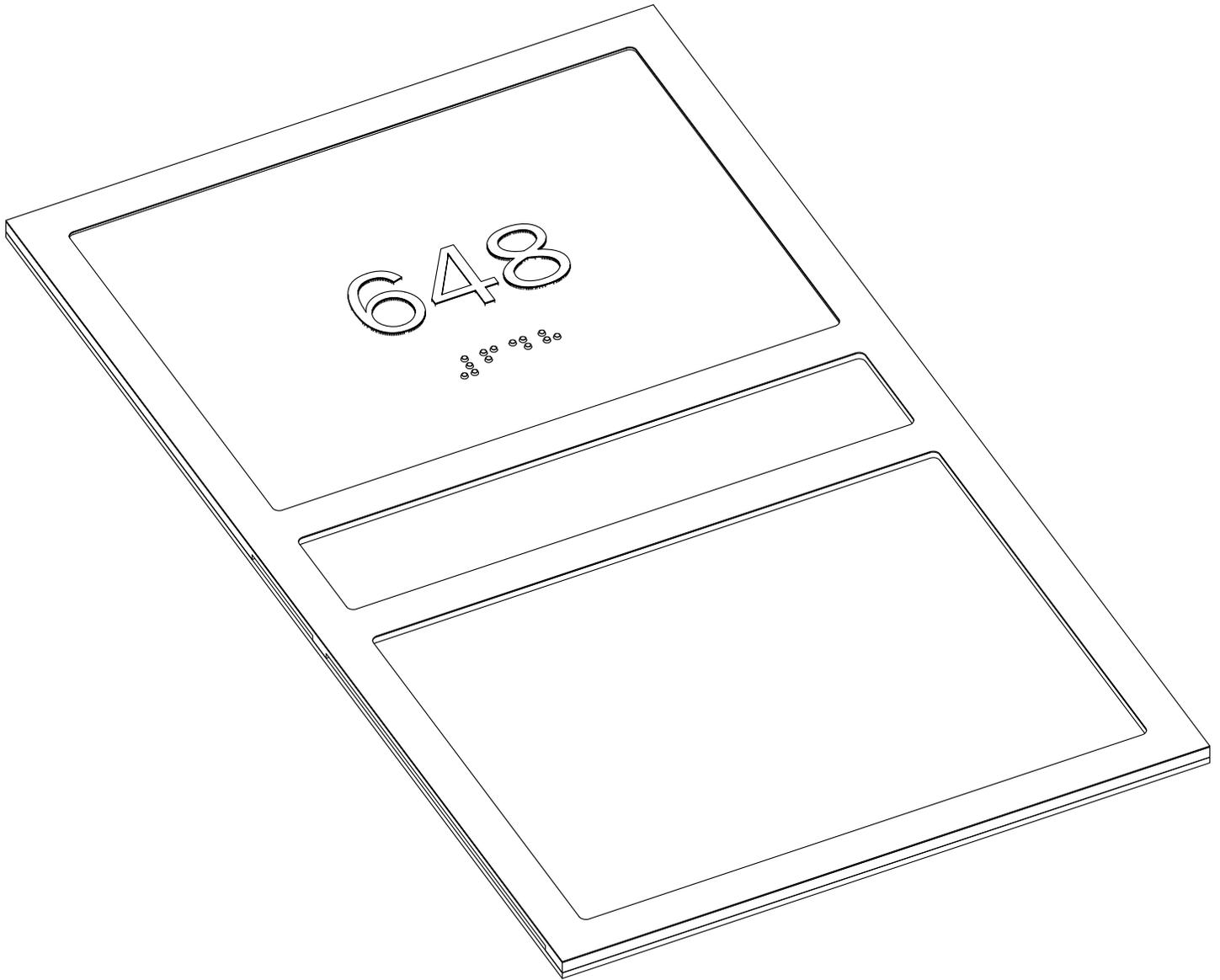
INTERIOR PANEL SIGN
TYPE: A6

10431
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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

A6-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.75 x SCALE

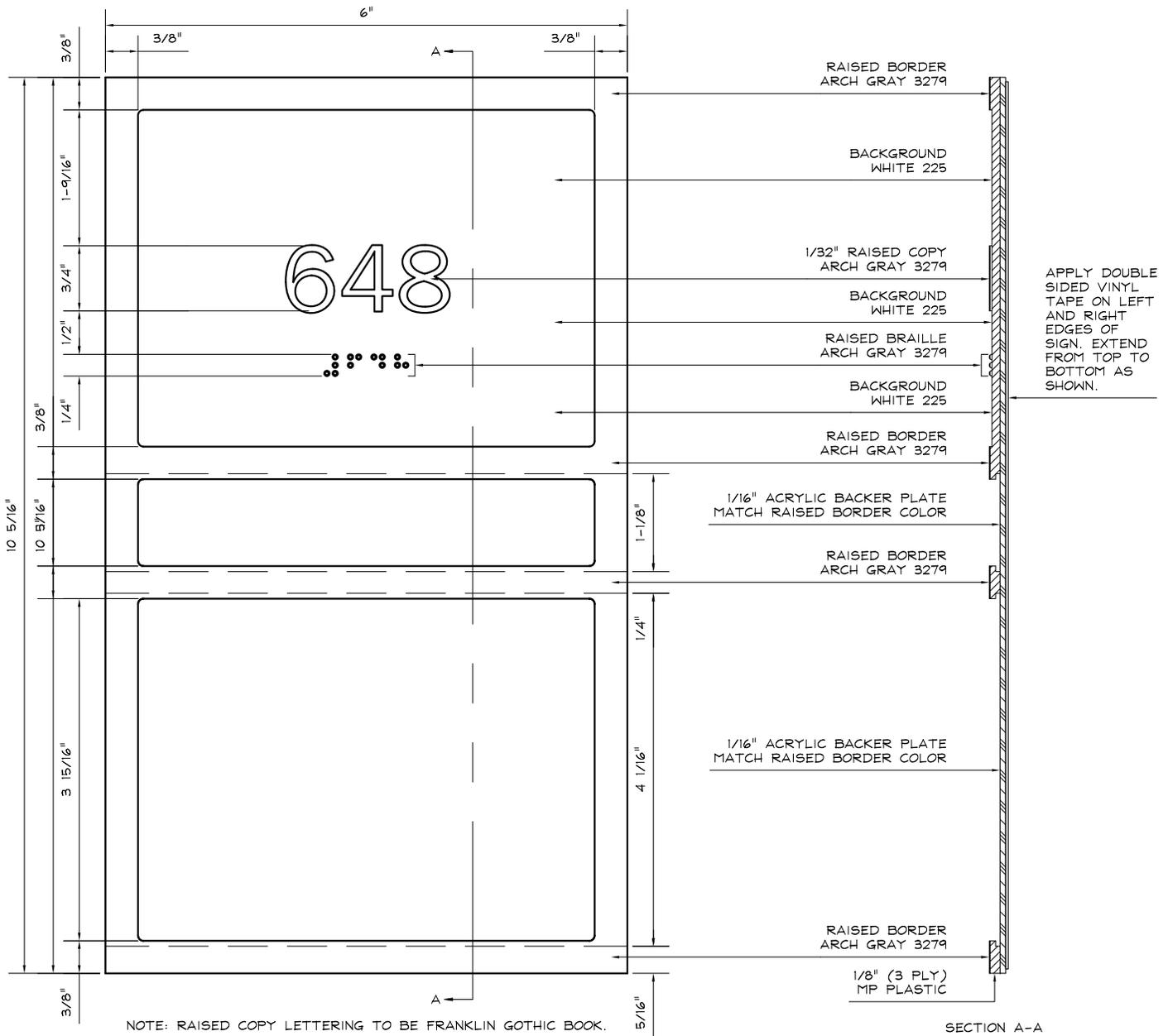
INTERIOR PANEL SIGN
TYPE: A6

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A6-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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DATE



INTERIOR PANEL SIGN
TYPE: A6

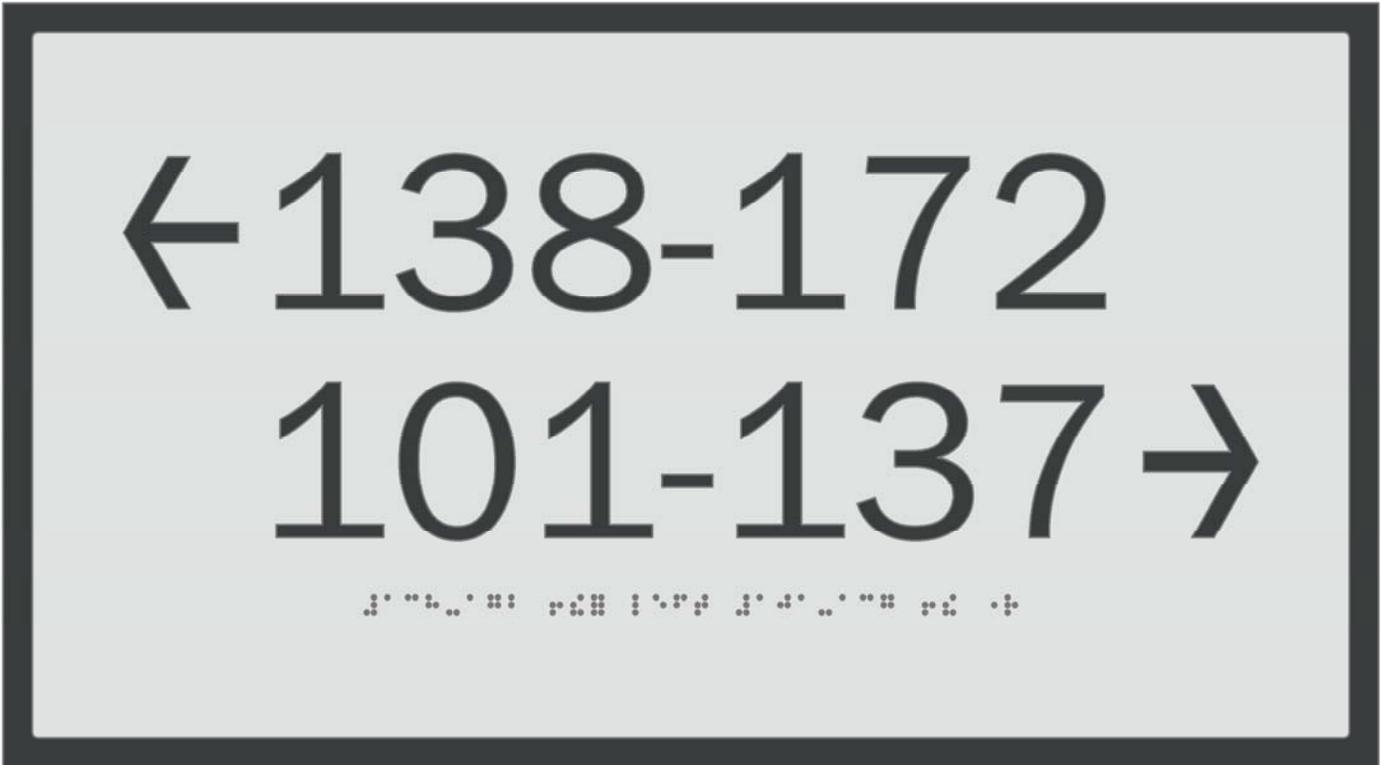
FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A6-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

0.55 x SCALE

10431
SPEC. SECTION

2007
DATE



0.4 x SCALE

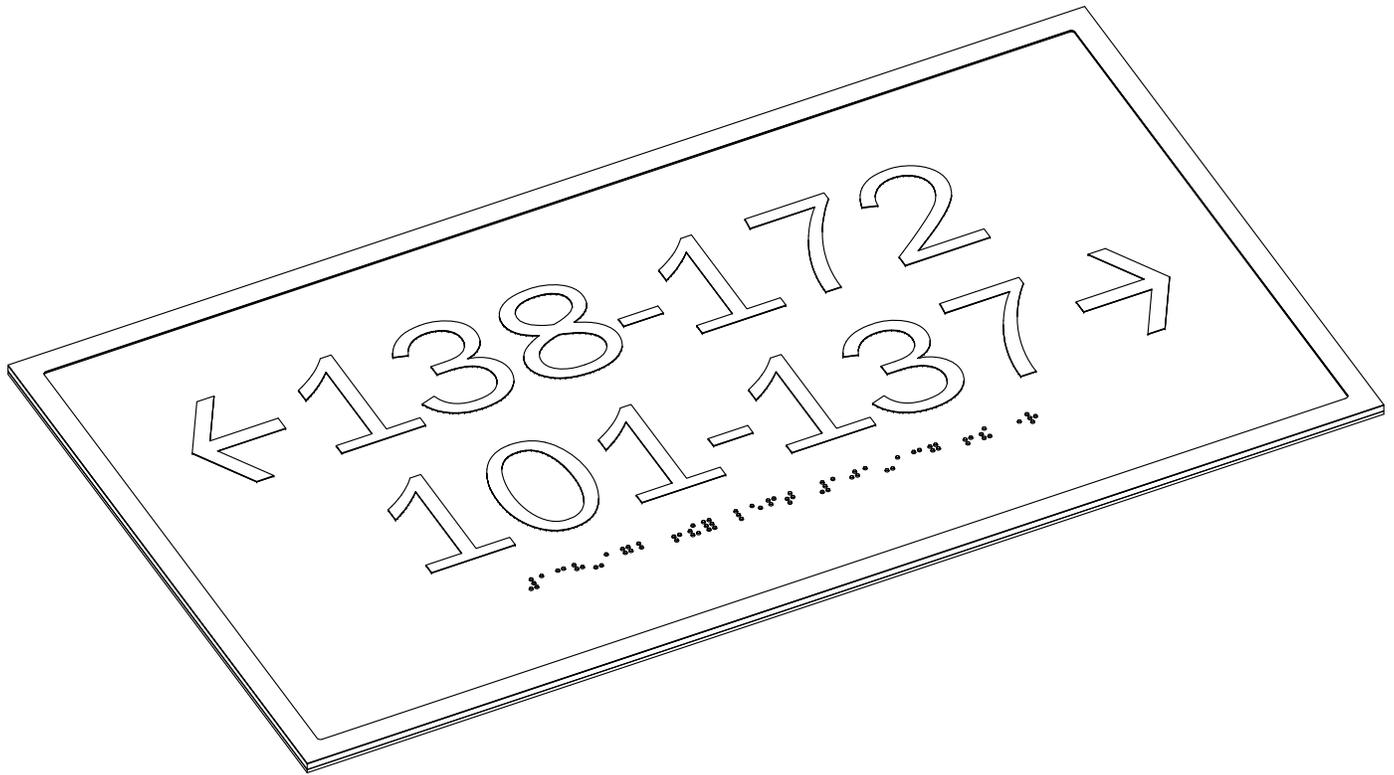
**INTERIOR PANEL SIGN
TYPE: A7**

**10431
SPEC. SECTION**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

**2007
DATE**

A7-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.35 x SCALE

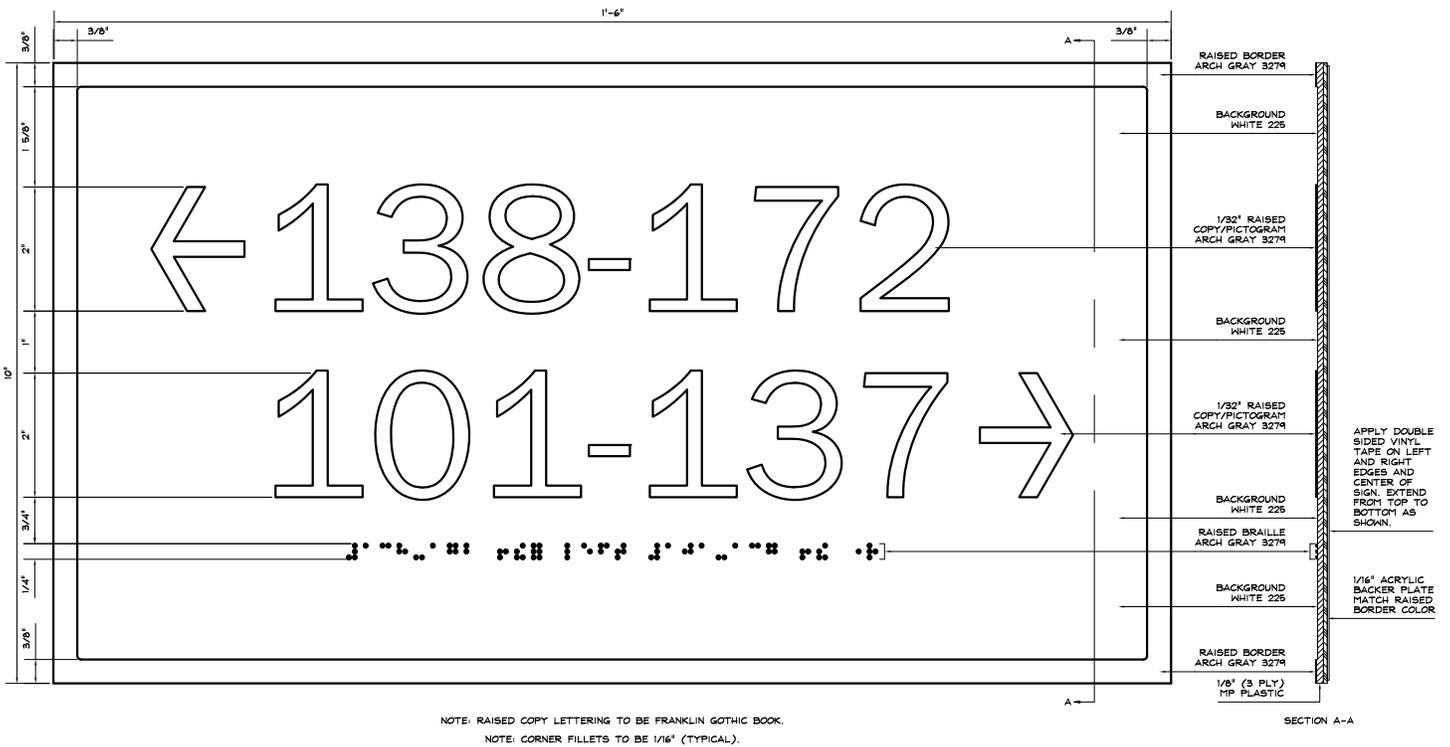
INTERIOR PANEL SIGN
TYPE: A7

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A7-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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0.325 x SCALE

INTERIOR PANEL SIGN
TYPE: A7

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A7-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
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2007
 DATE

BALLROOM A



0.7 x SCALE

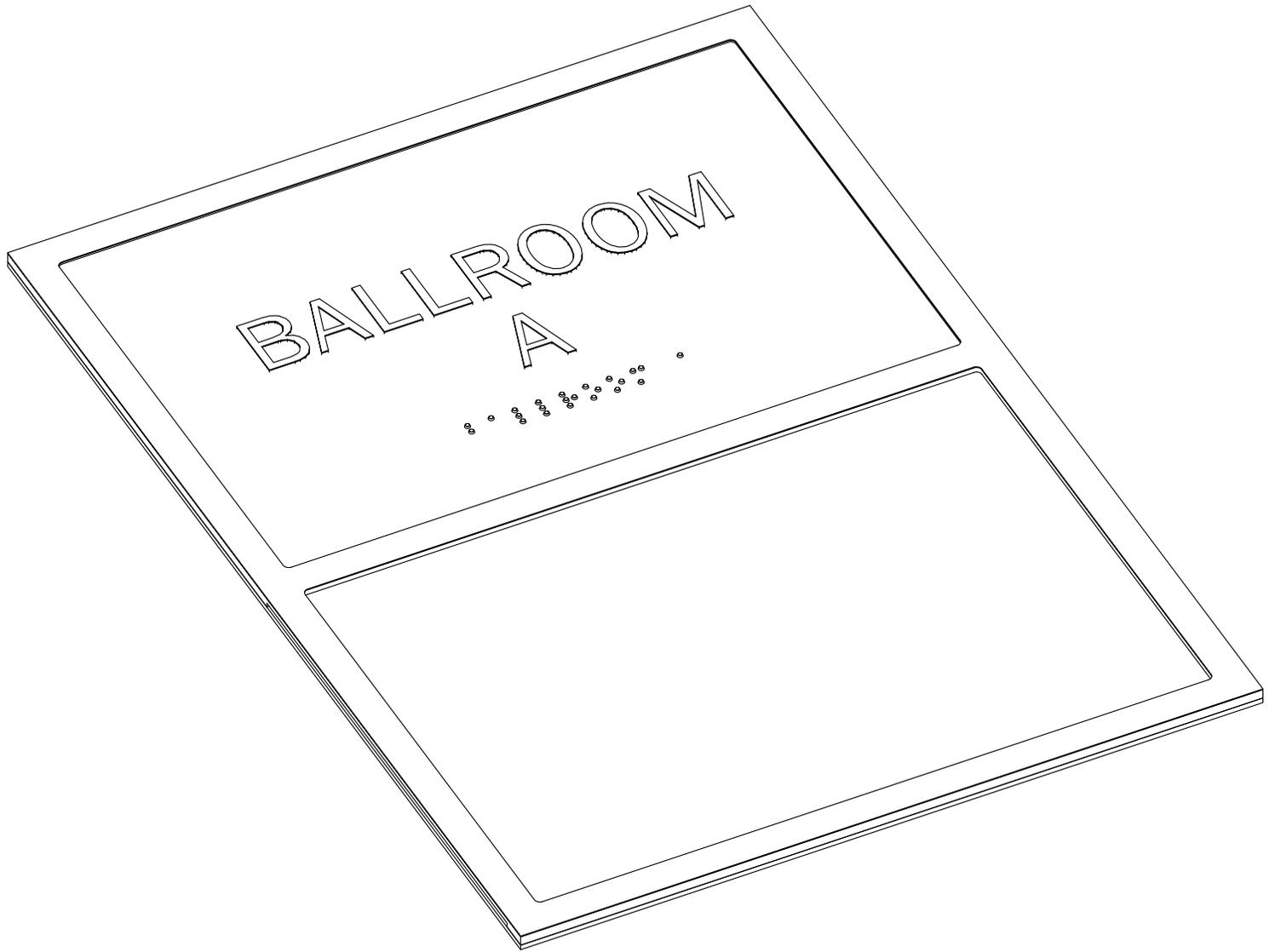
**INTERIOR PANEL SIGN
TYPE: A8**

**10431
SPEC. SECTION**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

**2007
DATE**

A8-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.6 x SCALE

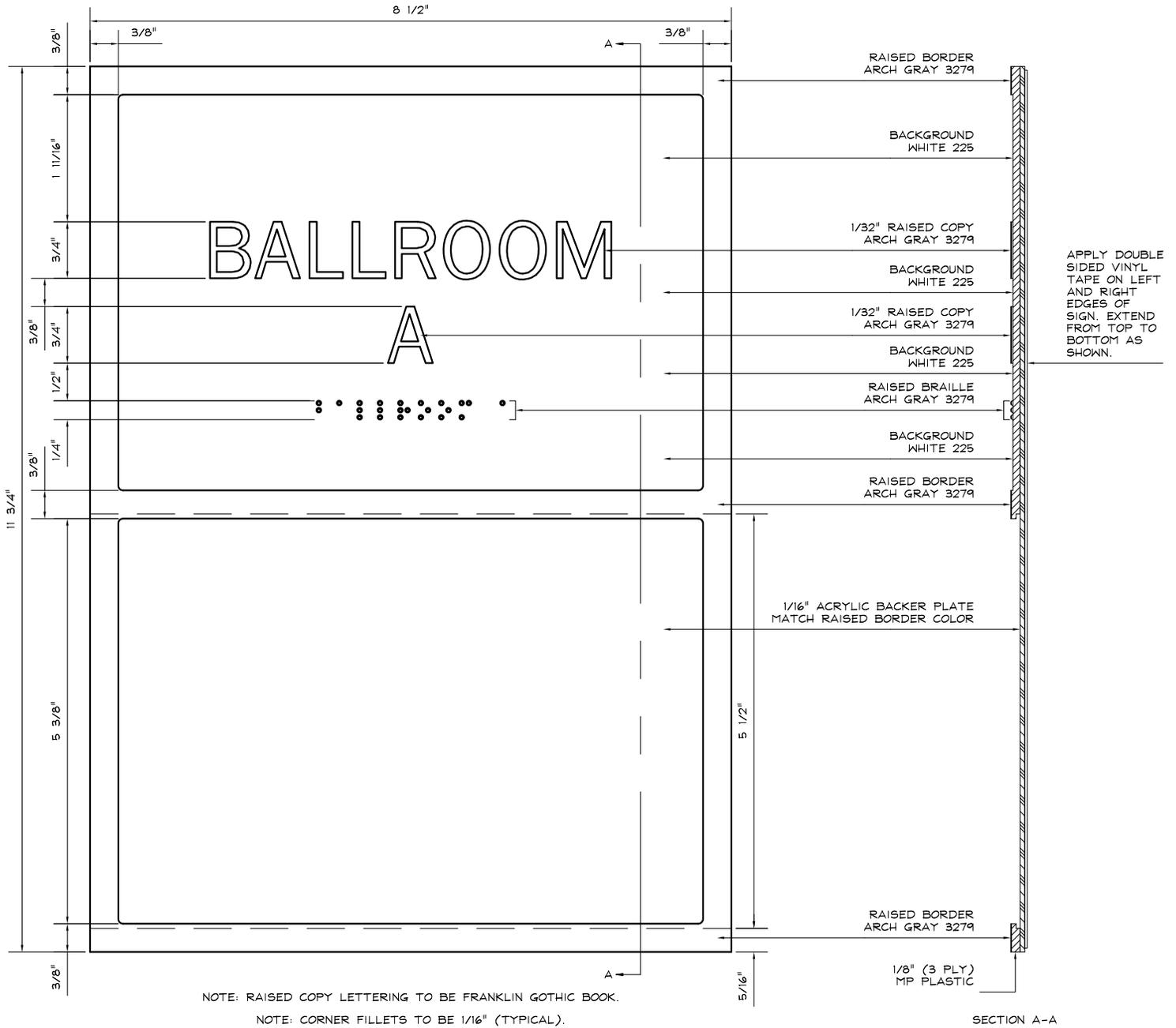
**INTERIOR PANEL SIGN
TYPE: A8**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A8-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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DATE



0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: A8**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A8-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
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2007
DATE



0.7 x SCALE

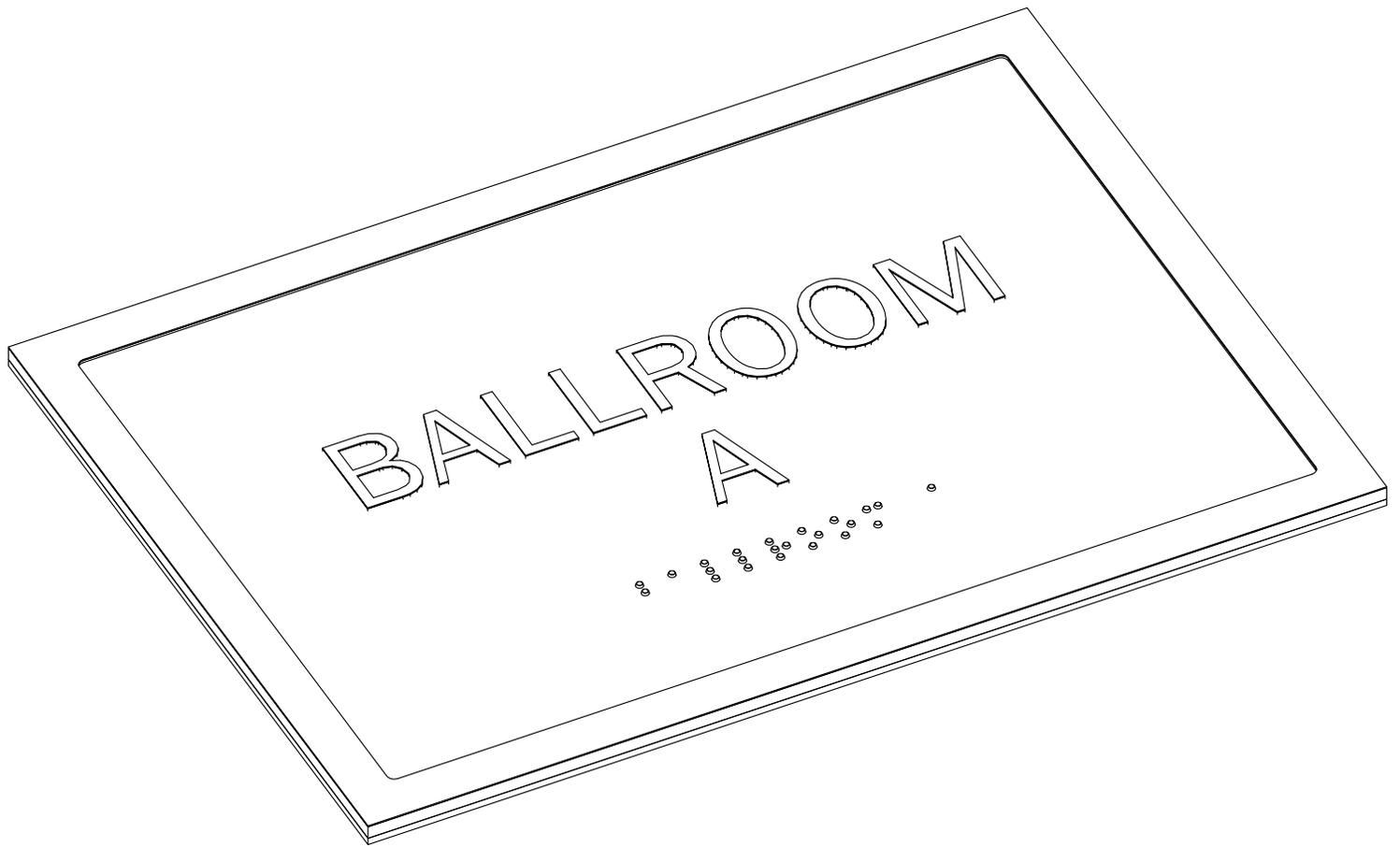
**INTERIOR PANEL SIGN
TYPE: A9**

**10431
SPEC. SECTION**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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DATE**

A9-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.75 x SCALE

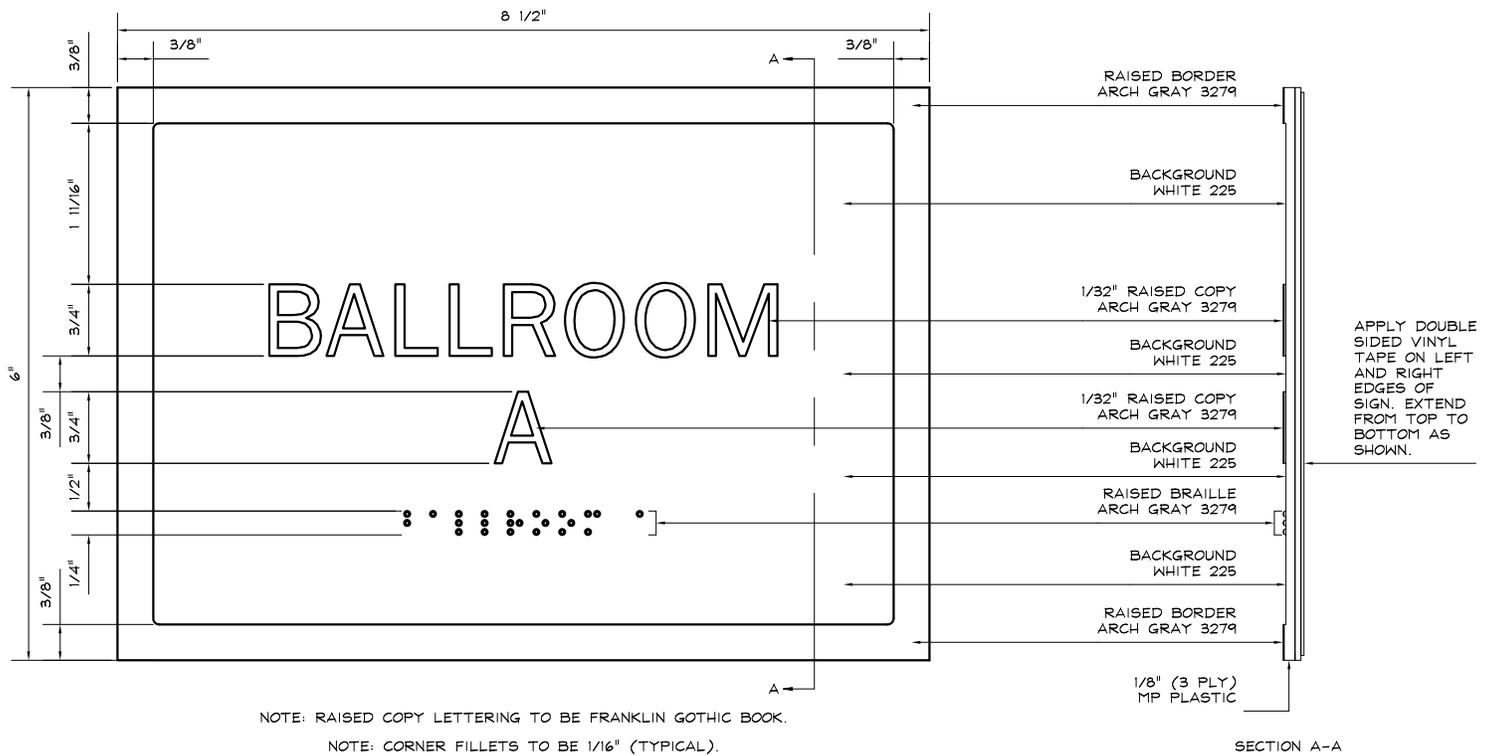
**INTERIOR PANEL SIGN
TYPE: A9**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A9-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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INTERIOR PANEL SIGN
TYPE: A9

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

A9-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

0.5 x SCALE

10431
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DATE



0.7 x SCALE

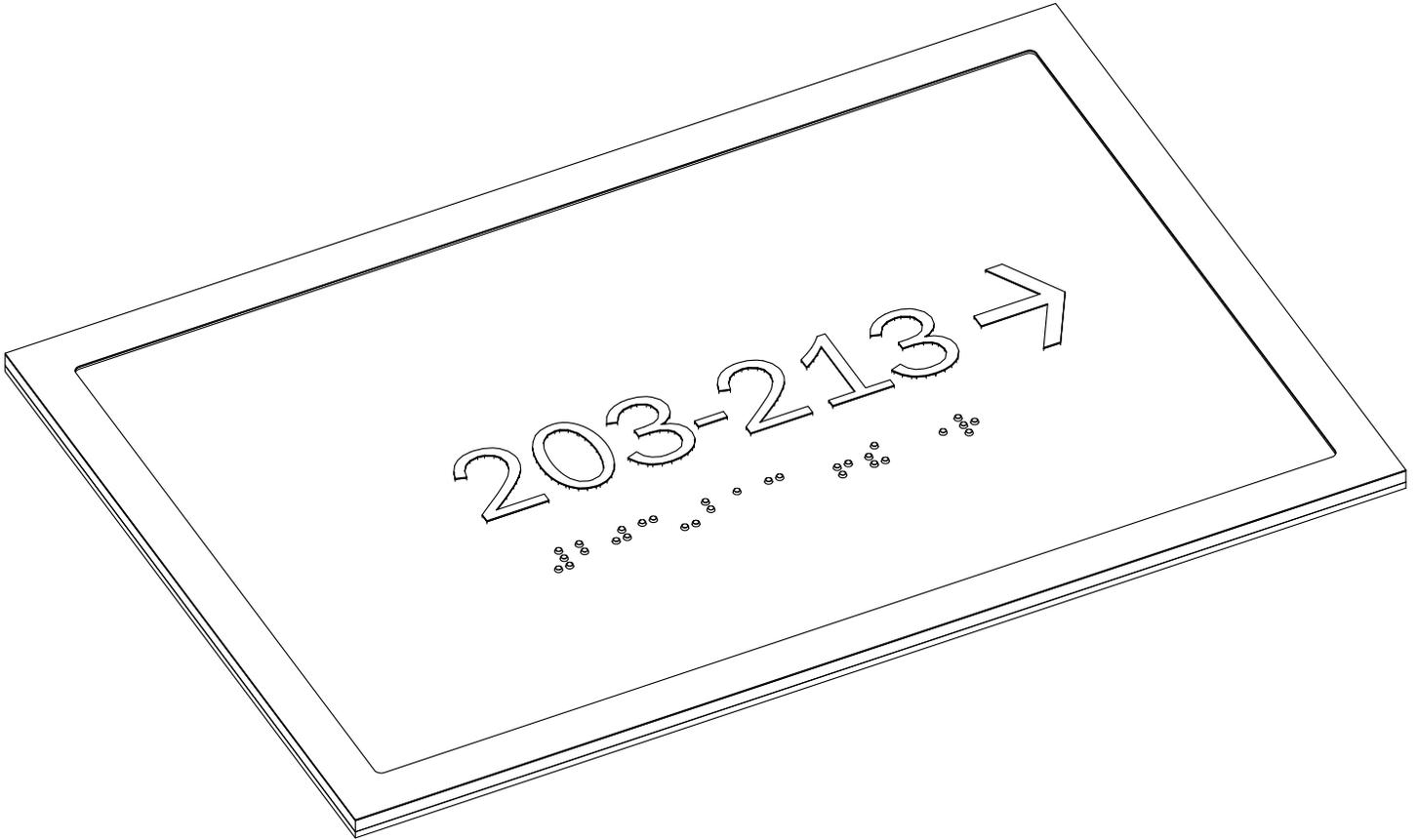
**INTERIOR PANEL SIGN
TYPE: A10**

10431
SPEC. SECTION

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2009
DATE

A10-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.7 x SCALE

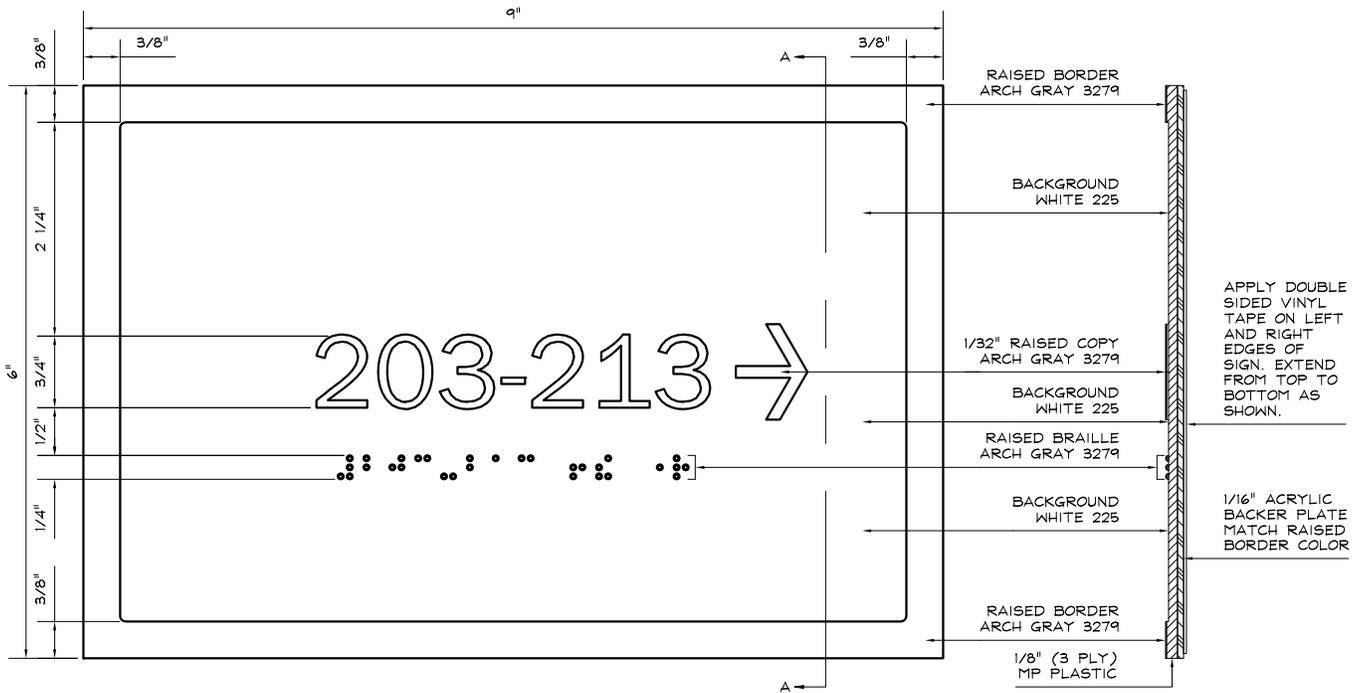
**INTERIOR PANEL SIGN
TYPE: A10**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

A10-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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 NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: A10

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A10-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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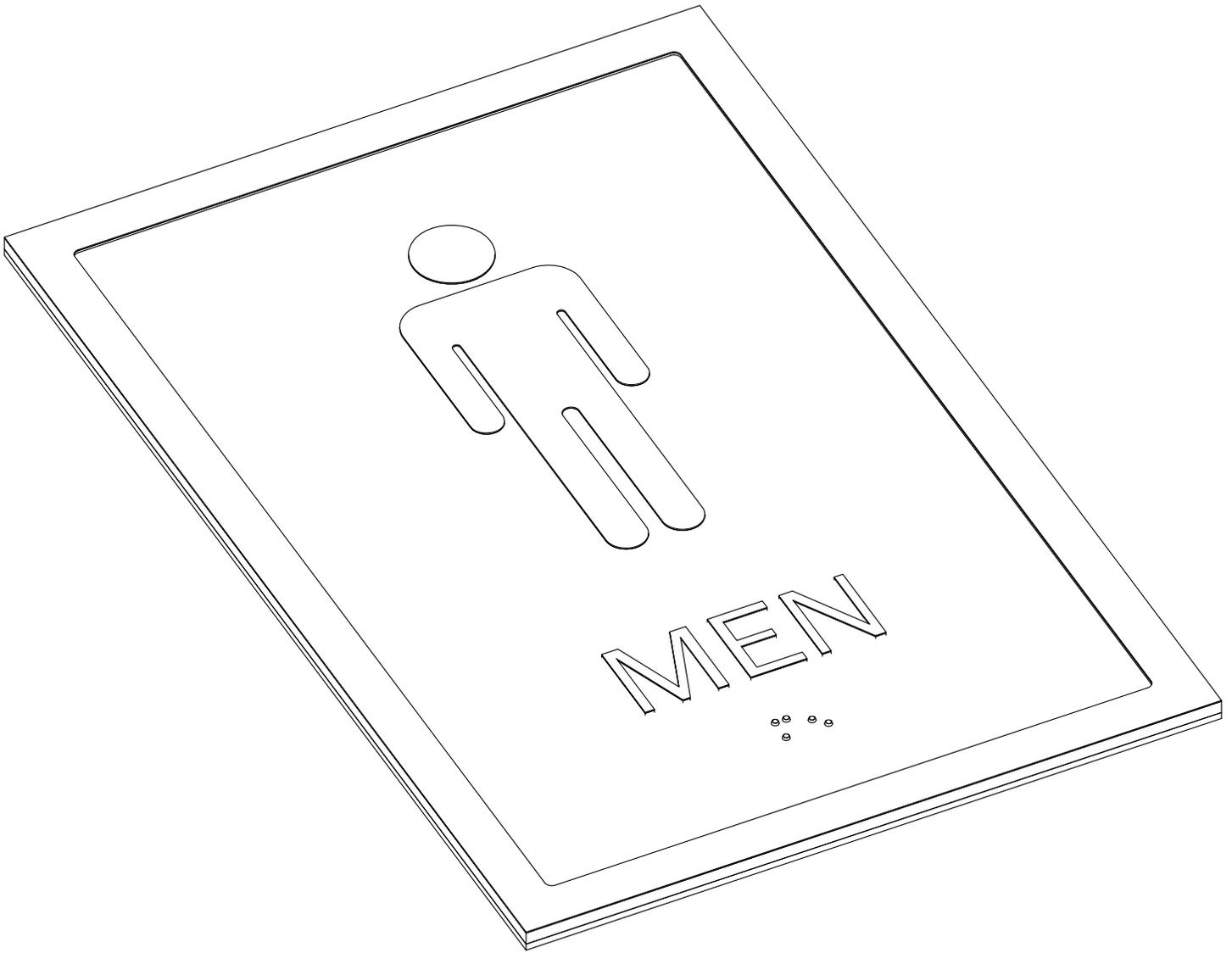
INTERIOR PANEL SIGN
TYPE: B1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

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0.8 x SCALE

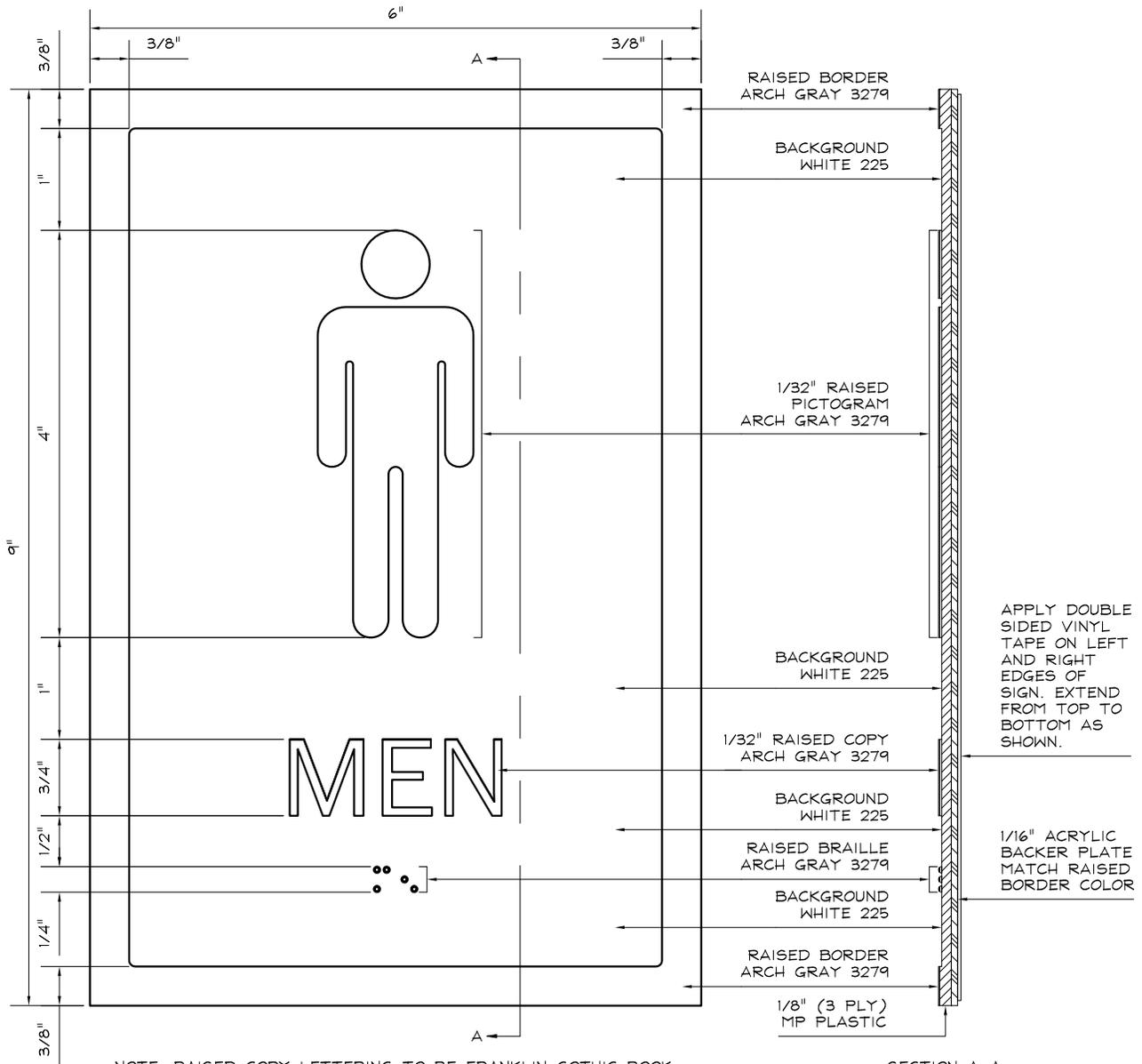
**INTERIOR PANEL SIGN
TYPE: B1**

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2007
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B1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.6 x SCALE

INTERIOR PANEL SIGN
TYPE: B1

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2007
DATE

B1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



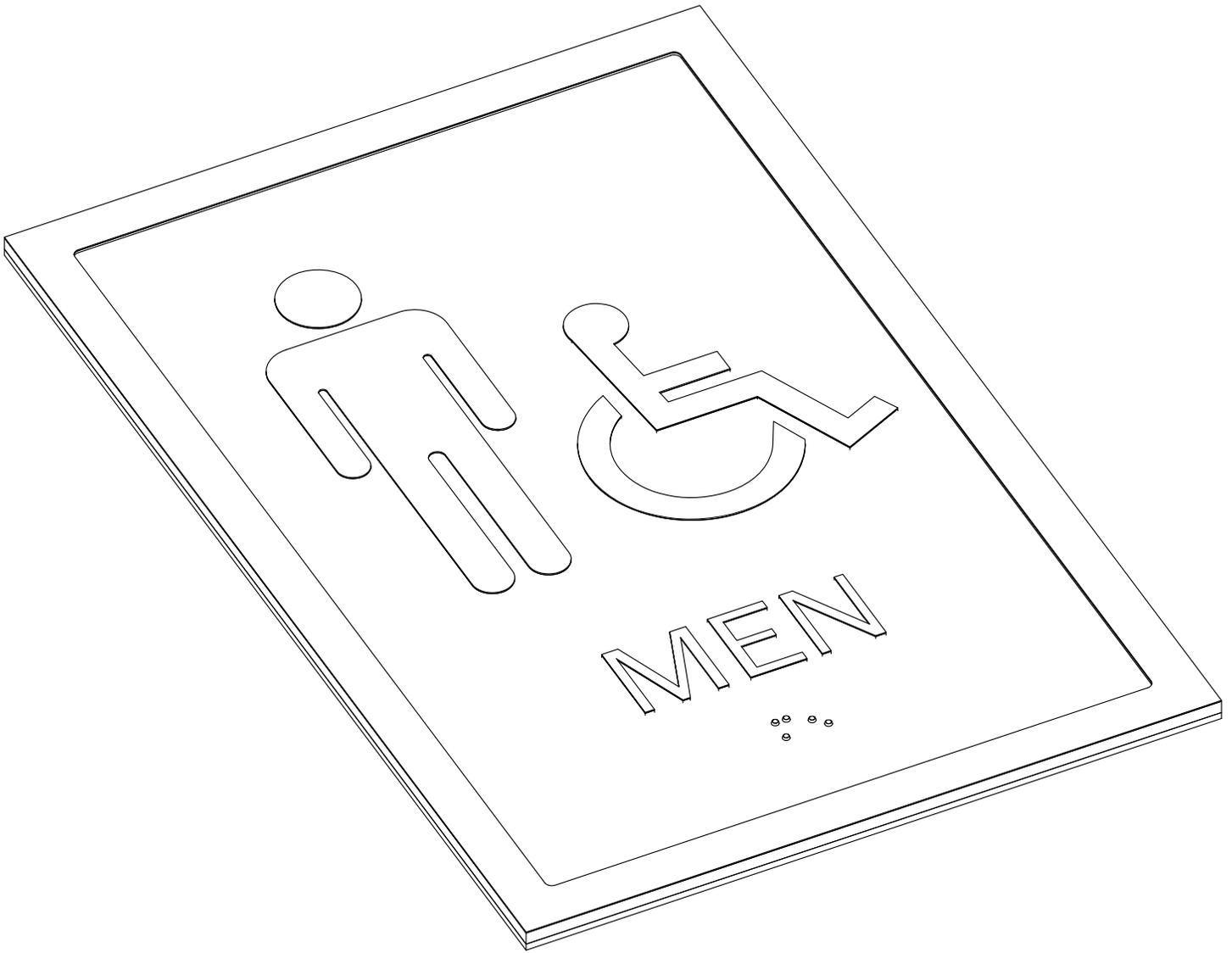
INTERIOR PANEL SIGN
TYPE: B2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

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2007
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0.8 X SCALE

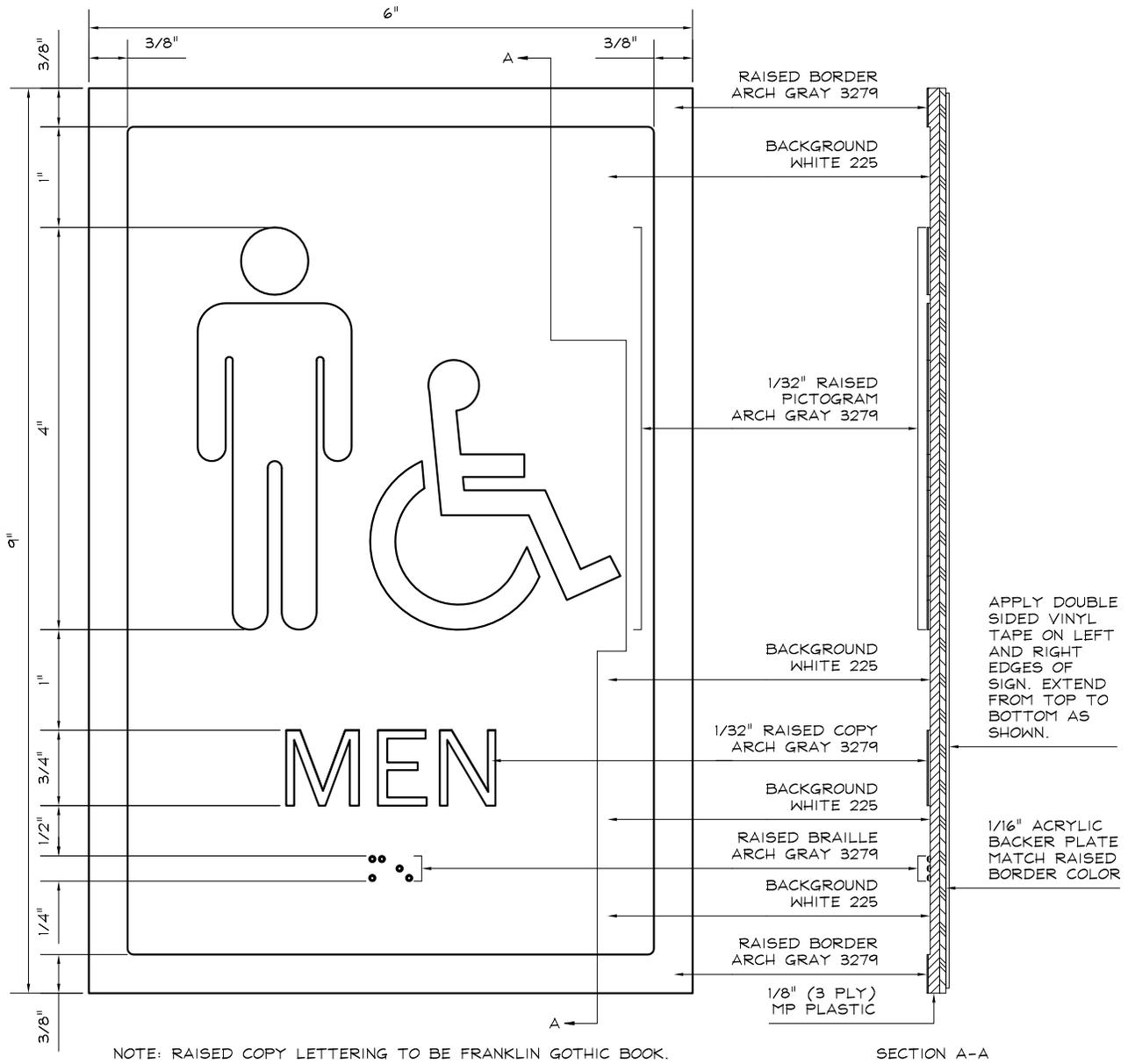
**INTERIOR PANEL SIGN
TYPE: B2**

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B2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.6 x SCALE

**INTERIOR PANEL SIGN
TYPE: B2**

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2007
DATE

B2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



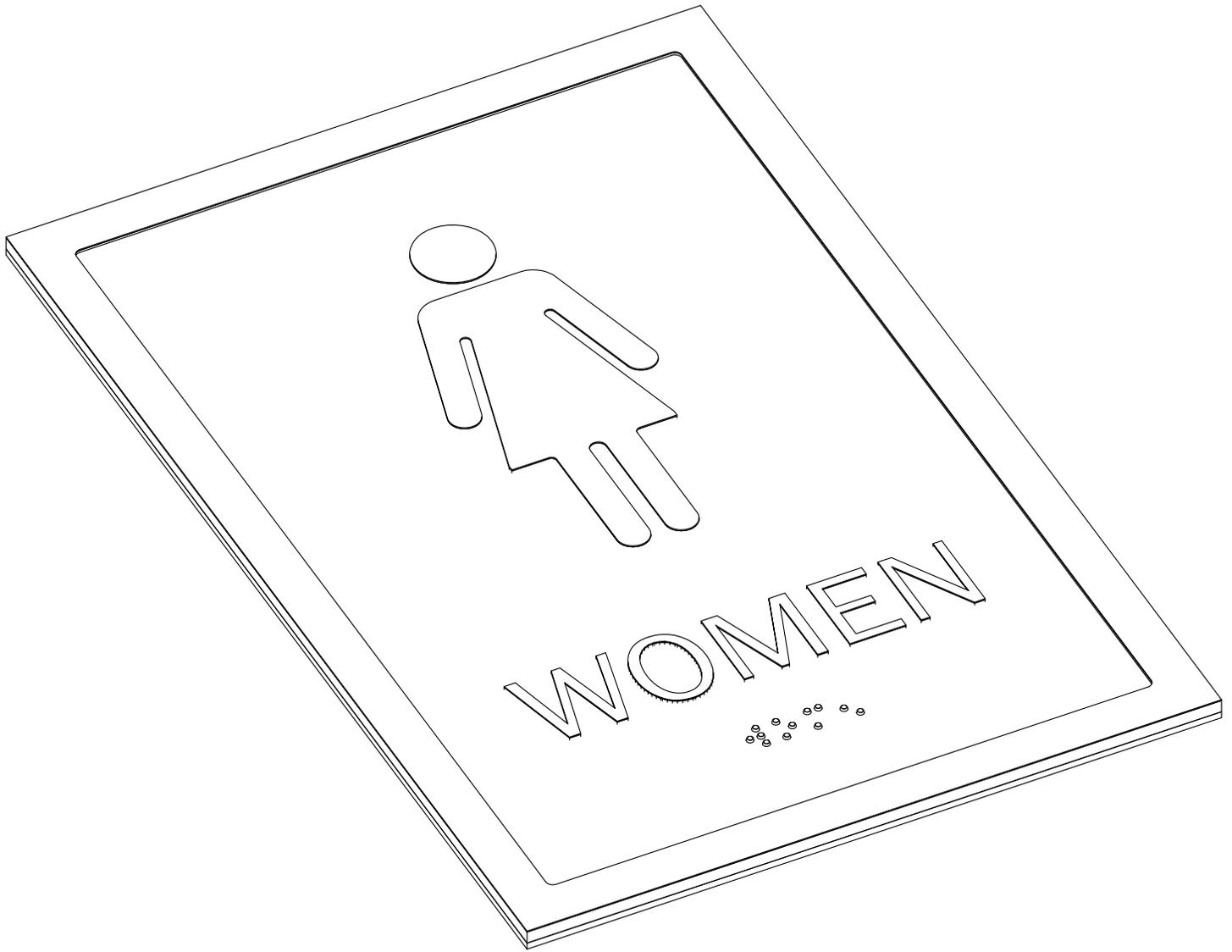
INTERIOR PANEL SIGN
TYPE: B3

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

10431
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0.8 x SCALE

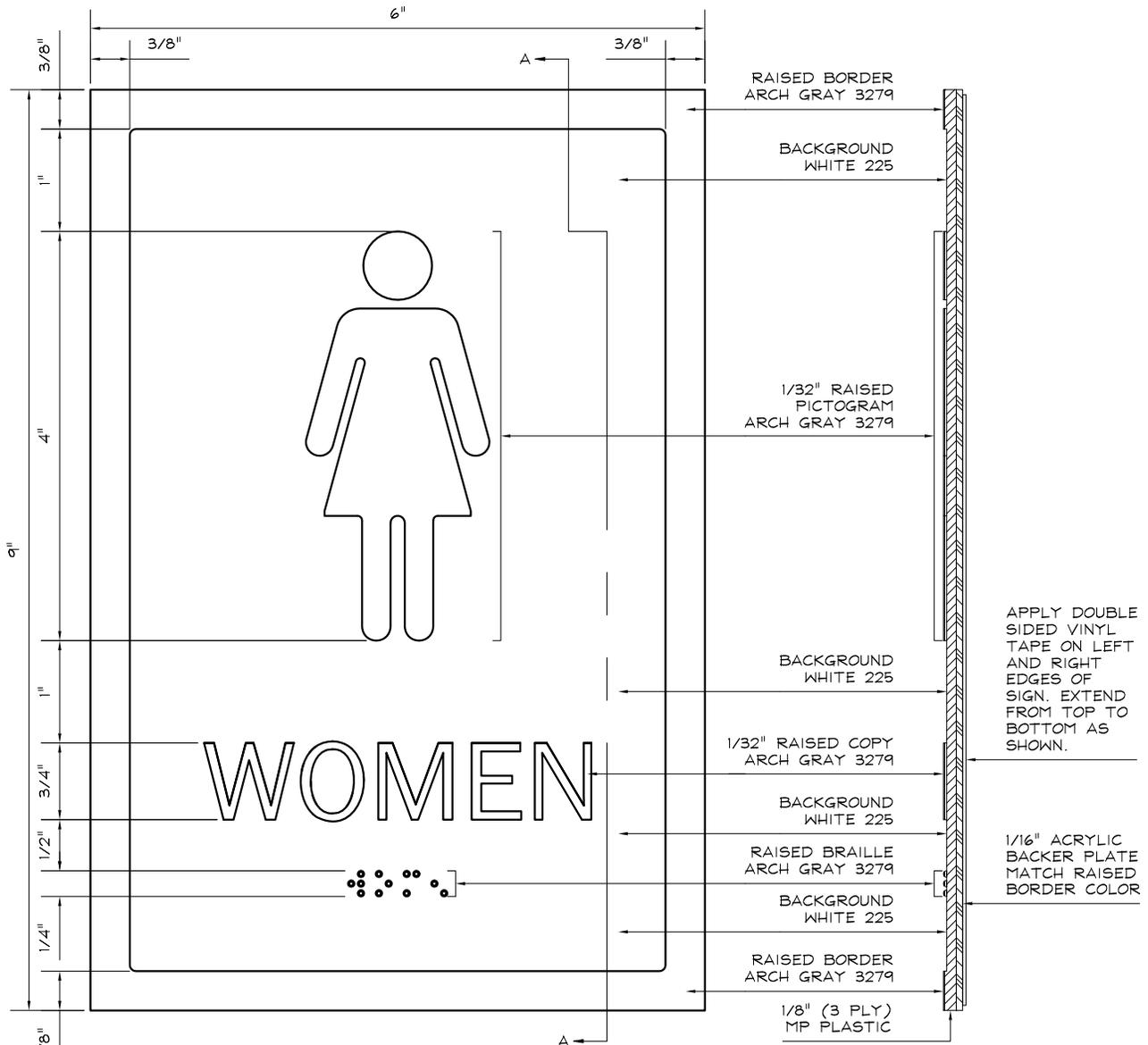
**INTERIOR PANEL SIGN
TYPE: B3**

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SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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B3-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.6 x SCALE

INTERIOR PANEL SIGN
TYPE: B3

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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B3-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



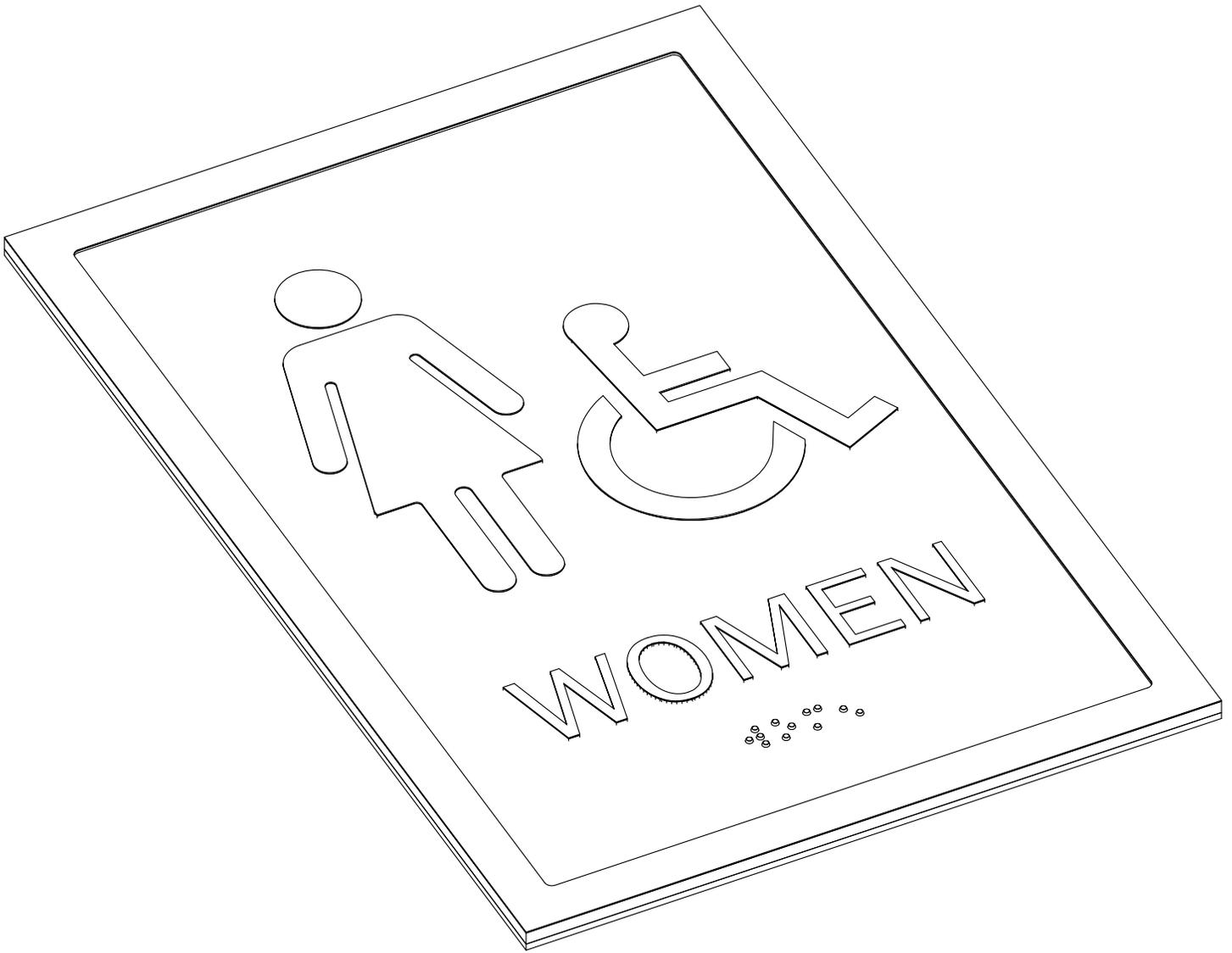
INTERIOR PANEL SIGN
TYPE: B4

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B4-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

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2007
DATE



0.8 x SCALE

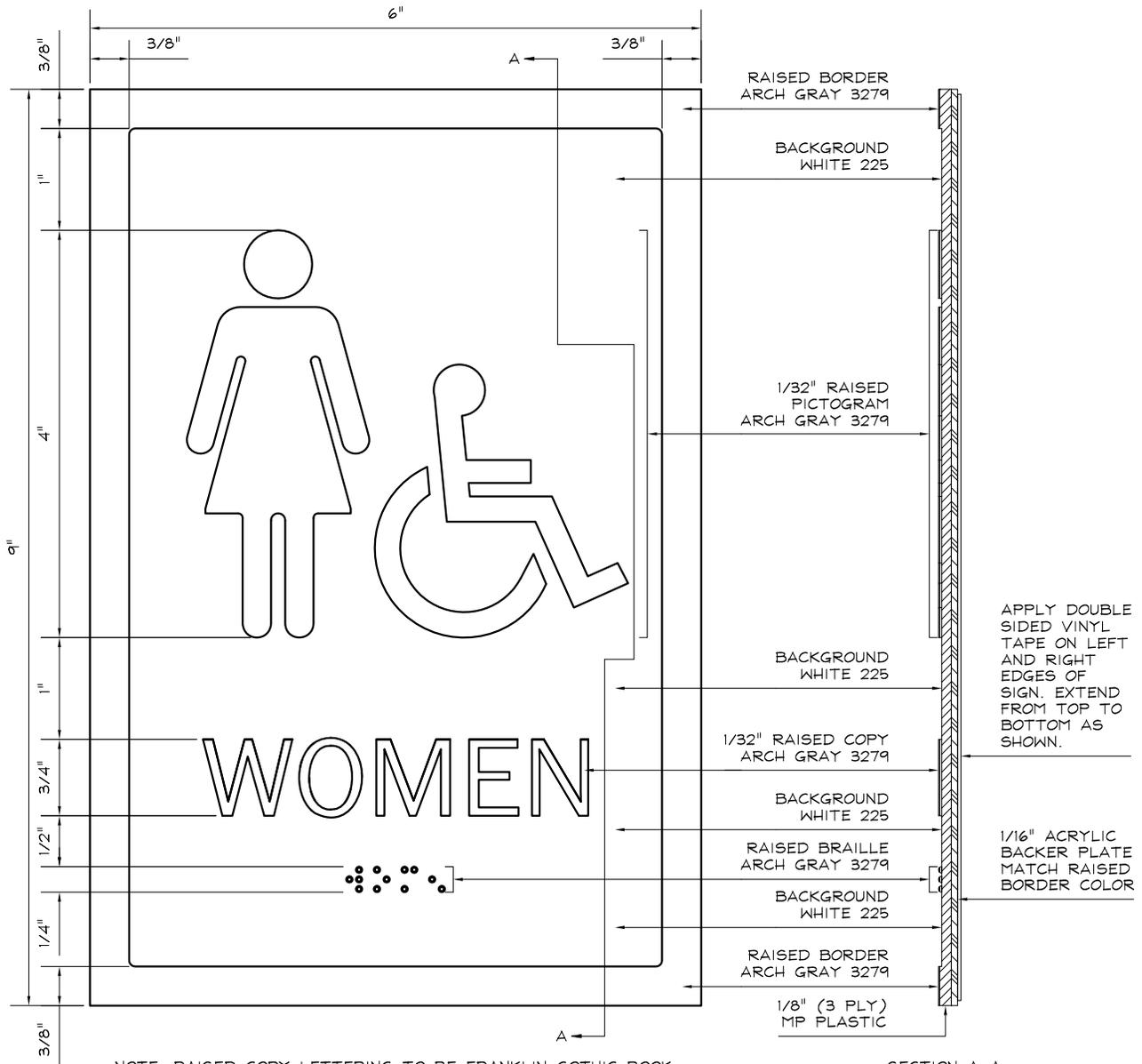
**INTERIOR PANEL SIGN
TYPE: B4**

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SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
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B4-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.6 x SCALE

INTERIOR PANEL SIGN
TYPE: B4

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SPEC. SECTION

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2007
DATE

B4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



RESTROOM



.85 x SCALE

INTERIOR PANEL SIGN
TYPE: B5

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

B5-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009



0.6 x SCALE

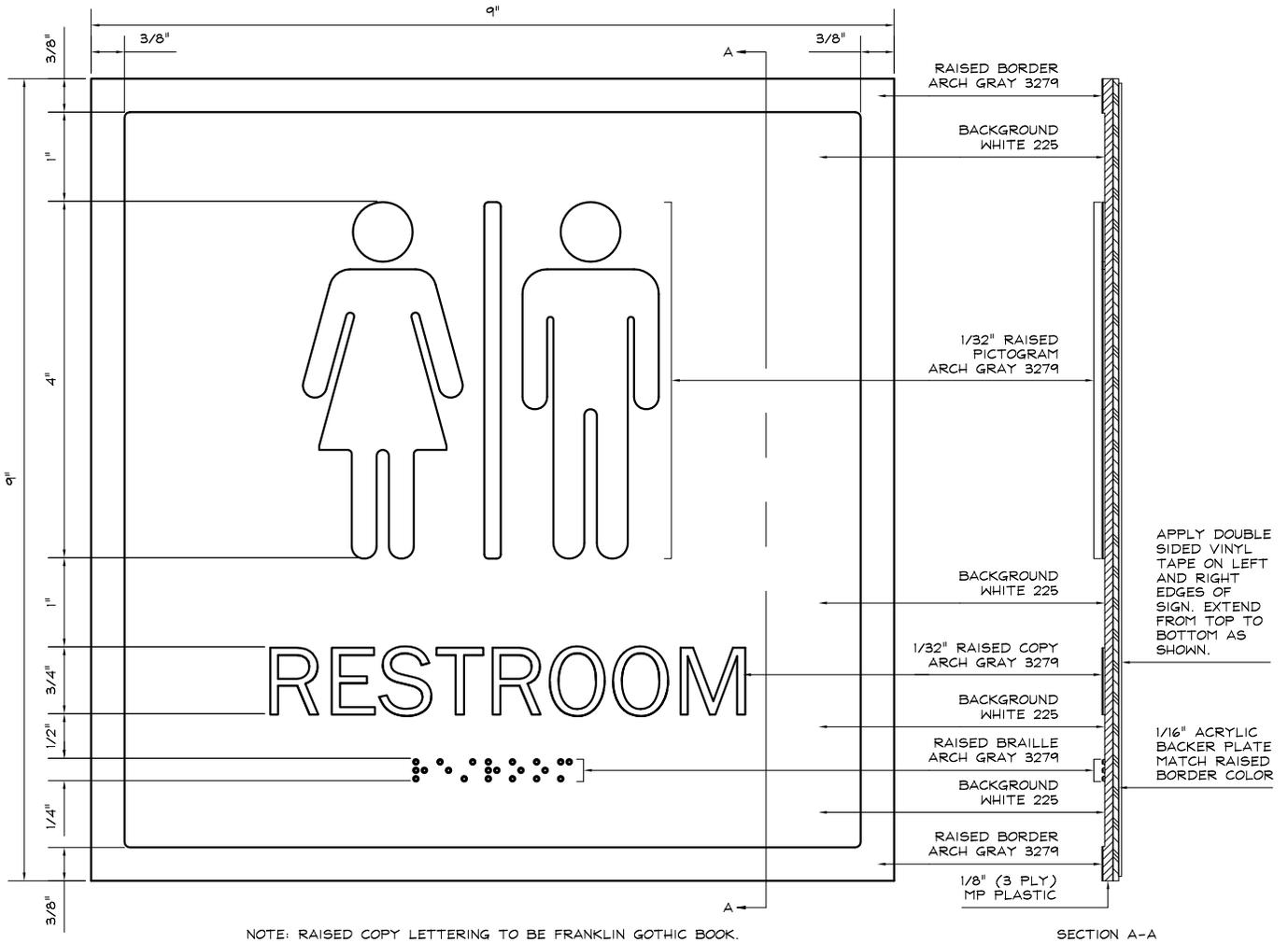
**INTERIOR PANEL SIGN
TYPE: B5**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

B5-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: B5**

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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B5-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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RESTROOM



INTERIOR PANEL SIGN
TYPE: B6

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B6-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

.85 x SCALE

10431
SPEC. SECTION

2007
DATE



0.6 x SCALE

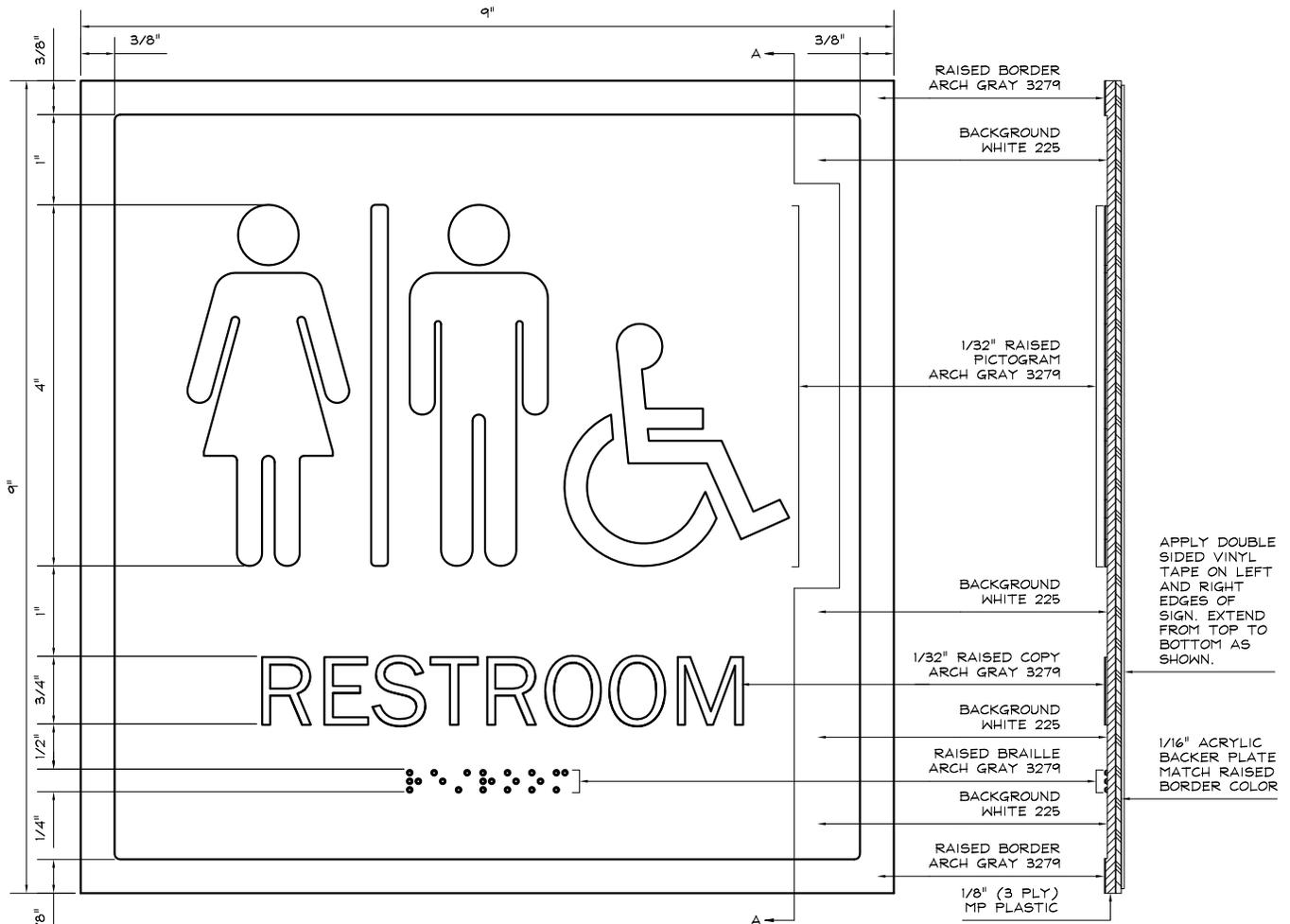
**INTERIOR PANEL SIGN
TYPE: B6**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

B6-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: B6**

10431

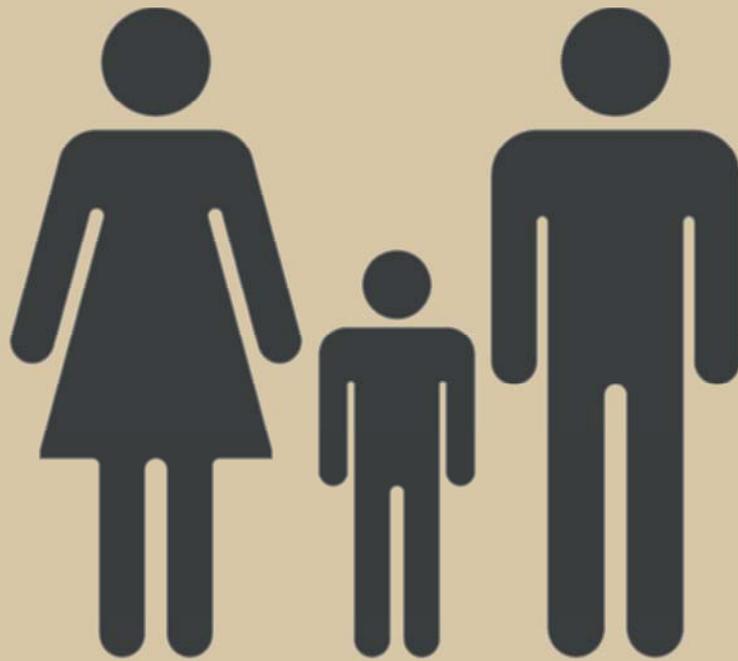
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007

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B6-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



RESTROOM



INTERIOR PANEL SIGN
TYPE: B7

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B7-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

.85 x SCALE

10431
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2007
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0.6 x SCALE

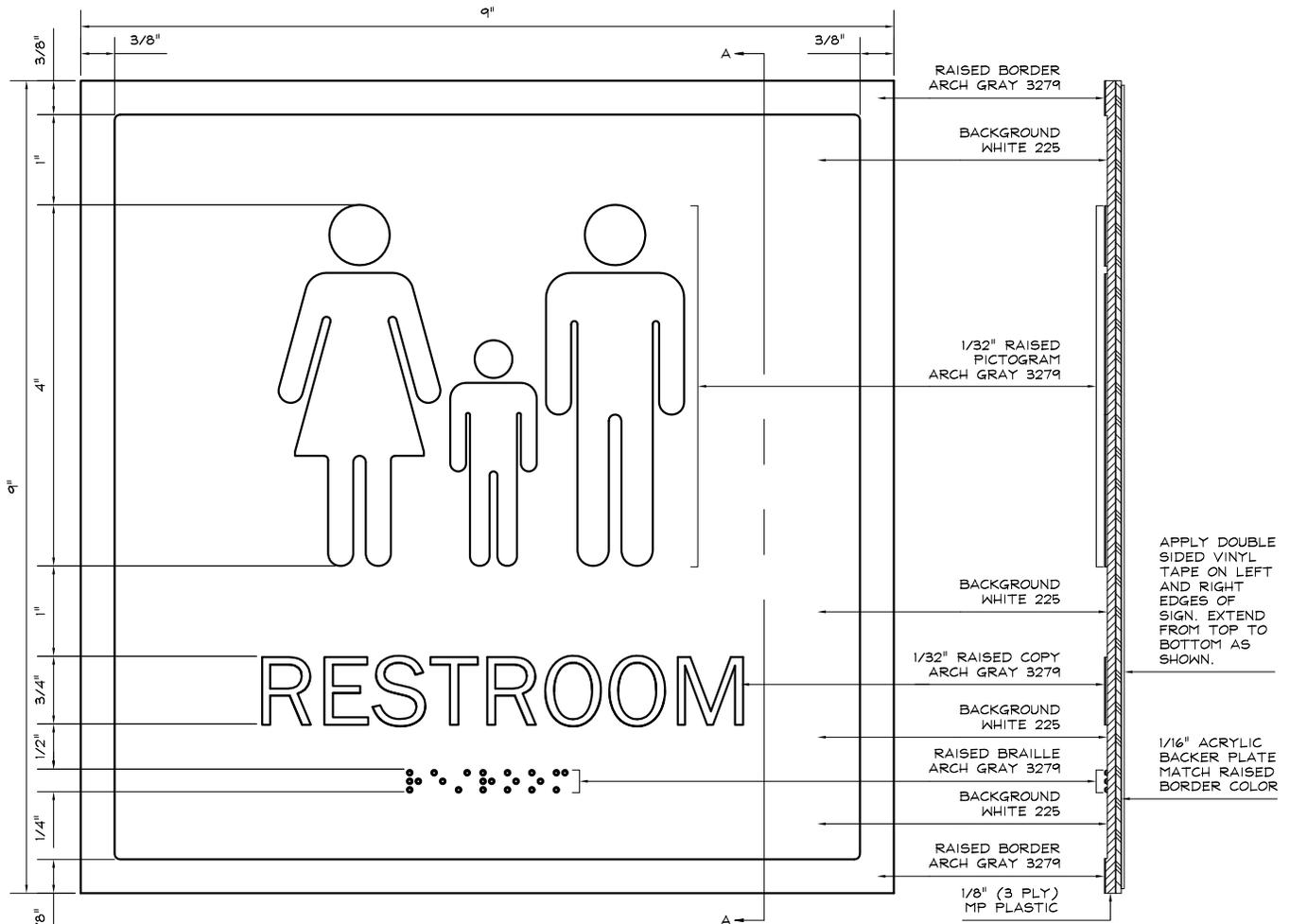
**INTERIOR PANEL SIGN
TYPE: B7**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

B7-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: B7

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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B7-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



RESTROOM



INTERIOR PANEL SIGN
TYPE: B8

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B8-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

.85 x SCALE

10431
SPEC. SECTION

2007
DATE



0.6 x SCALE

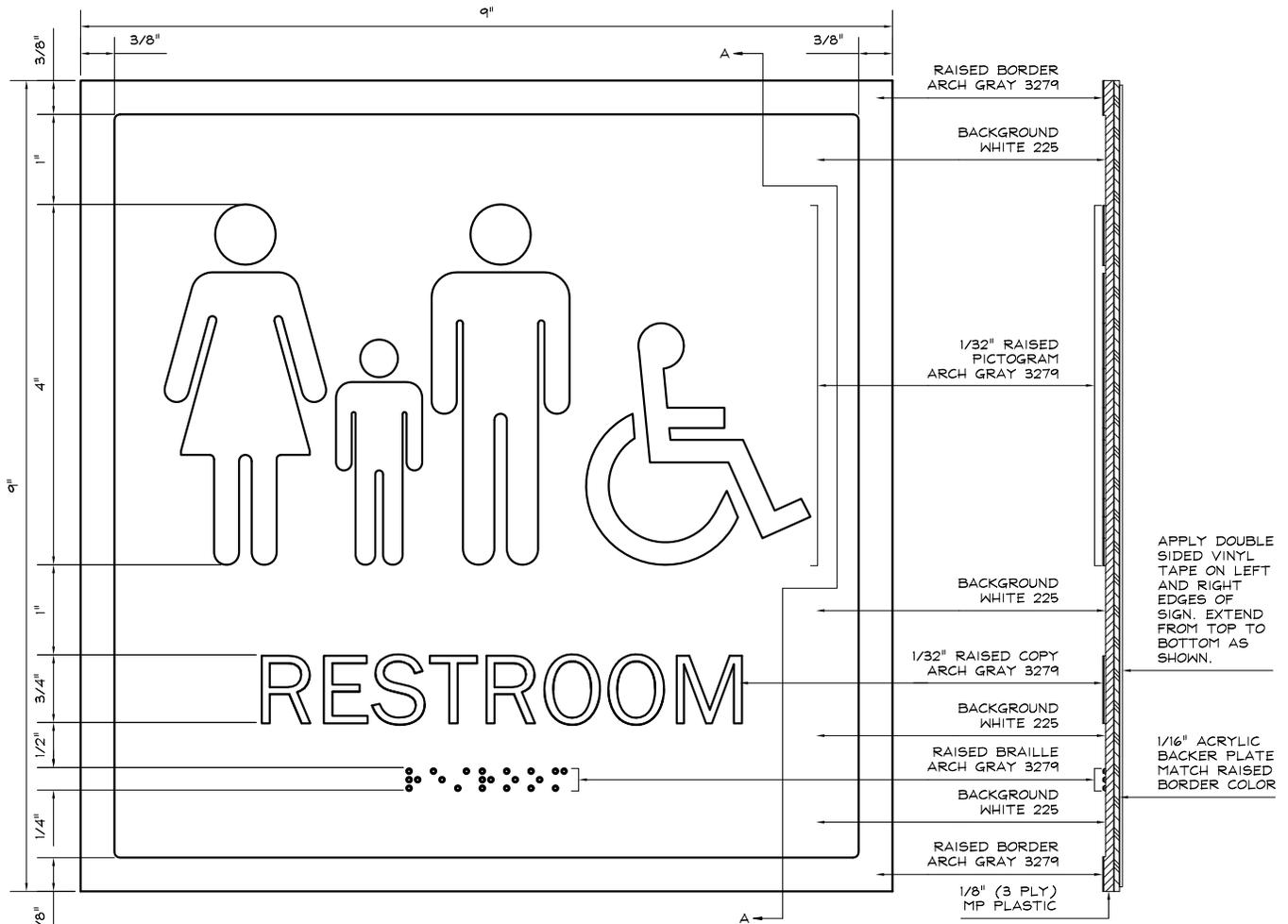
**INTERIOR PANEL SIGN
TYPE: B8**

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SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

B8-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: B8**

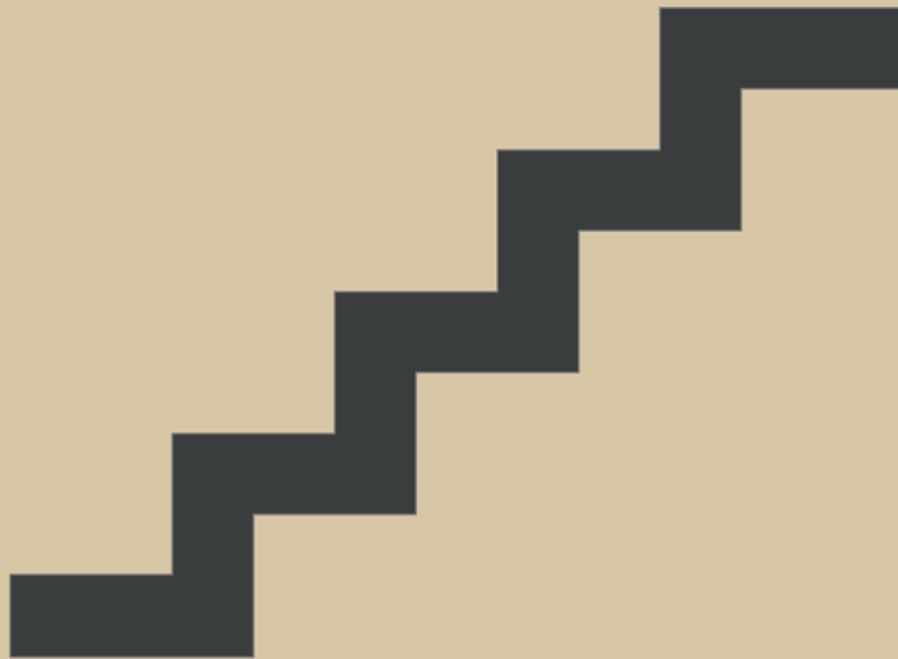
**10431
SPEC. SECTION**

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B8-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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STAIR S1



.85 x SCALE

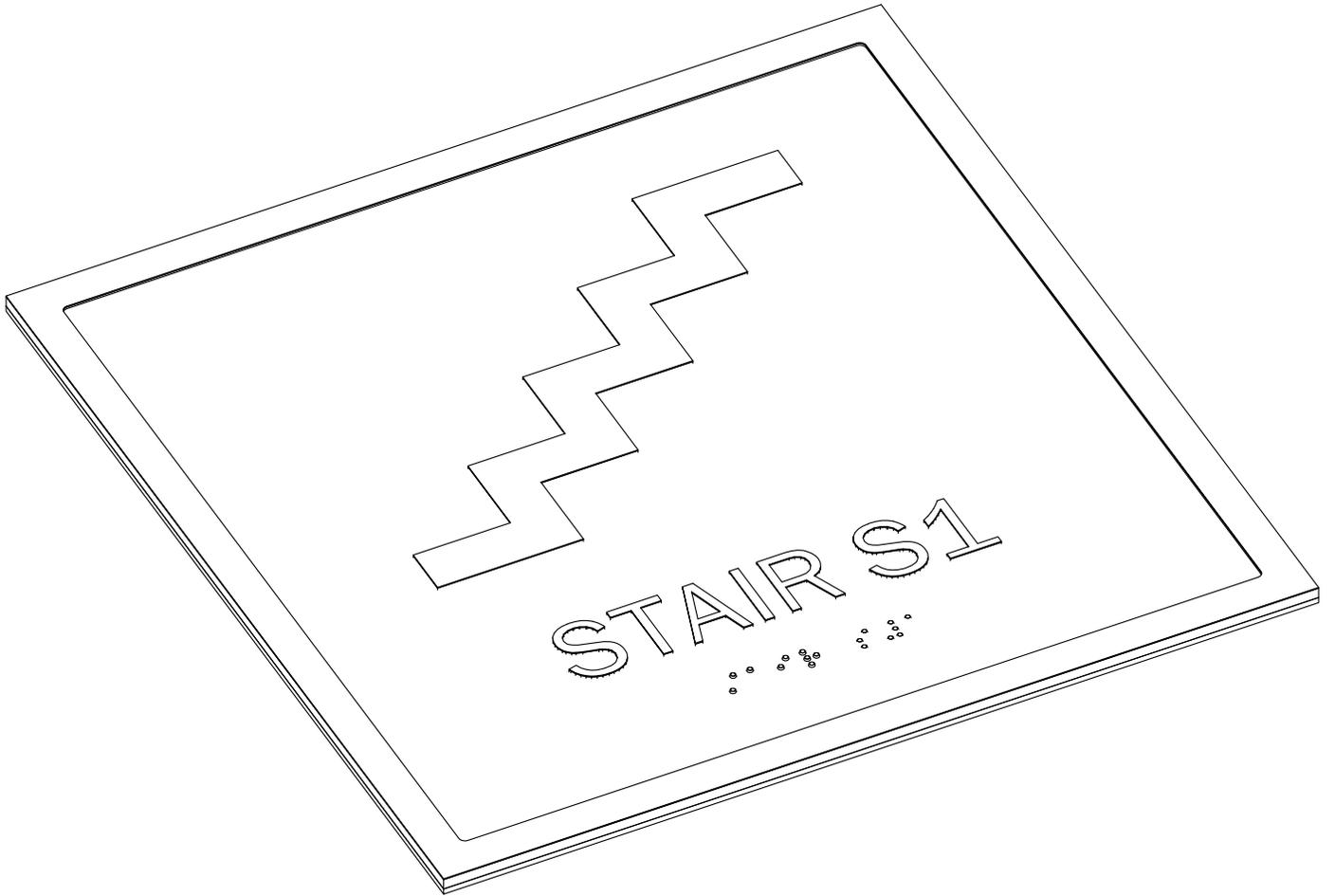
INTERIOR PANEL SIGN
TYPE: C1

10431
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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

C1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.6 x SCALE

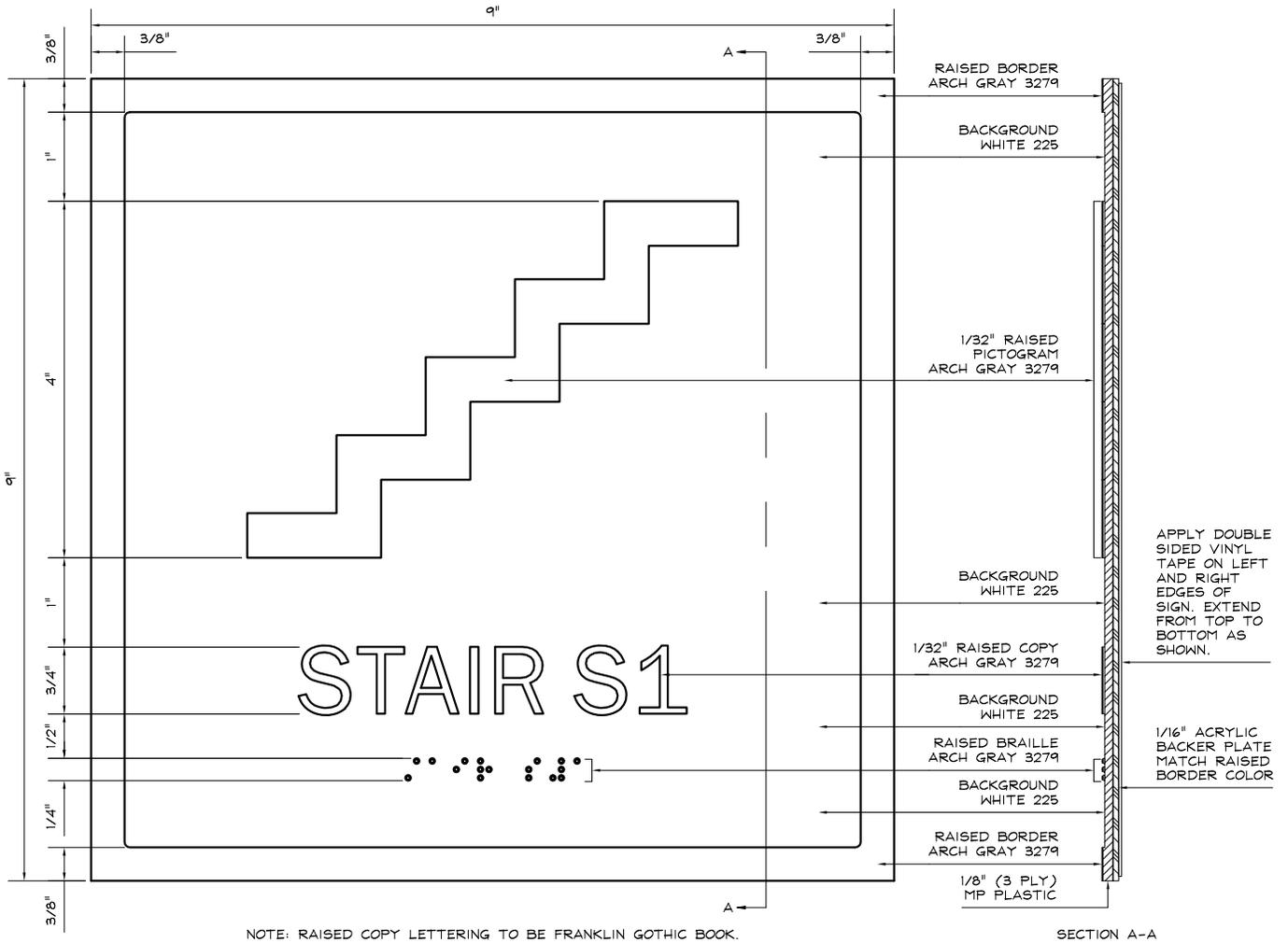
**INTERIOR PANEL SIGN
TYPE: C1**

10431
SPEC. SECTION

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2007
DATE

C1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: C1**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

C1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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2007

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STAIR LEVEL 1



.85 x SCALE

**INTERIOR PANEL SIGN
TYPE: C2**

**10431
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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

**2007
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C2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

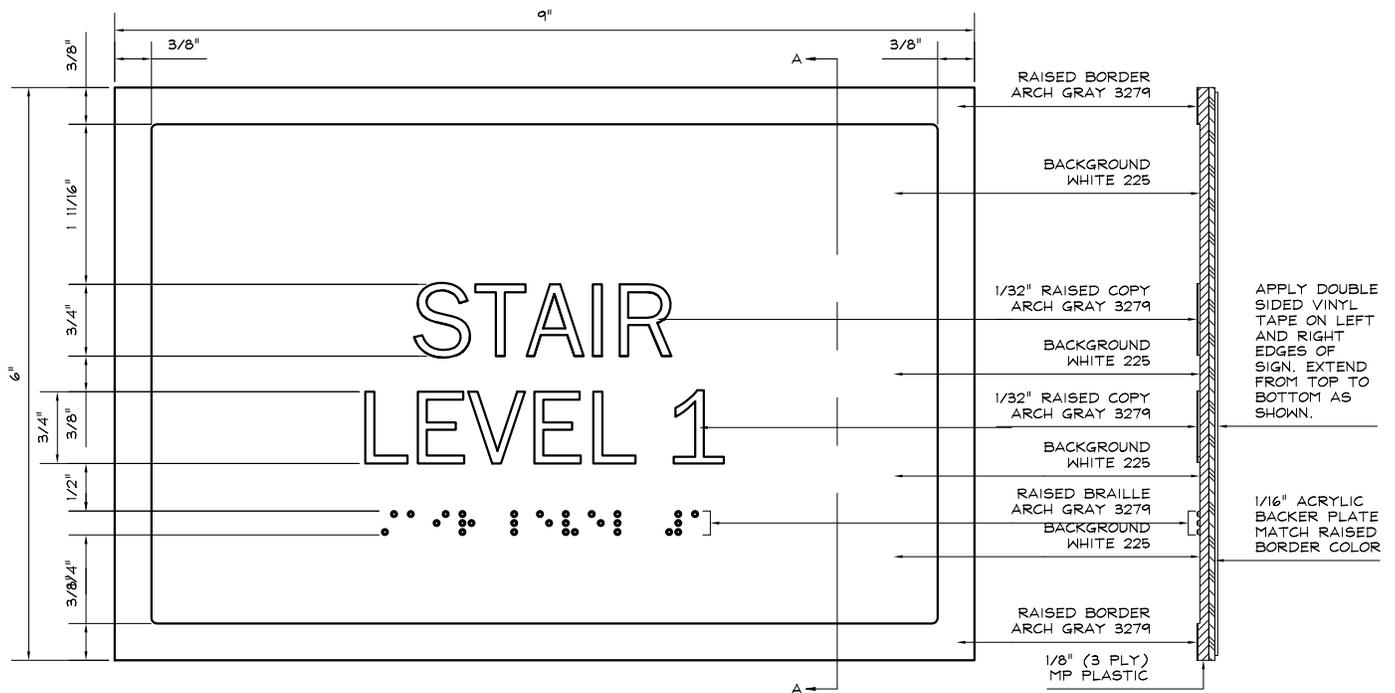
**INTERIOR PANEL SIGN
TYPE: C2**

10431
SPEC. SECTION

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2007
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C2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: C2

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LEVEL 1



.85 x SCALE

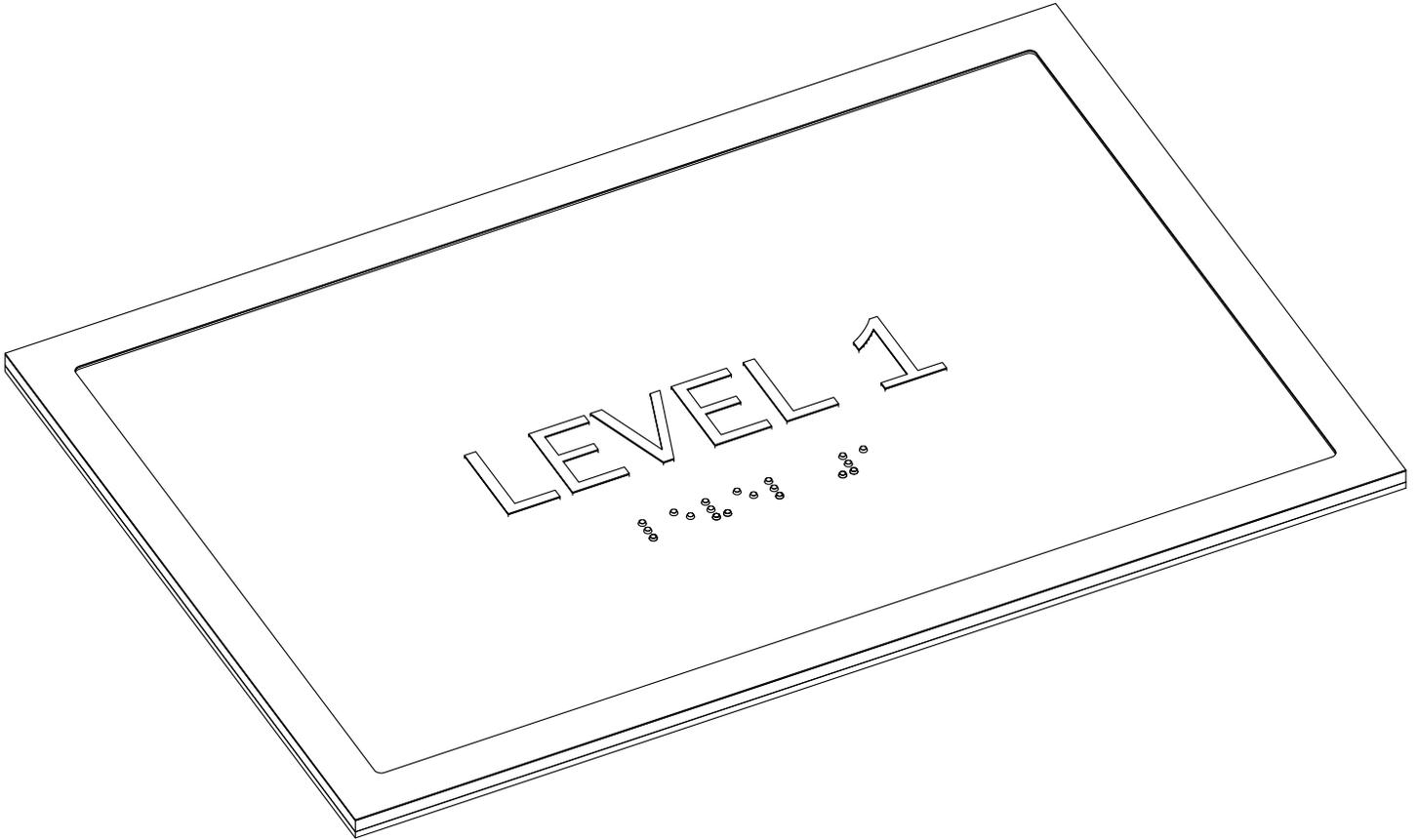
INTERIOR PANEL SIGN
TYPE: C3

10431
SPEC. SECTION

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2007
DATE

C3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

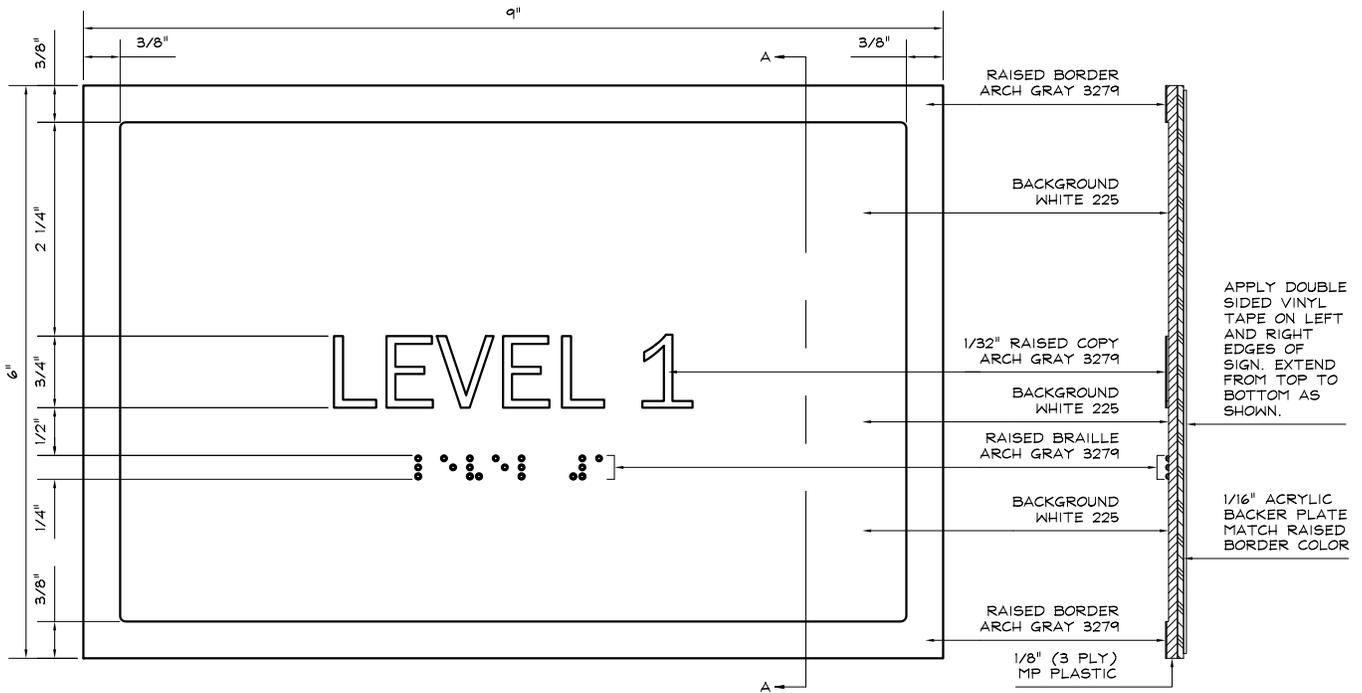
**INTERIOR PANEL SIGN
TYPE: C3**

10431
SPEC. SECTION

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DATE

C3-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: C3

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SPEC. SECTION

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STAIR S1
(BASEMENT TO LEVEL 9)

3

PROCEED DOWN TO
LEVEL 1 TO EXIT BUILDING

FIREMAN'S ROOF ACCESS

STAIR S1
PROCEED DOWN TO
LEVEL 1 TO EXIT BUILDING
FIREMAN'S ROOF ACCESS

.5 x SCALE

INTERIOR PANEL SIGN
TYPE: C4

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C4-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.4 x SCALE

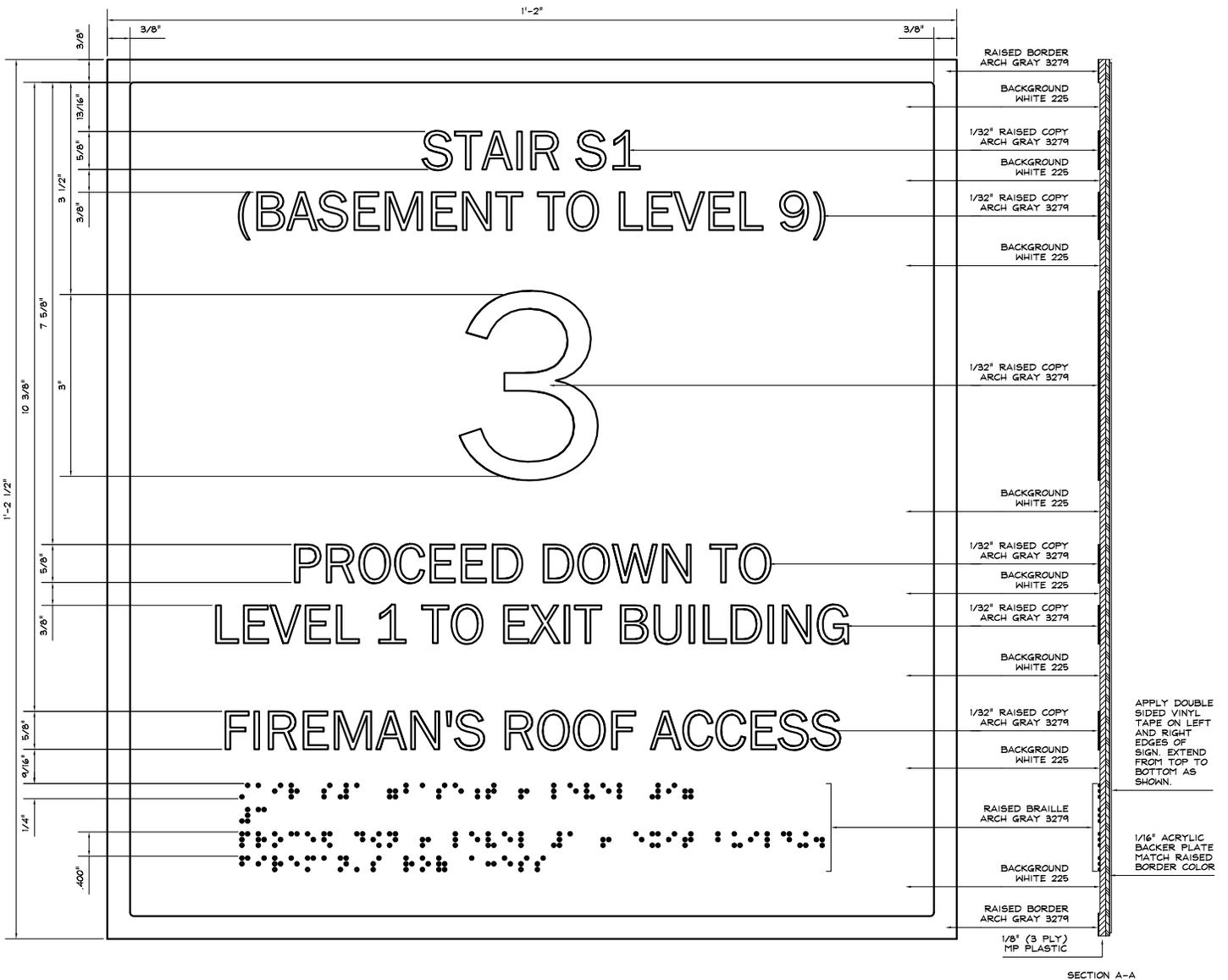
INTERIOR PANEL SIGN
TYPE: C4

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
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C4-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.375 x SCALE

INTERIOR PANEL SIGN
TYPE: C4

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SPEC. SECTION

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C4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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.6 x SCALE

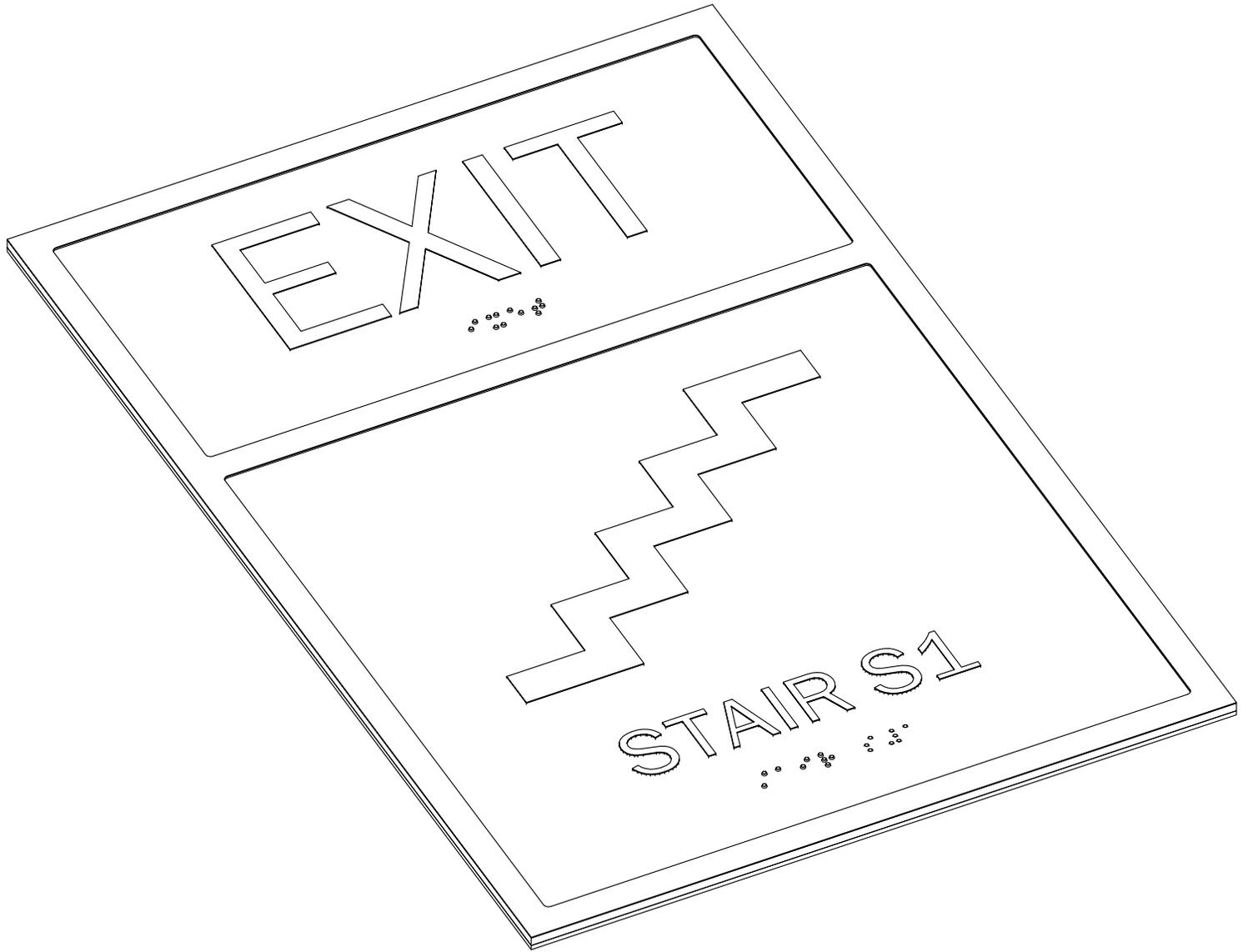
INTERIOR PANEL SIGN
TYPE: C5

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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C5-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.55 x SCALE

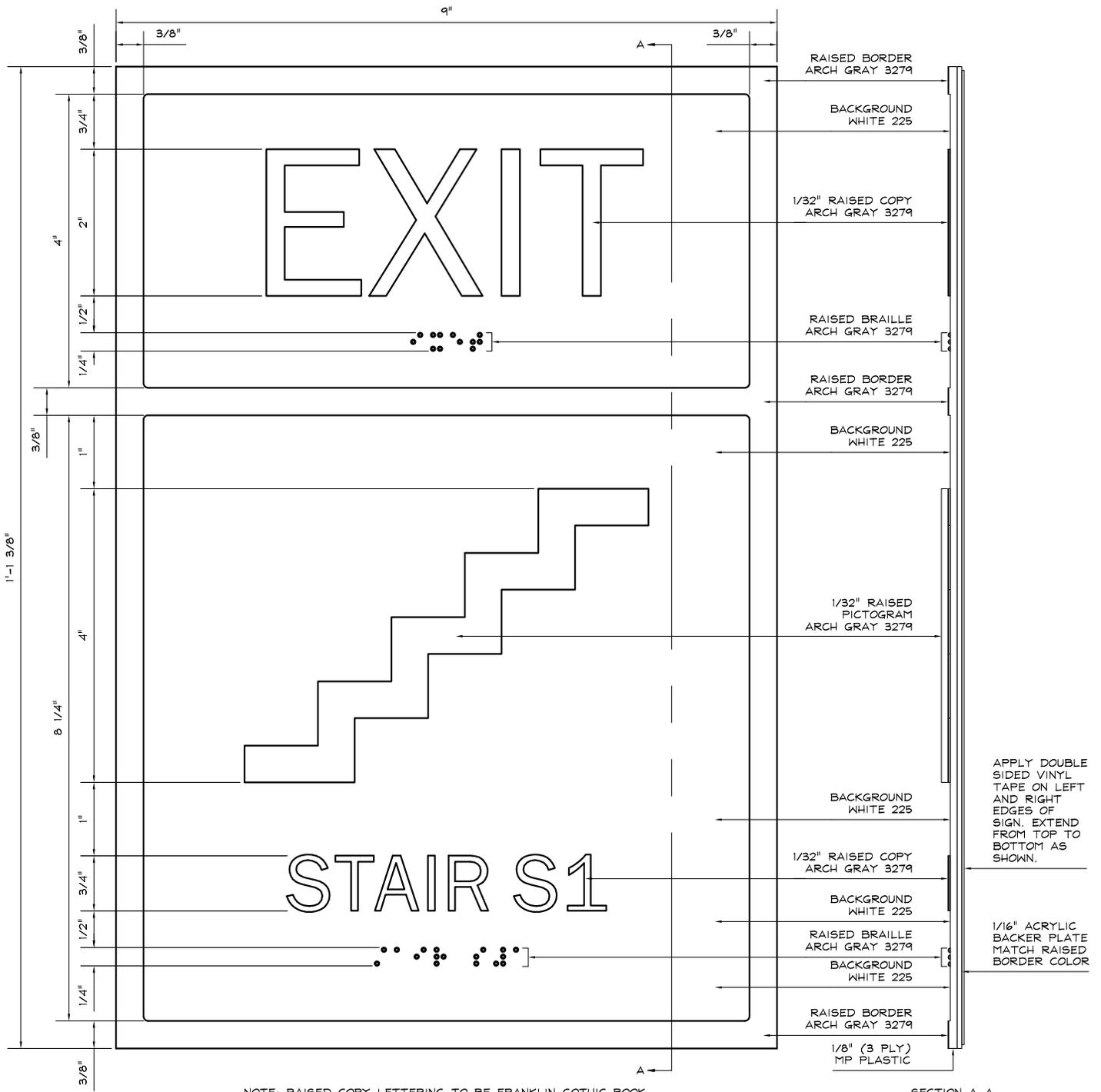
**INTERIOR PANEL SIGN
TYPE: C5**

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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C5-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: C5

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C5-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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ELEVATOR LEVEL 1



.85 x SCALE

**INTERIOR PANEL SIGN
TYPE: D1**

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D1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

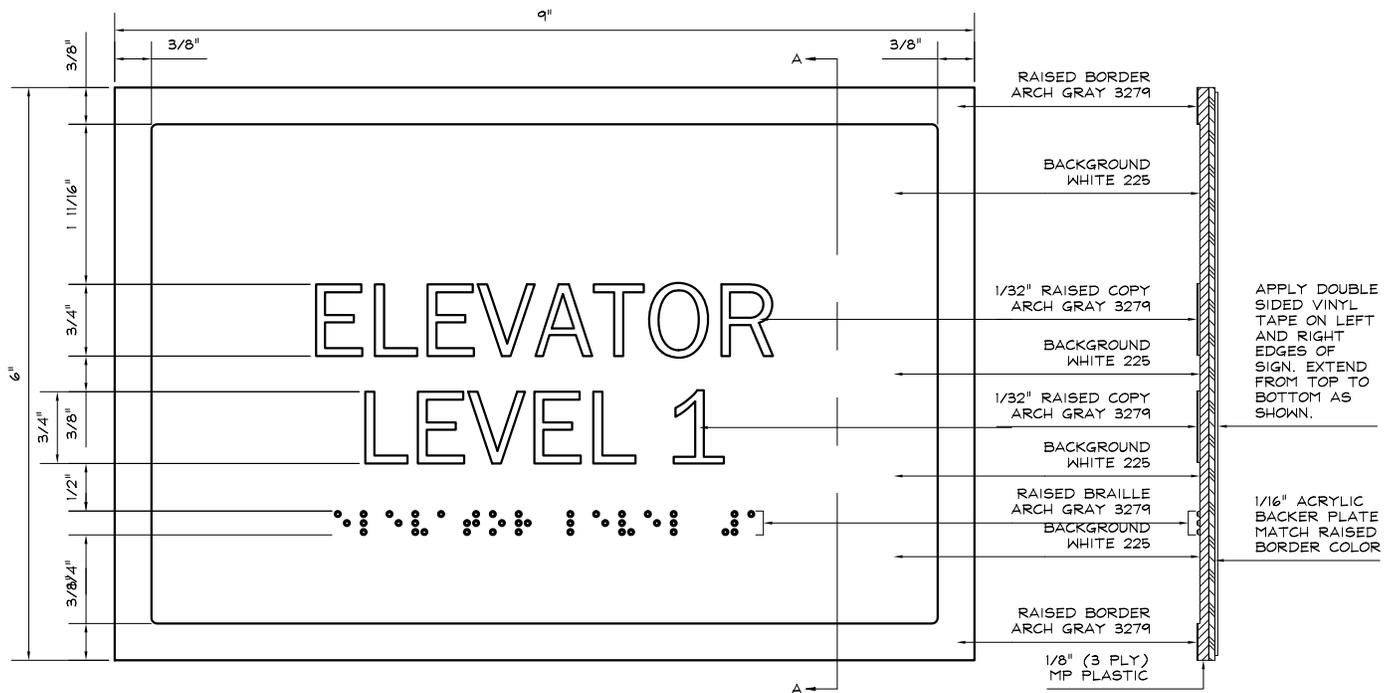
**INTERIOR PANEL SIGN
TYPE: D1**

10431
SPEC. SECTION

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DATE

D1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: D1

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INTERIOR PANEL SIGN
TYPE: D2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

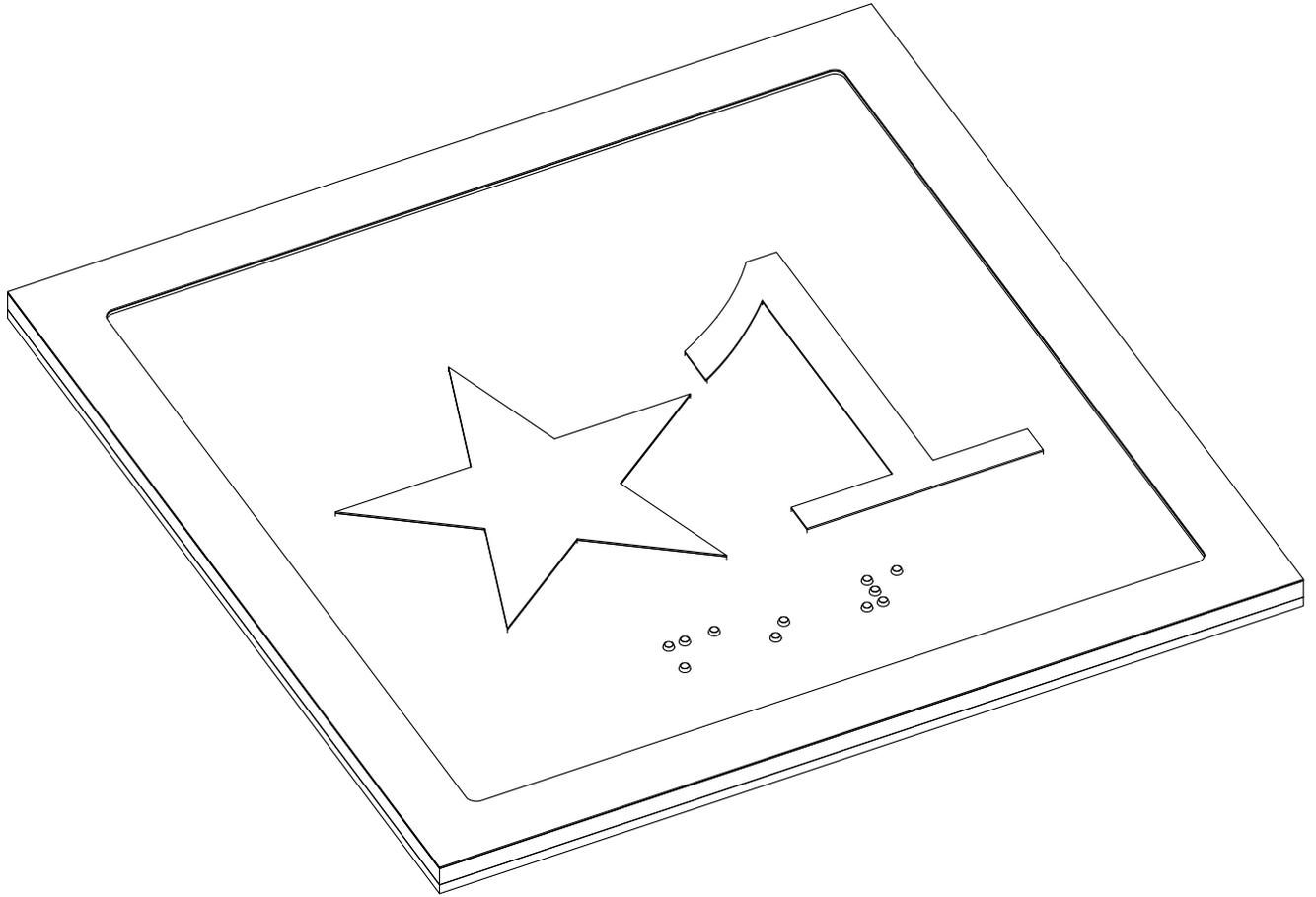
D2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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DATE



INTERIOR PANEL SIGN
TYPE: D2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

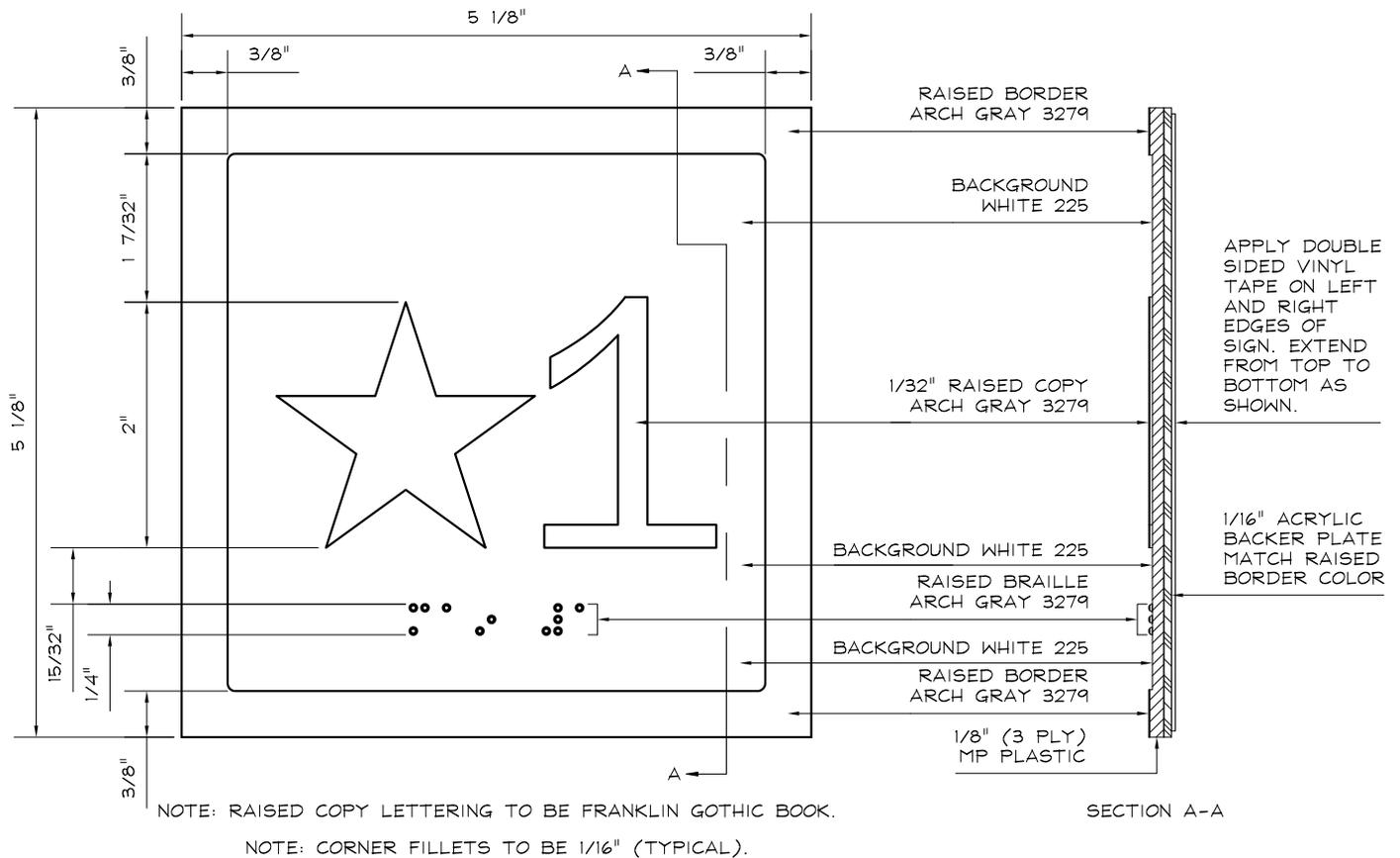
D2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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SPEC. SECTION

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DATE



0.65 x SCALE

INTERIOR PANEL SIGN
TYPE: D2

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007

D2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

DATE



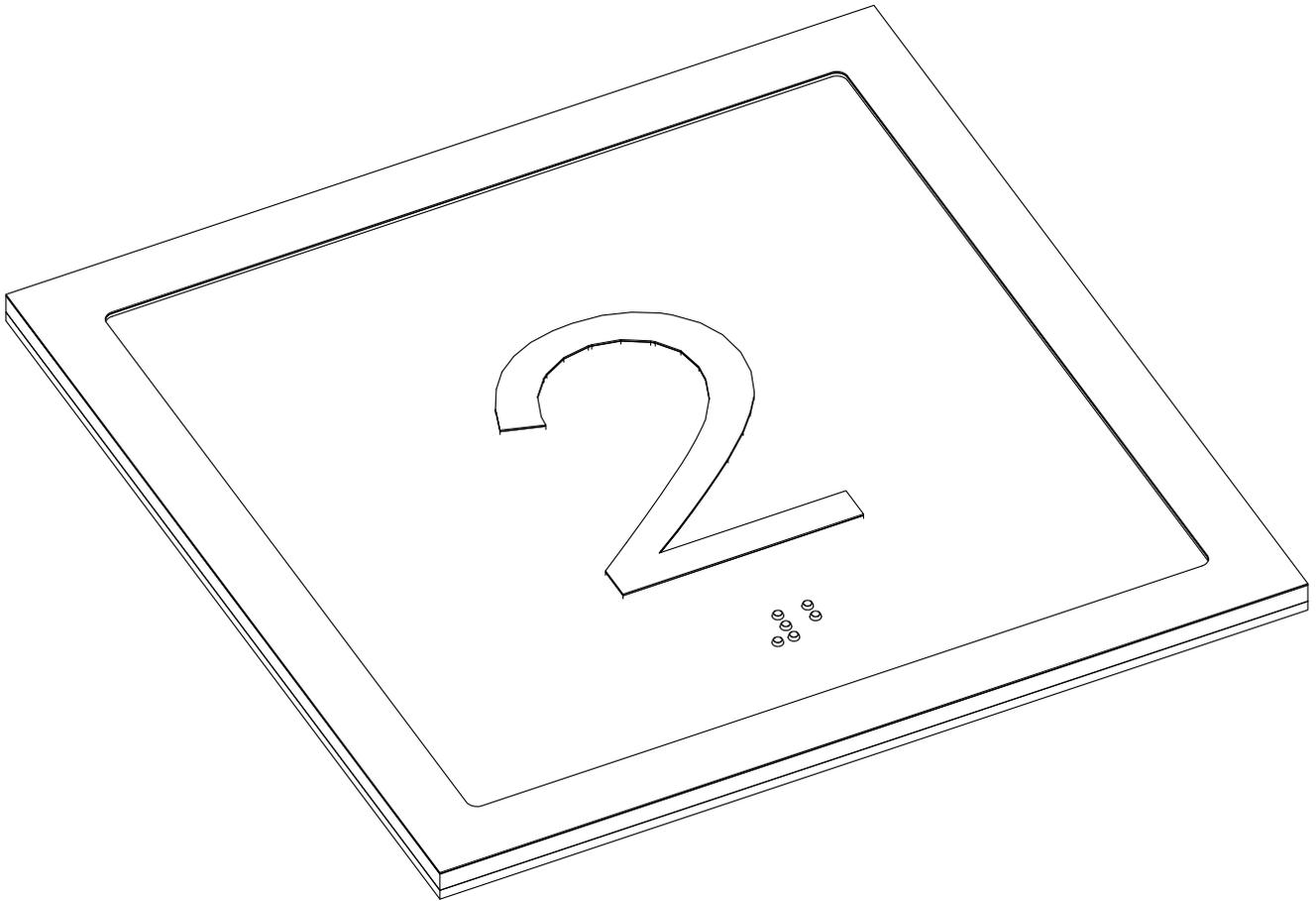
INTERIOR PANEL SIGN
TYPE: D3

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

D3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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SPEC. SECTION

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DATE



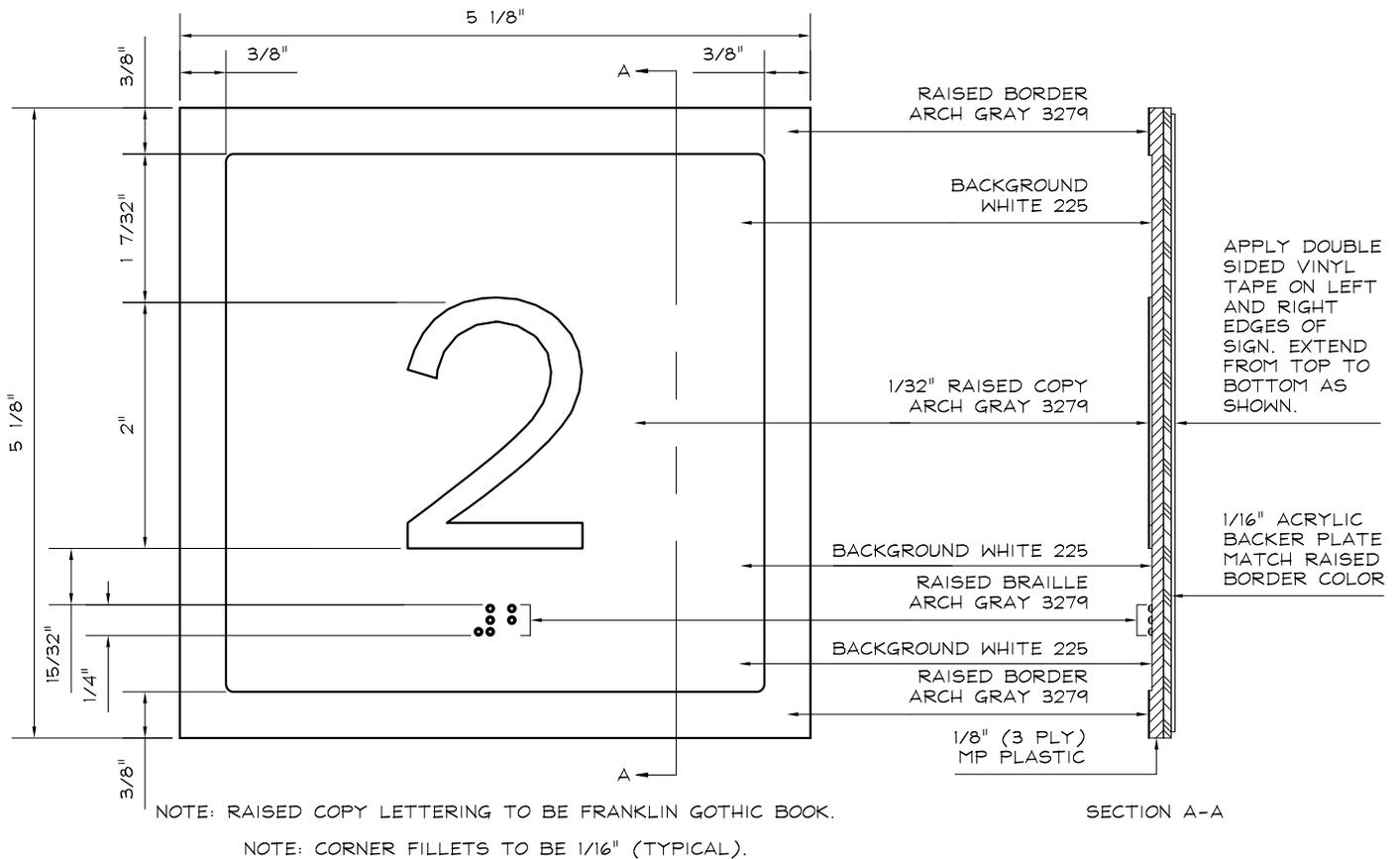
INTERIOR PANEL SIGN
TYPE: D3

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

D3-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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SPEC. SECTION

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DATE



0.65 x SCALE

INTERIOR PANEL SIGN
TYPE: D3

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D3-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

MACHINE ROOM



.85 x SCALE

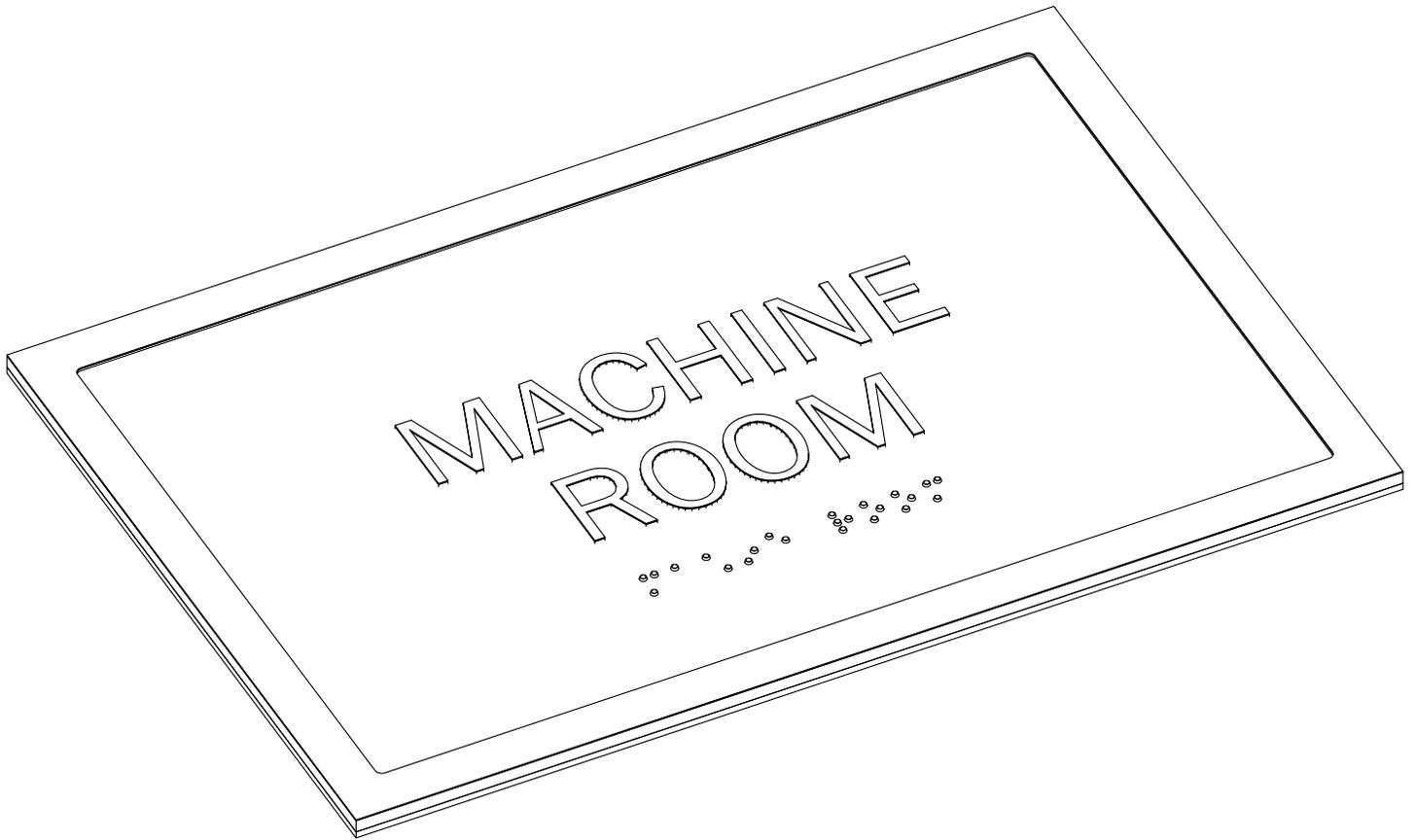
**INTERIOR PANEL SIGN
TYPE: D4**

**10431
SPEC. SECTION**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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DATE**

D4-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

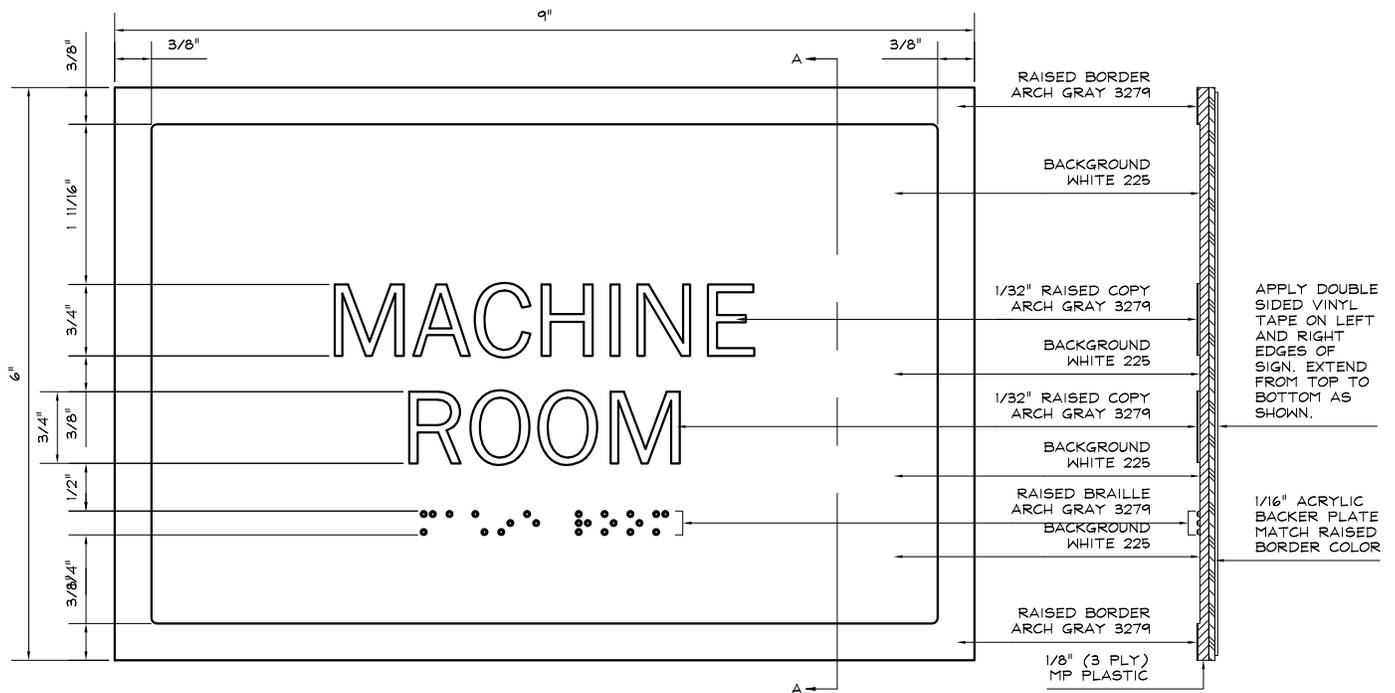
**INTERIOR PANEL SIGN
TYPE: D4**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

D4-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.
 NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

**INTERIOR PANEL SIGN
 TYPE: D4**

**10431
 SPEC. SECTION**

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2007

D4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

DATE

CUSTODIAN



.85 x SCALE

INTERIOR PANEL SIGN
TYPE: E1

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SPEC. SECTION

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E1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

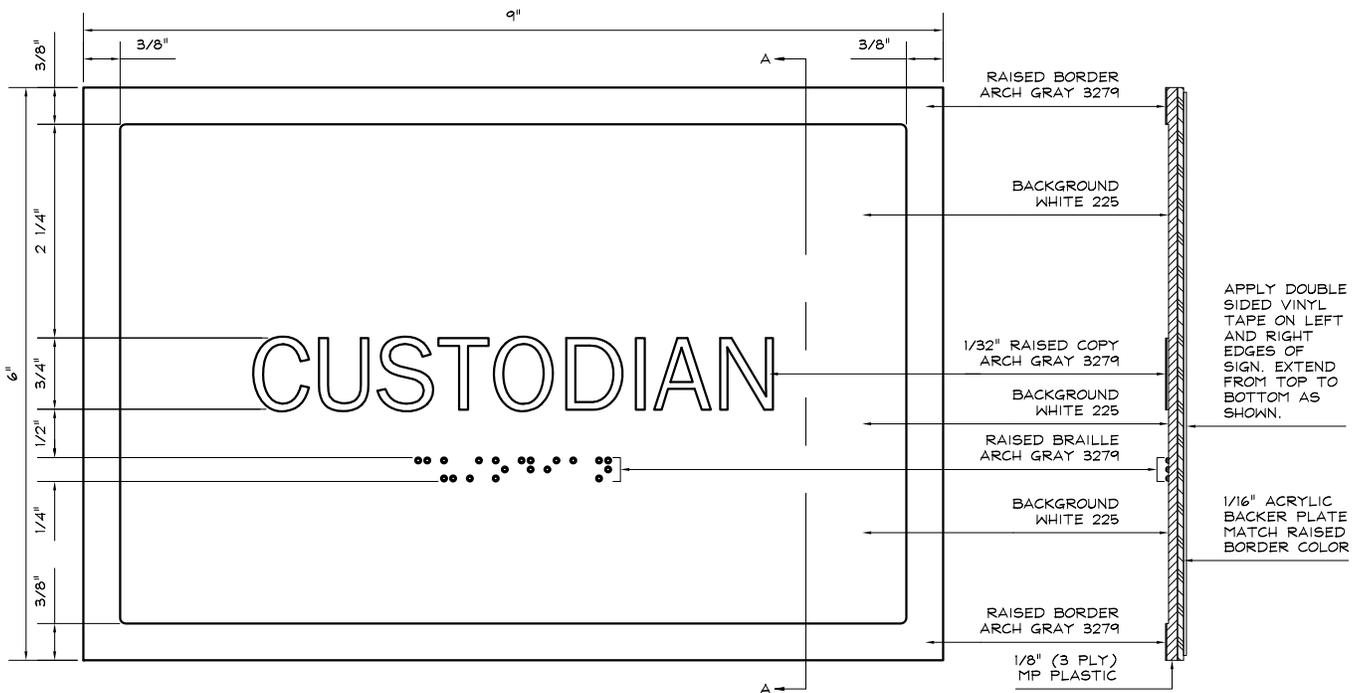
**INTERIOR PANEL SIGN
TYPE: E1**

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SPEC. SECTION

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2007
DATE

E1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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 NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

**INTERIOR PANEL SIGN
 TYPE: E1**

**10431
 SPEC. SECTION**

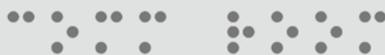
FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007

E1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

DATE

COMM ROOM



.85 x SCALE

**INTERIOR PANEL SIGN
TYPE: E2**

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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DATE**

E2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

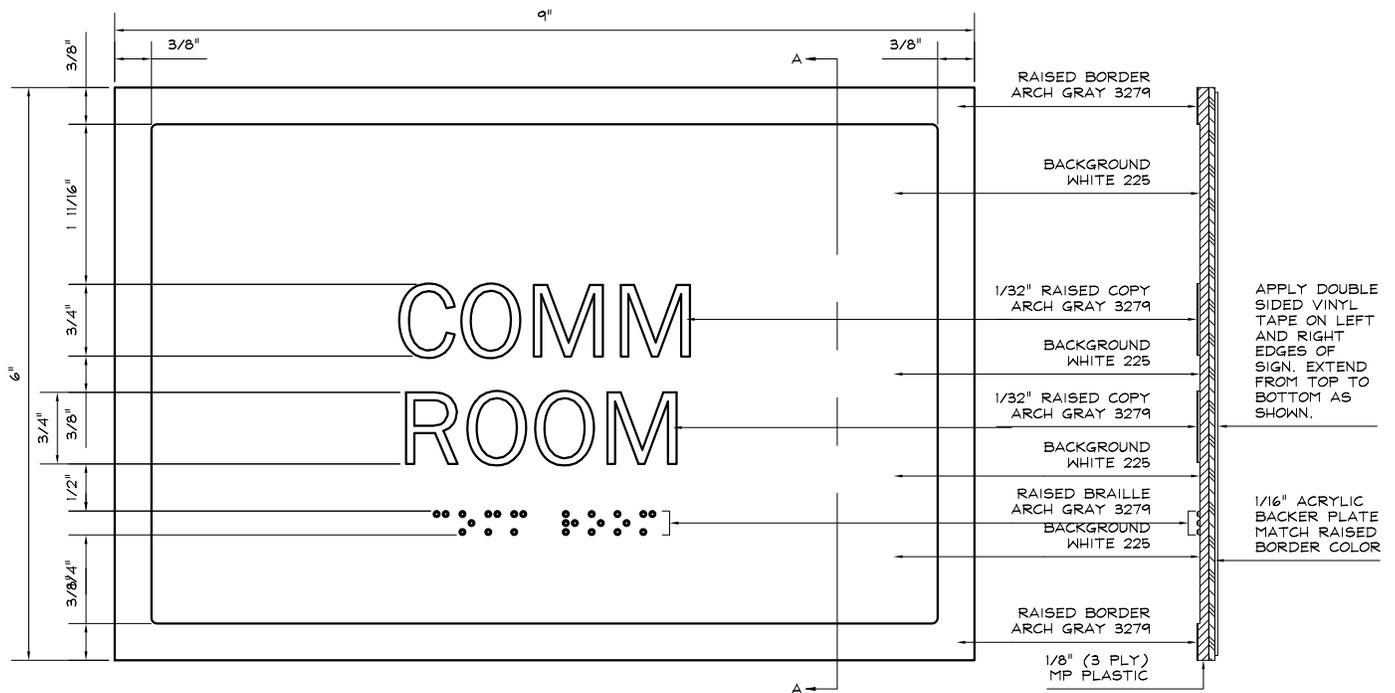
**INTERIOR PANEL SIGN
TYPE: E2**

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SPEC. SECTION

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E2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: E2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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DATE

PLUMBING ACCESS



.85 x SCALE

**INTERIOR PANEL SIGN
TYPE: E3**

**10431
SPEC. SECTION**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

**2007
DATE**

E3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

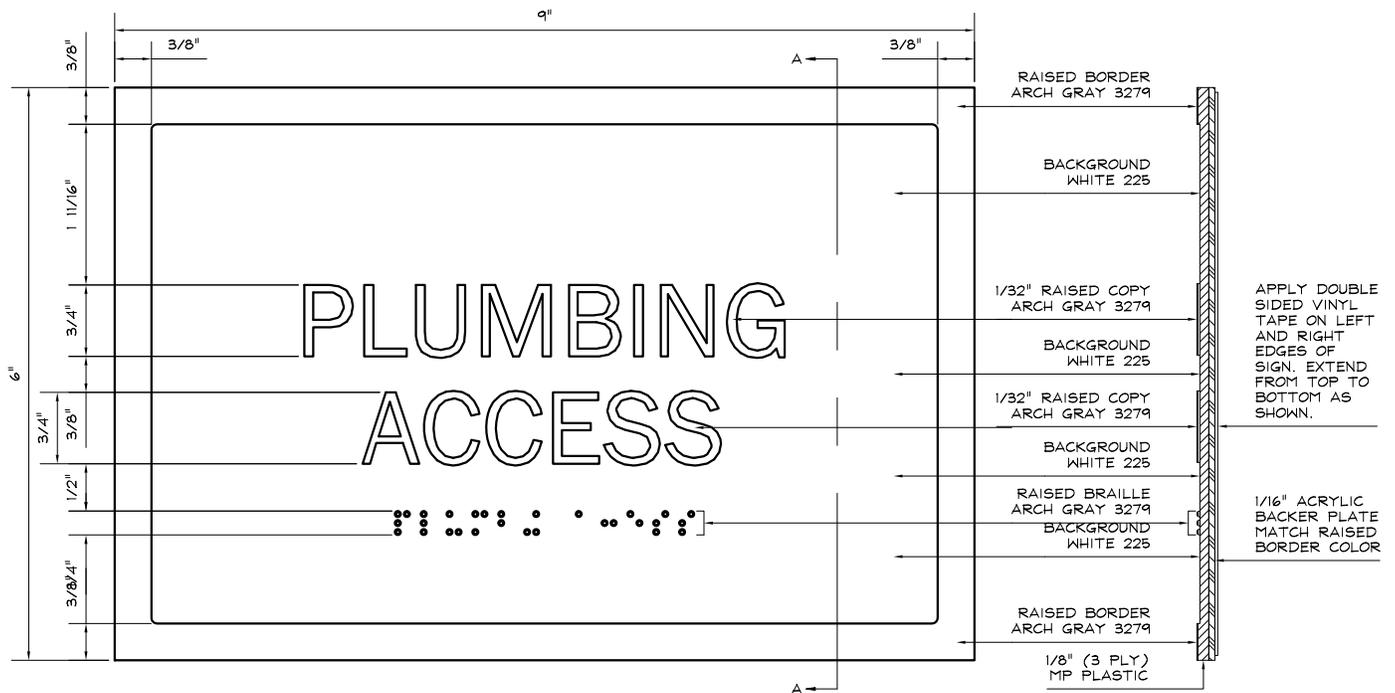
**INTERIOR PANEL SIGN
TYPE: E3**

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SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

E3-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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SECTION A-A

0.5 x SCALE

**INTERIOR PANEL SIGN
 TYPE: E3**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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**2007
 DATE**

MECHANICAL



.85 x SCALE

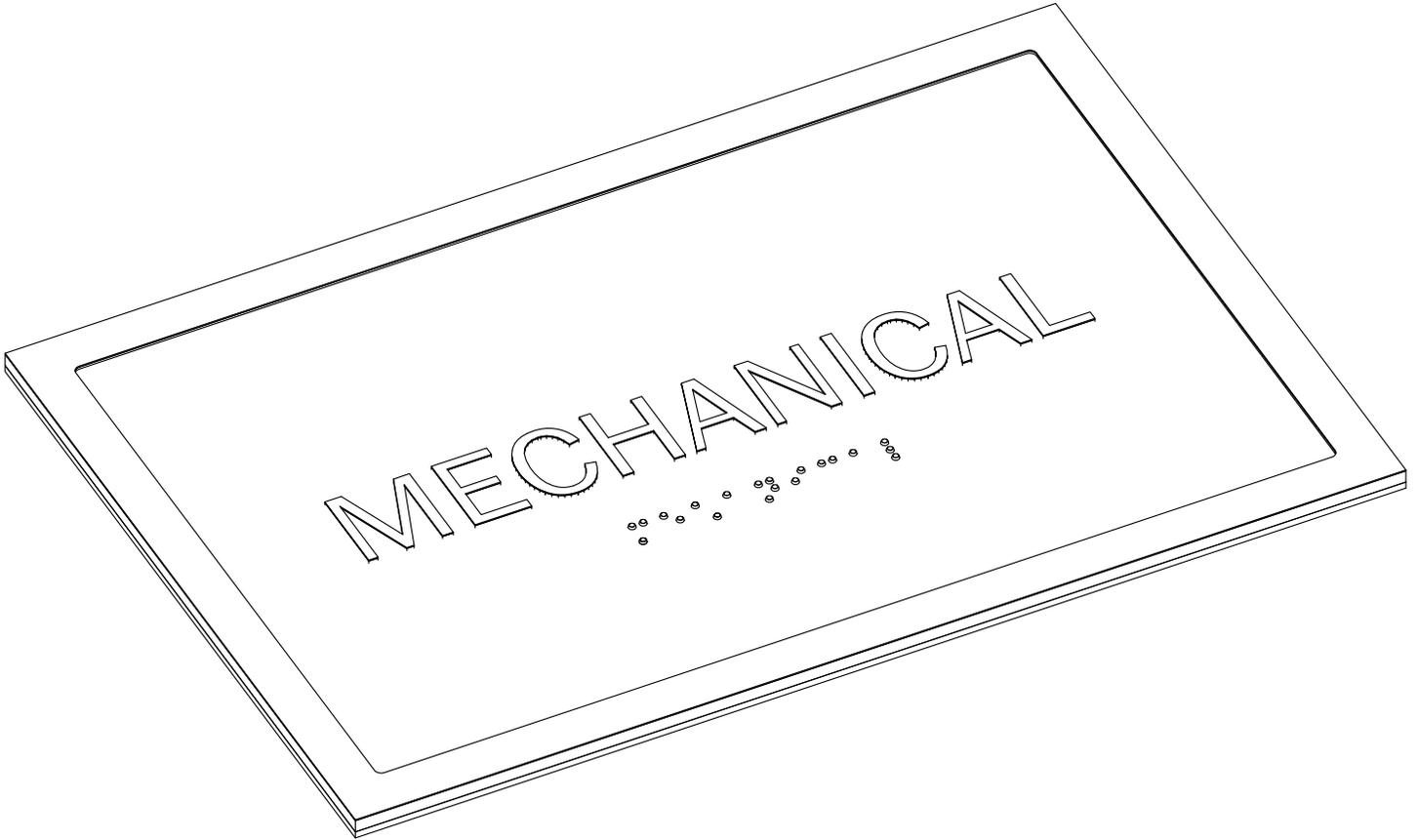
**INTERIOR PANEL SIGN
TYPE: F1**

**10431
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**2007
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F1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

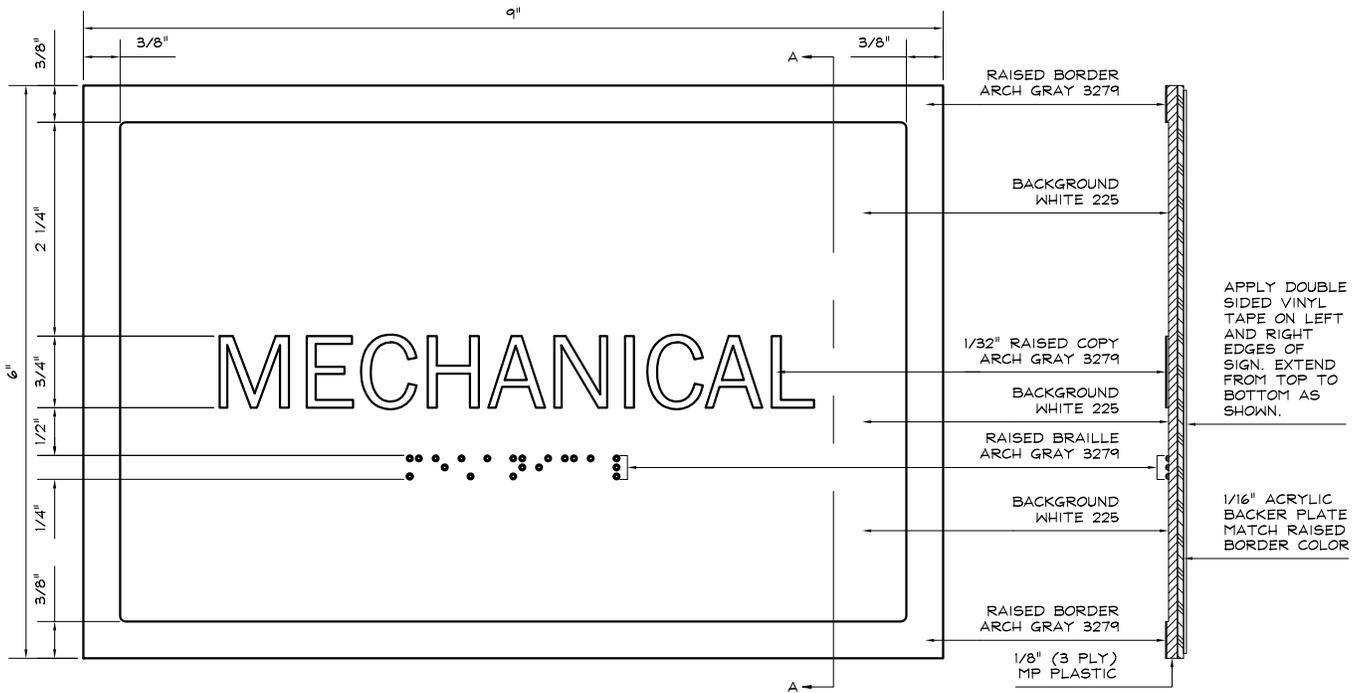
**INTERIOR PANEL SIGN
TYPE: F1**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

F1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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0.5 x SCALE

**INTERIOR PANEL SIGN
 TYPE: F1**

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F1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ELECTRICAL



.85 x SCALE

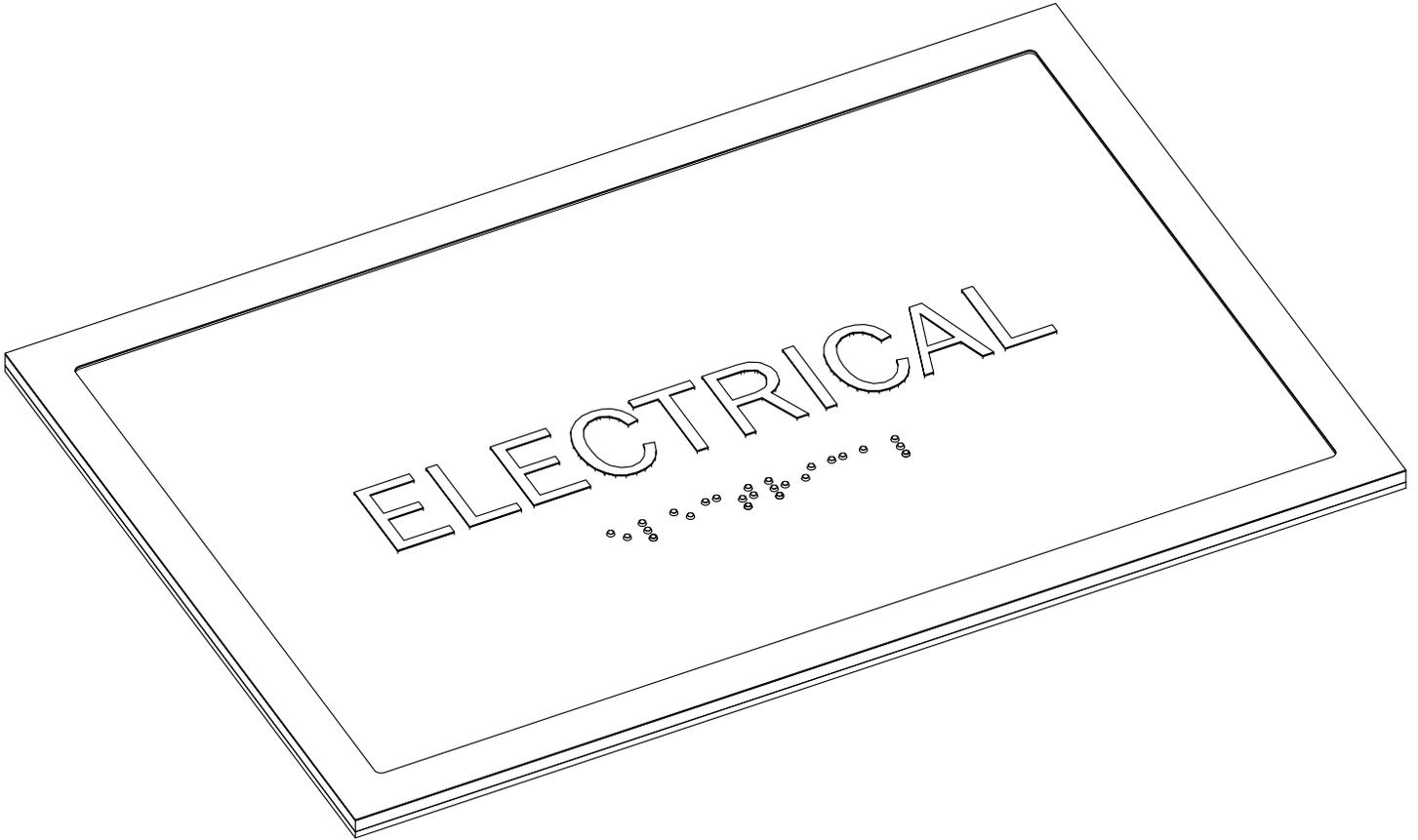
INTERIOR PANEL SIGN
TYPE: F2

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SPEC. SECTION

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DATE

F2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.7 x SCALE

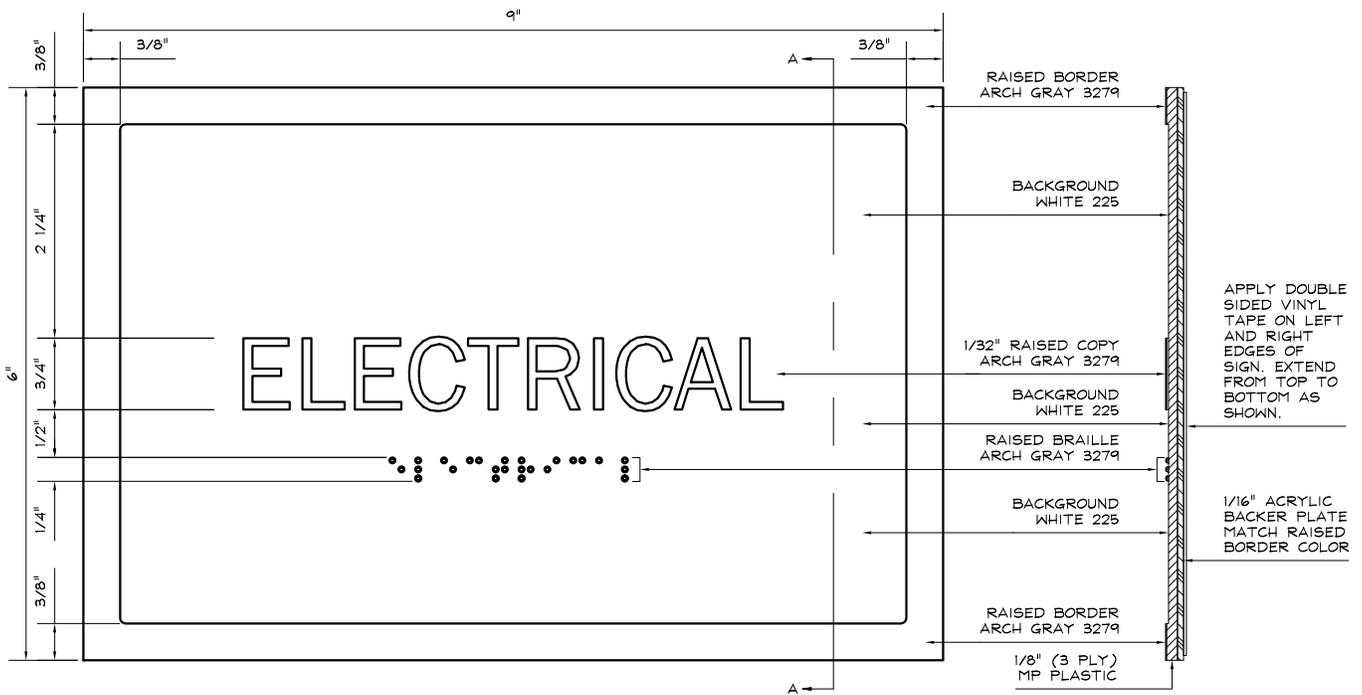
**INTERIOR PANEL SIGN
TYPE: F2**

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SPEC. SECTION

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2007
DATE

F2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



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NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: F2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

F2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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.85 x SCALE

**INTERIOR PANEL SIGN
TYPE: G1**

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SPEC. SECTION**

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**2007
DATE**

G1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.75 x SCALE

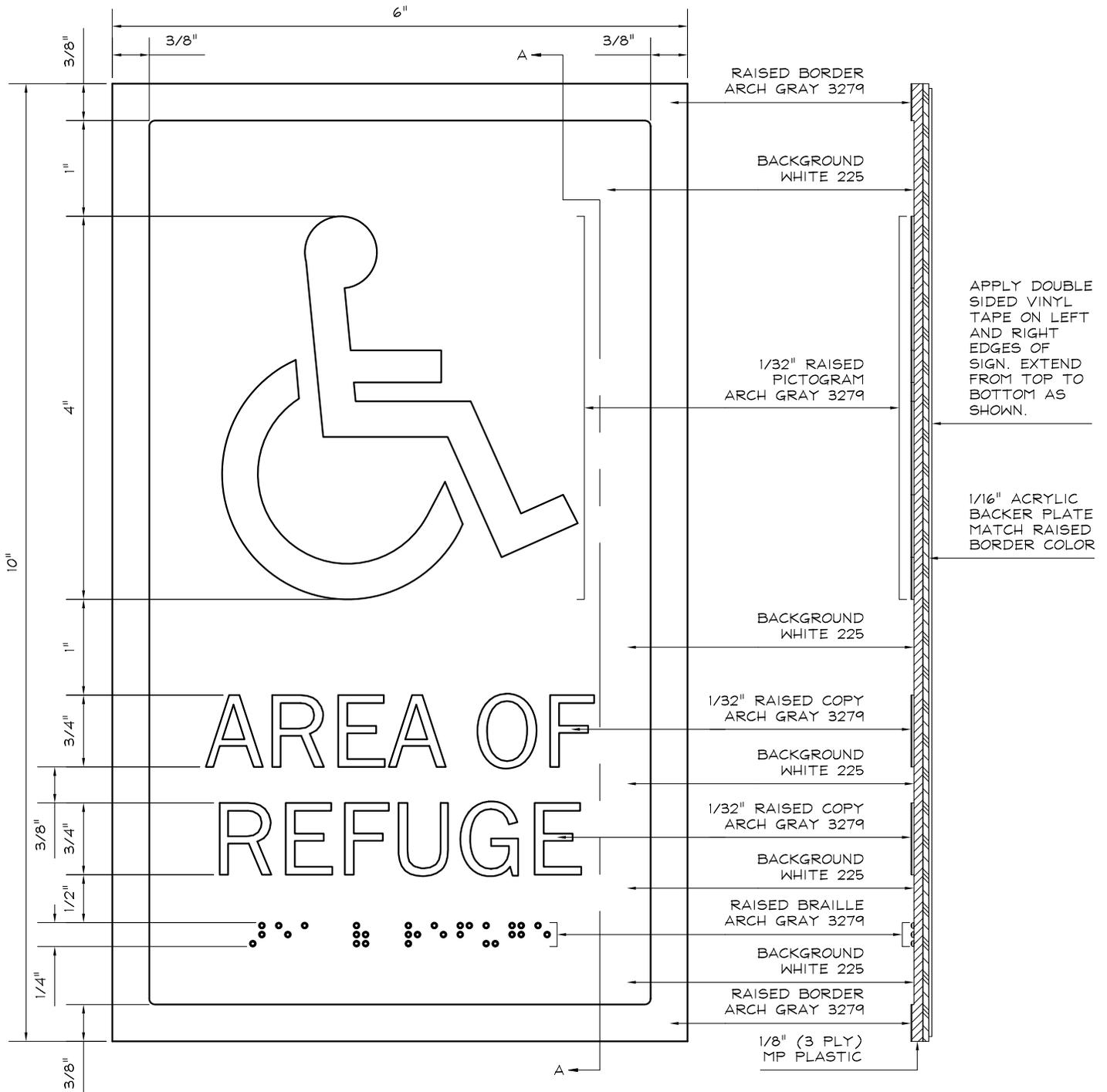
**INTERIOR PANEL SIGN
TYPE: G1**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

G1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

10431
SPEC. SECTION

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NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.

SECTION A-A

NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

0.65 x SCALE

INTERIOR PANEL SIGN
TYPE: G1

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G1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



.60 x SCALE

INTERIOR PANEL SIGN
TYPE: G2

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FACILITIES PLANNING, DESIGN AND CONSTRUCTION

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DATE

G2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.50 x SCALE

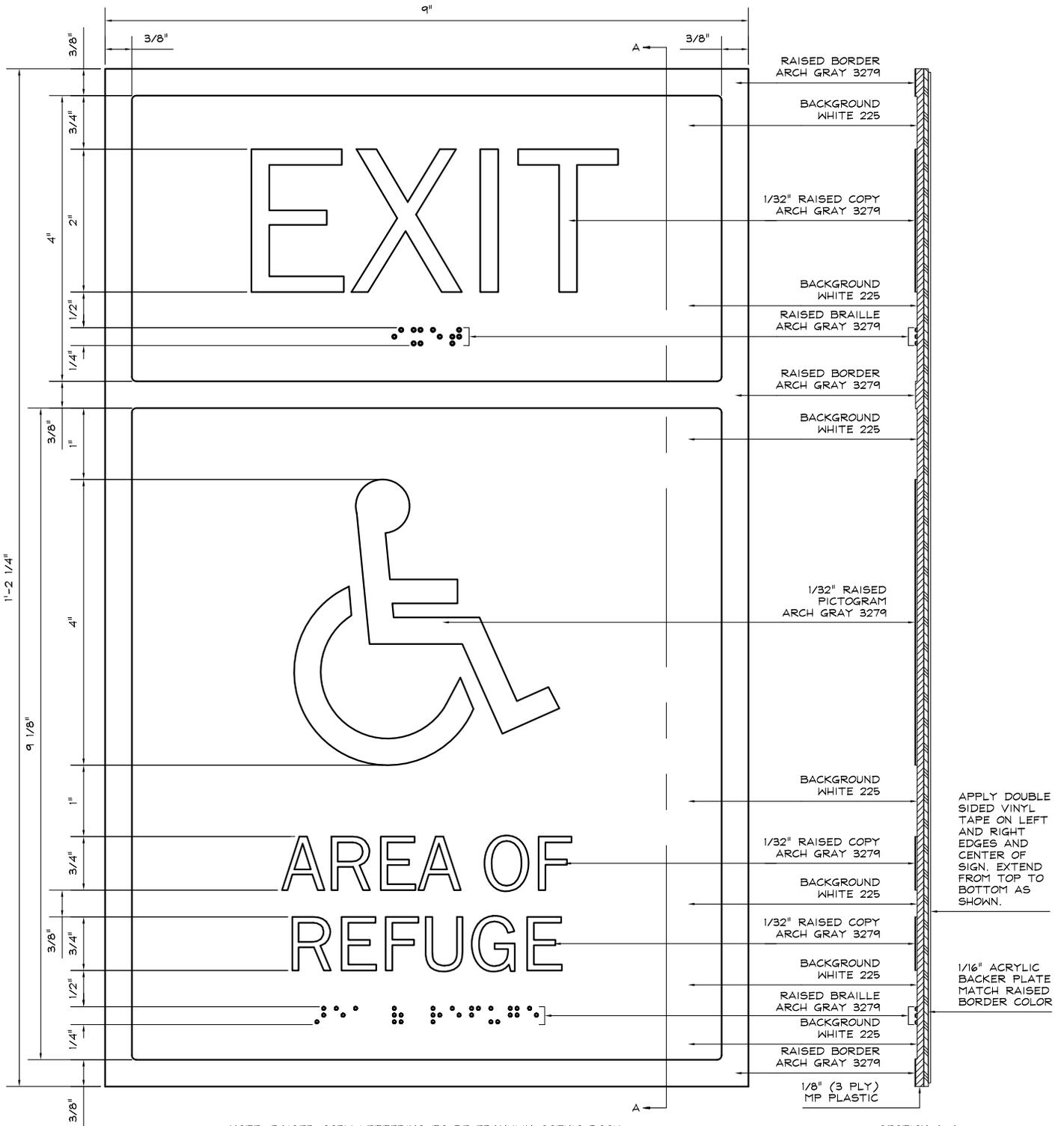
**INTERIOR PANEL SIGN
TYPE: G2**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

G2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

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SPEC. SECTION

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NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.
 NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL).

SECTION A-A

0.50 x SCALE

INTERIOR PANEL SIGN
TYPE: G2

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AREA OF REFUGE INSTRUCTIONS

1. FOR AN ALTERNATE EXIT ROUTE, PROCEED TO THE EAST EXIT ON THIS LEVEL.
2. PERSONS ABLE TO USE THE EXIT STAIRWAY SHOULD DO SO IMMEDIATELY, UNLESS ASSISTING OTHERS.
3. TO SUMMON ASSISTANCE, LIFT HANDSET ON PHONE. MSU POLICE WILL RESPOND.
4. RESCUE PERSONNEL WILL ASSIST IN USE OF STAIRS UPON ARRIVAL.

Braille representation of the instructions above.

.35 x SCALE

INTERIOR PANEL SIGN
TYPE: G3

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G3-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

**MAXIMUM
OCCUPANCY
250 PERSONS**

0.7 x SCALE

**INTERIOR PANEL SIGN
TYPE: H2**

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DATE**

H2-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.75 x SCALE

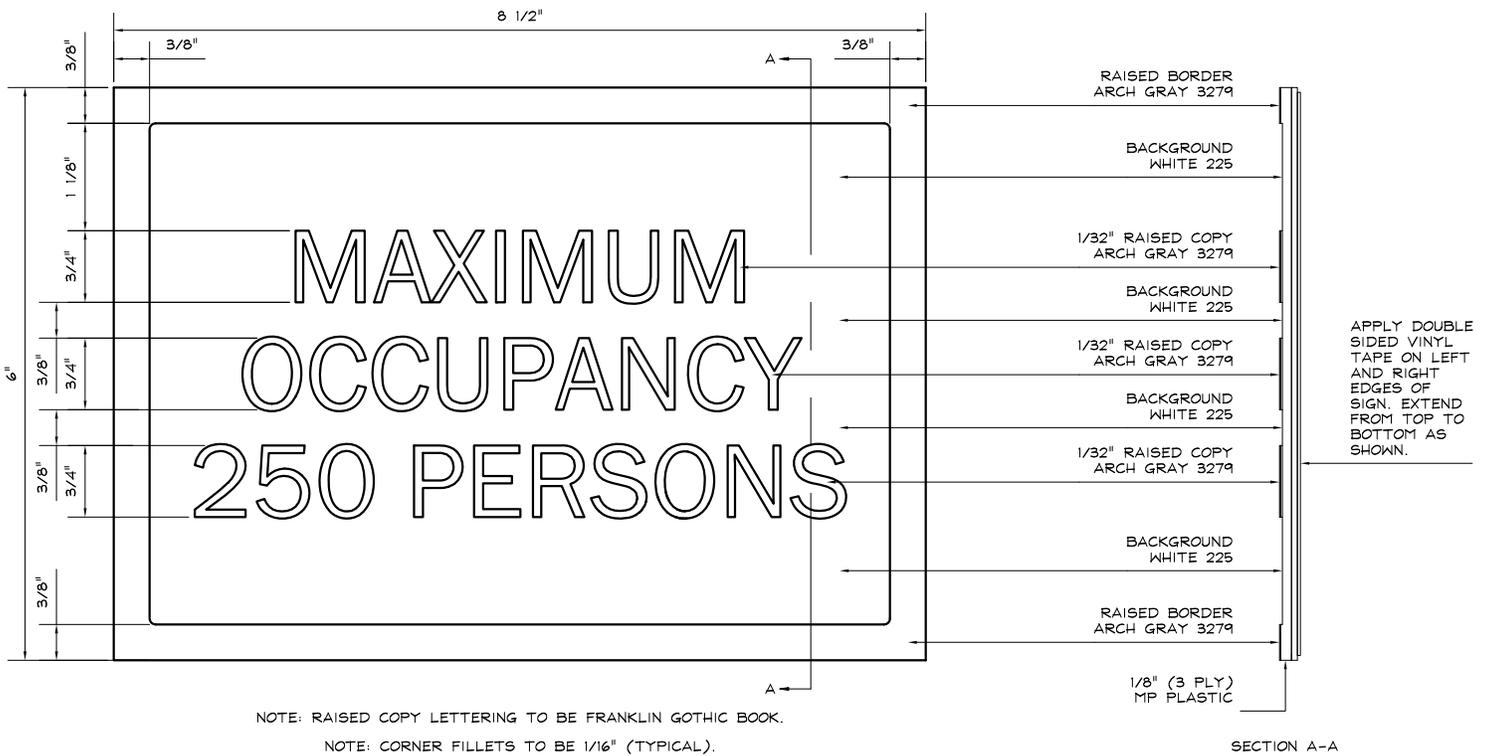
INTERIOR PANEL SIGN
TYPE: H2

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SPEC. SECTION

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H2-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



**INTERIOR PANEL SIGN
TYPE: H2**

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
H2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

0.5 x SCALE

10431
SPEC. SECTION

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FAMILY CARE



INTERIOR PANEL SIGN
TYPE: I1

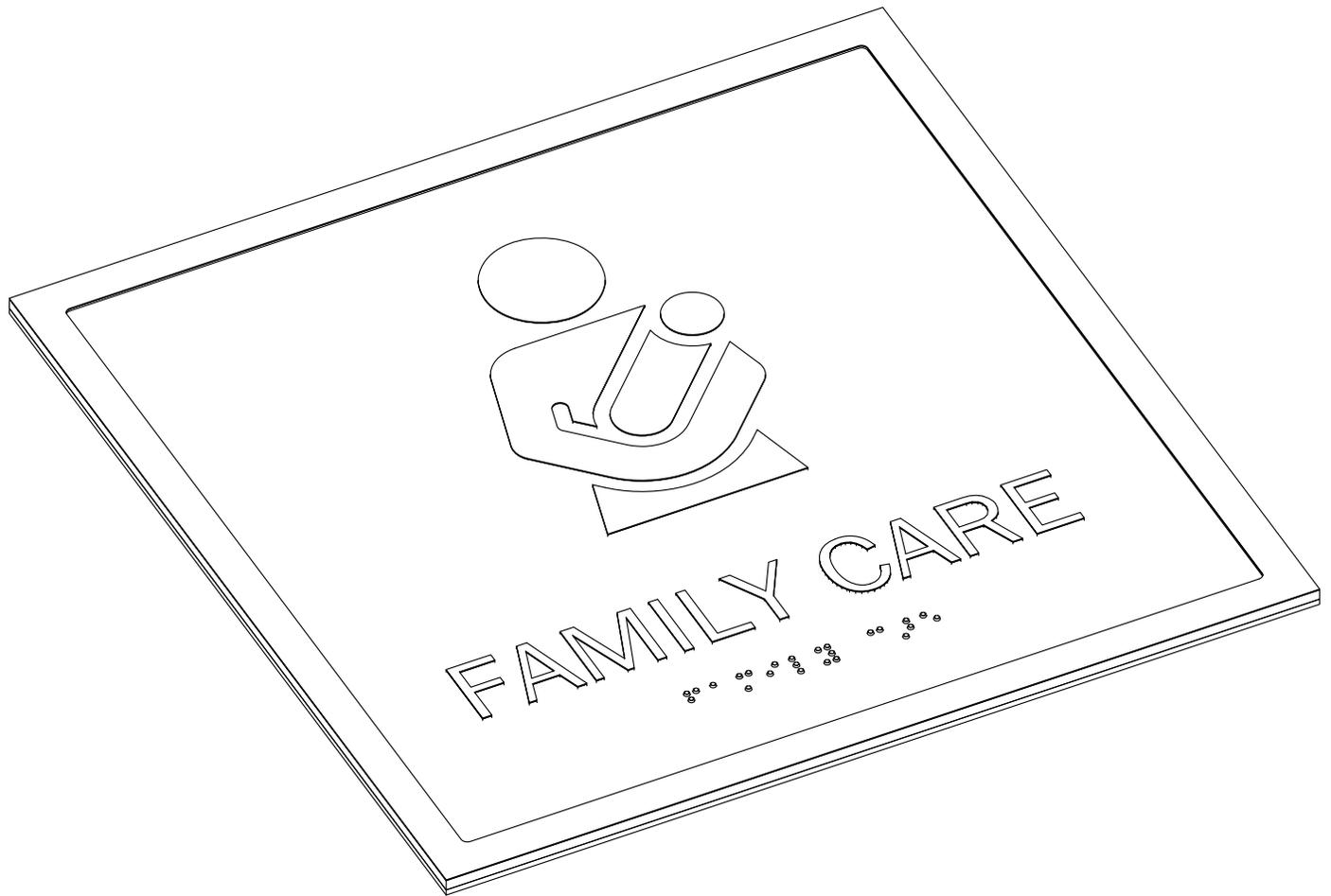
FACILITIES PLANNING, DESIGN AND CONSTRUCTION

I1-PLAN - Interior Panel Signs - Master Set.dwg - Issued Sep 21, 2009

.85 x SCALE

10431
SPEC. SECTION

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DATE



0.6 x SCALE

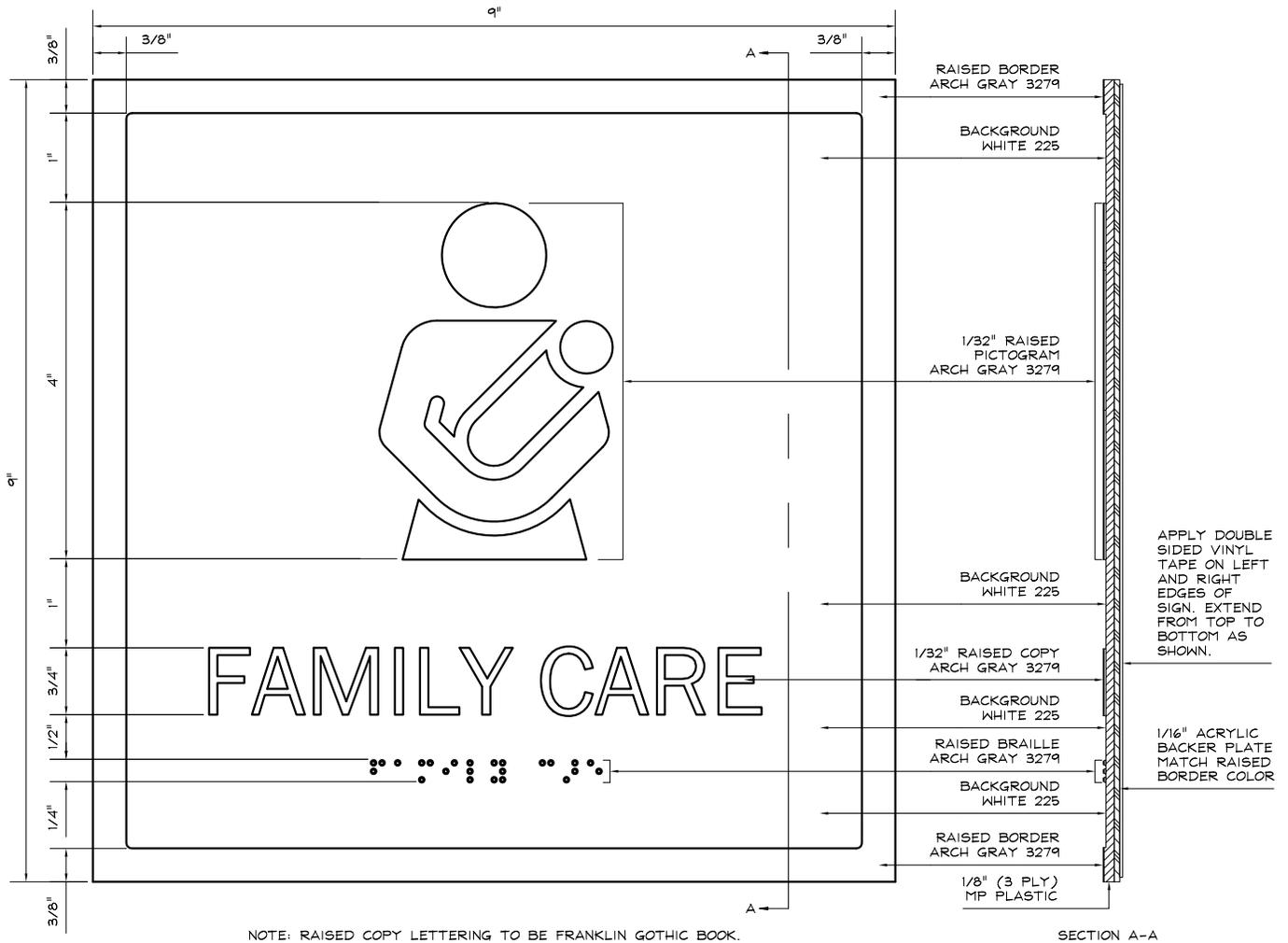
**INTERIOR PANEL SIGN
TYPE: I1**

10431
SPEC. SECTION

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

I1-ISO - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009



0.5 x SCALE

**INTERIOR PANEL SIGN
TYPE: I1**

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SPEC. SECTION

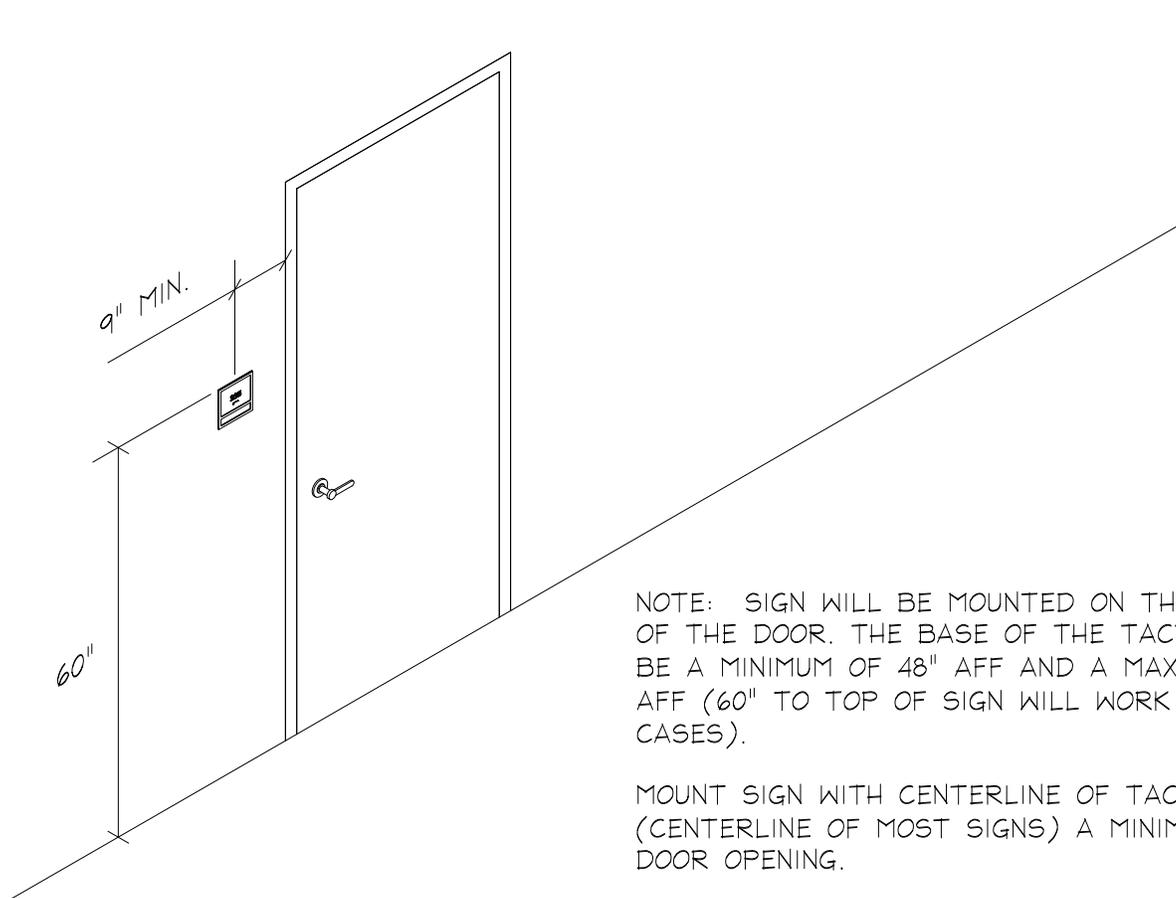
FACILITIES PLANNING, DESIGN AND CONSTRUCTION

2007
DATE

I1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 23, 2009

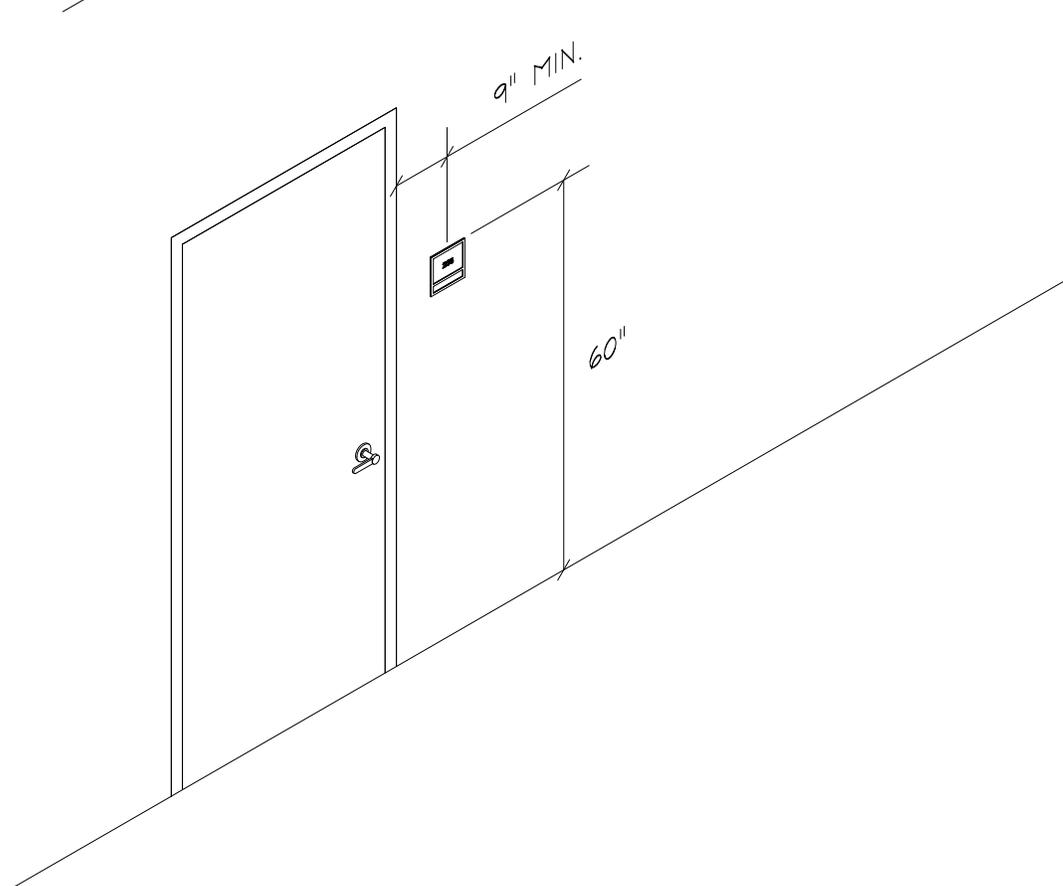
1.10-3 Environmental Graphics Checklist

Section #	Task Description	
1.10	Has the design team familiarized themselves with the MSU LRCDP & LMP with regards to Wayfinding?	
	Has the design team retained the services of a Graphic Designer for the project specific signage?	
	Has the FPDC Project Manager determined the primary entrances requiring building ID signage?	
	Does the exterior building ID signage follow the neighborhood signage standard?	
	Has the interior signage design met all governing bodies' requirements?	
	Are any dedicatory, commemorative or memorial inscriptions or plaques required for the project?	
	Has the Design Team included the construction signage requirements in the project specifications?	
	Has the proper documentation been reviewed for the appropriate design phase?	
	Has the FPDC Project Manager established a budget for the graphics work?	
	Has the designer developed a code-conformance schedule?	
	Has the assignment of room numbering been reviewed by the design team & FPDC Project Manager?	
	Does the room numbering signage meet MSU's signage specifications for installation & performance?	
	Has a final sign schedule been created and included in the construction documents?	



NOTE: SIGN WILL BE MOUNTED ON THE LATCH SIDE OF THE DOOR. THE BASE OF THE TACTILE TEXT MUST BE A MINIMUM OF 48" AFF AND A MAXIMUM OF 60" AFF (60" TO TOP OF SIGN WILL WORK IN MOST CASES).

MOUNT SIGN WITH CENTERLINE OF TACTILE TEXT (CENTERLINE OF MOST SIGNS) A MINIMUM OF 9" FROM DOOR OPENING.



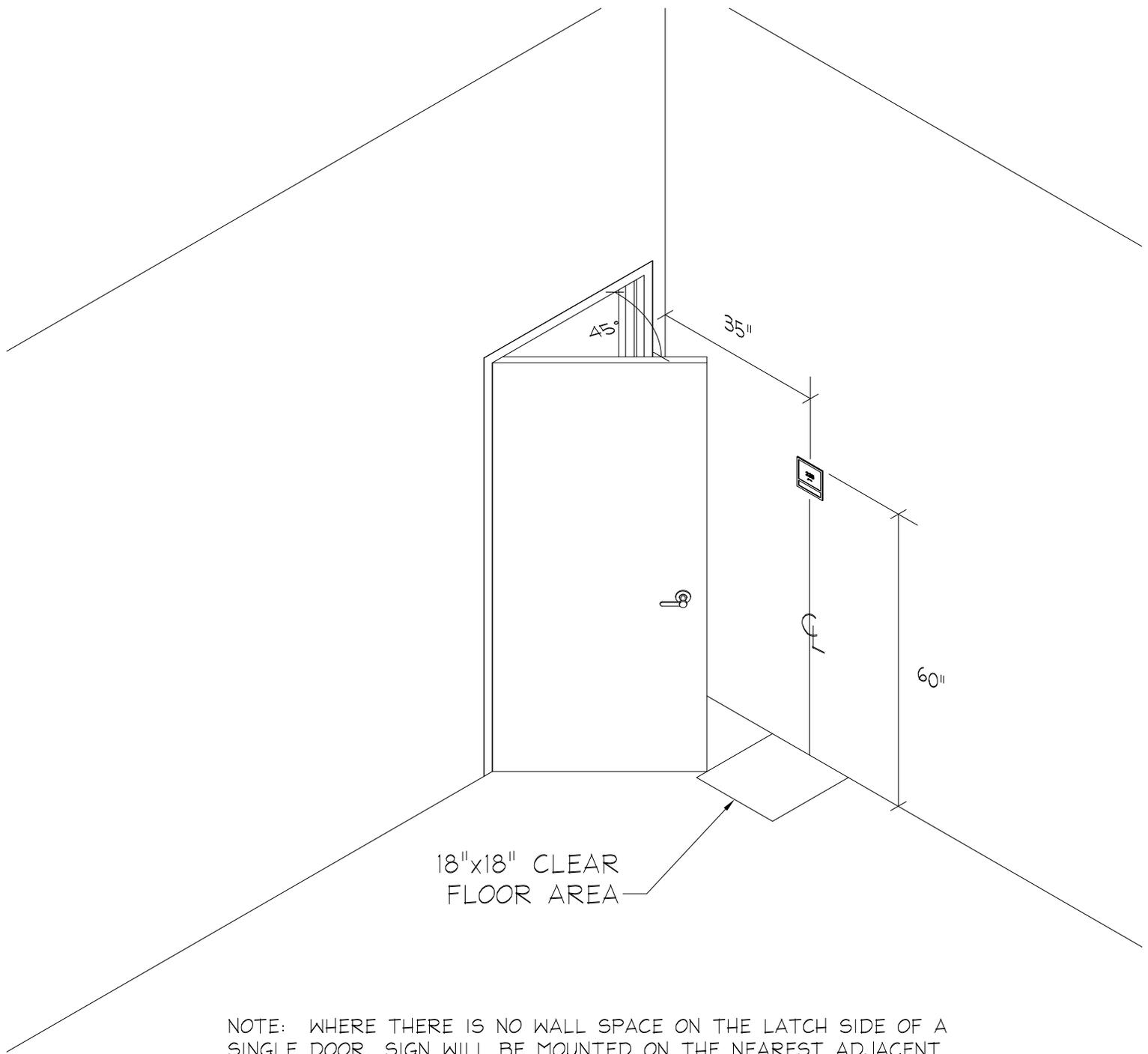
INTERIOR PANEL SIGN - MOUNTING INSTRUCTIONS
TYPE: ROOM SIGNAGE LOCATION A

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

LOCATION A - Door Signs.dwg - Issued May 15, 2009

10431
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2007
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NOTE: WHERE THERE IS NO WALL SPACE ON THE LATCH SIDE OF A SINGLE DOOR, SIGN WILL BE MOUNTED ON THE NEAREST ADJACENT WALL. SIGNS SHALL BE LOCATED SO THAT A CLEAR FLOOR AREA 18" MIN. BY 18" MIN. CENTERED ON THE TACTILE TEXT (CENTERLINE OF MOST SIGNS) IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.

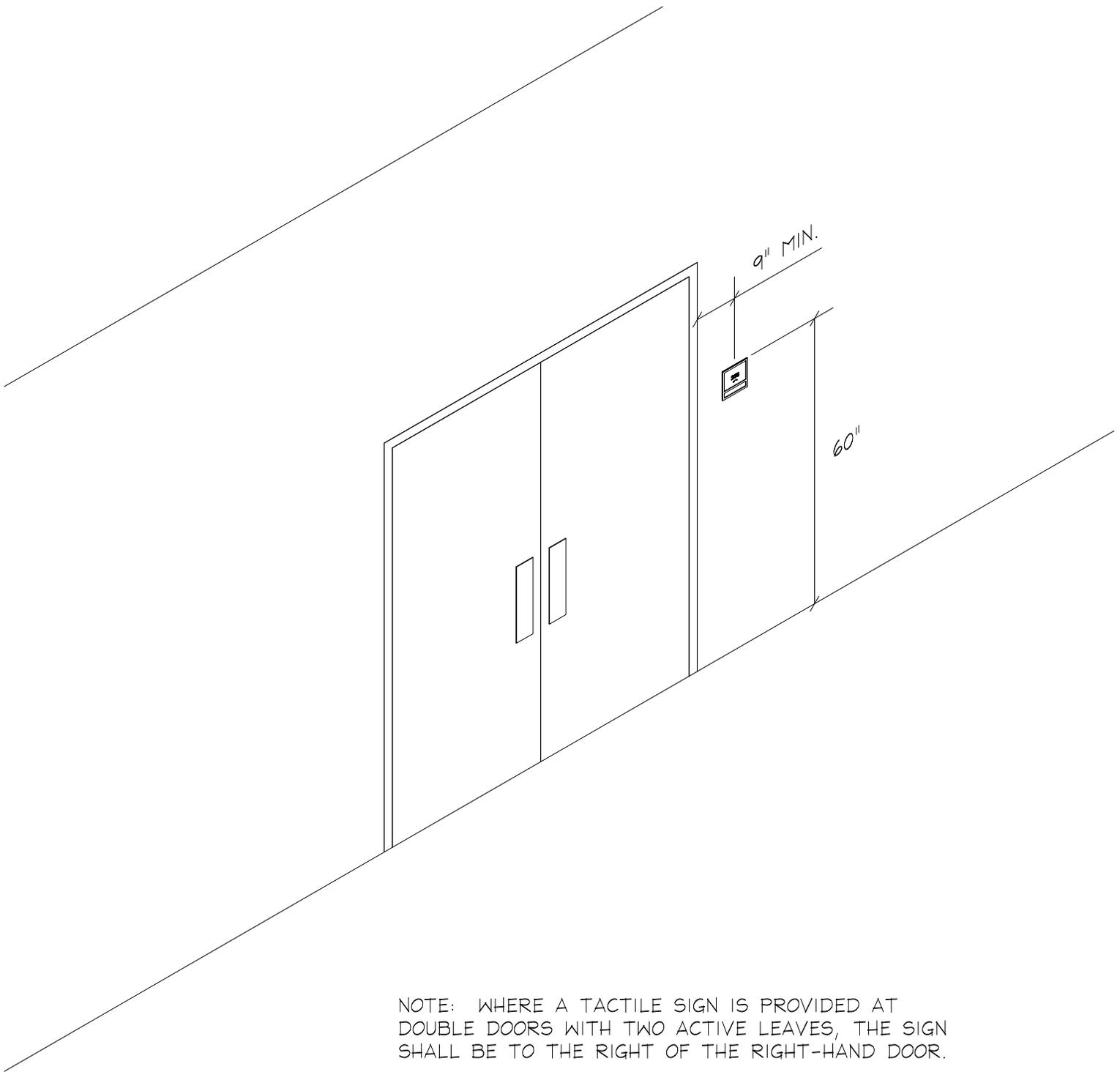
TACTILE TEXT MUST BE A MINIMUM OF 48" AFF AND A MAXIMUM OF 60" AFF (60" TO TOP OF SIGN WILL WORK IN MOST CASES).

INTERIOR PANEL SIGN - MOUNTING INSTRUCTIONS
TYPE: ROOM SIGNAGE LOCATION B

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

LOCATION B - Door Signs.dwg - Issued May 15, 2009

10431
SPEC. SECTION
2007
DATE



NOTE: WHERE A TACTILE SIGN IS PROVIDED AT DOUBLE DOORS WITH TWO ACTIVE LEAVES, THE SIGN SHALL BE TO THE RIGHT OF THE RIGHT-HAND DOOR.

TACTILE TEXT MUST BE A MINIMUM OF 48" AFF AND A MAXIMUM OF 60" AFF (60" TO TOP OF SIGN WILL WORK IN MOST CASES).

MOUNT SIGN WITH CENTERLINE OF TACTILE TEXT (CENTERLINE OF MOST SIGNS) A MINIMUM OF 9" FROM DOOR OPENING.

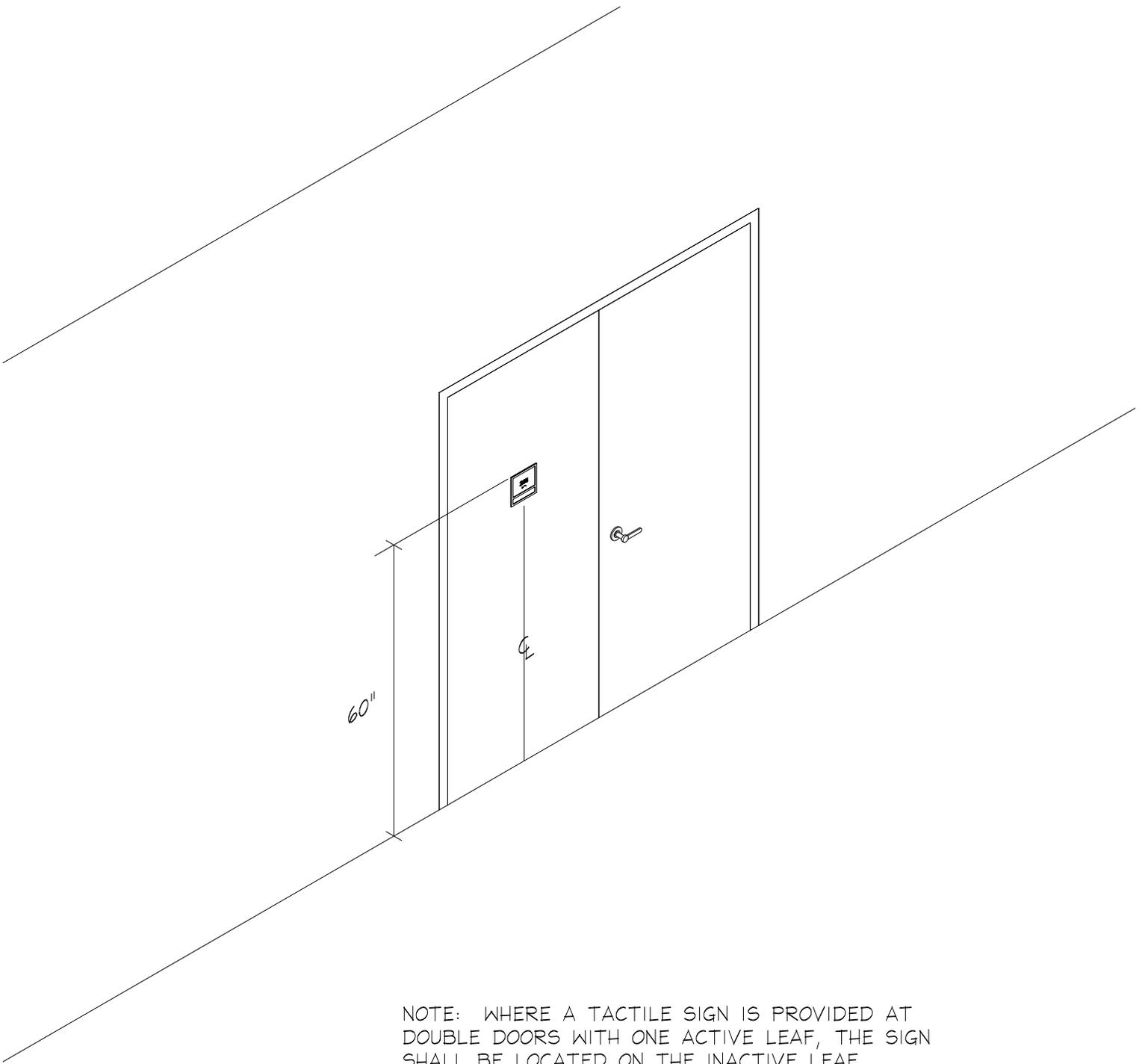
INTERIOR PANEL SIGN - MOUNTING INSTRUCTIONS
TYPE: ROOM SIGNAGE LOCATION C

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

LOCATION C - Door Signs.dwg - Issued May 15, 2009

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 SPEC. SECTION

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NOTE: WHERE A TACTILE SIGN IS PROVIDED AT DOUBLE DOORS WITH ONE ACTIVE LEAF, THE SIGN SHALL BE LOCATED ON THE INACTIVE LEAF.

TACTILE TEXT MUST BE A MINIMUM OF 48" AFF AND A MAXIMUM OF 60" AFF (60" TO TOP OF SIGN WILL WORK IN MOST CASES).

MOUNT SIGN WITH CENTERLINE OF TACTILE TEXT (CENTER OF MOST SIGNS) ON CENTERLINE OF INACTIVE LEAF.

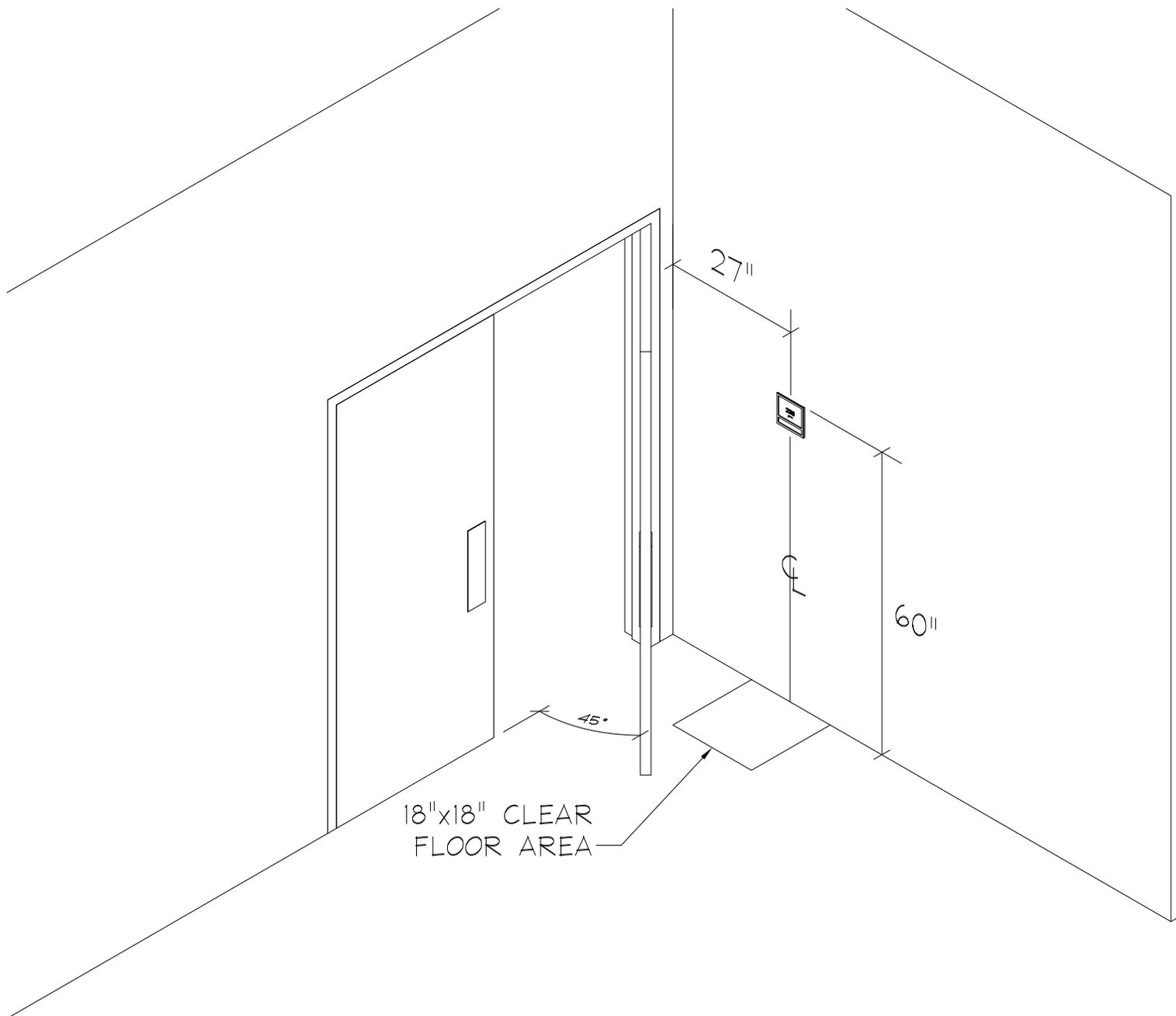
INTERIOR PANEL SIGN - MOUNTING INSTRUCTIONS
TYPE: ROOM SIGNAGE LOCATION D

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

LOCATION D - Door Signs.dwg - Issued May 15, 2009

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 SPEC. SECTION

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NOTE: WHERE THERE IS NO WALL SPACE ON THE RIGHT SIDE OF DOUBLE DOORS, SIGN WILL BE MOUNTED ON THE NEAREST ADJACENT WALL. SIGNS SHALL BE LOCATED SO THAT A CLEAR FLOOR AREA 18" MIN. BY 18" MIN. CENTERED ON THE TACTILE TEXT IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.

TACTILE TEXT MUST BE A MINIMUM OF 48" AFF AND A MAXIMUM OF 60" AFF (60" TO TOP OF SIGN WILL WORK IN MOST CASES).

MOUNT SIGN WITH CENTERLINE OF TACTILE TEXT (CENTER OF MOST SIGNS) ON CENTERLINE OF INACTIVE LEAF.

INTERIOR PANEL SIGN - MOUNTING INSTRUCTIONS
TYPE: ROOM SIGNAGE LOCATION E

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

LOCATION E - Door Signs.dwg - Issued May 15, 2009

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 SPEC. SECTION

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 DATE

SECTION 10431 – DOOR AND ROOM SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Room Signs.
 - 2. Restroom Signs.
 - 3. Elevator Signs.
 - 4. Stairwell Signs.
 - 5. Specialty Signs.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for temporary project identification signs.
 - 2. Division 15 Section "Mechanical Identification" for labels, tags and nameplates for mechanical equipment.
 - 3. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
 - 4. Division 16 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated include construction details, material descriptions, dimensions of individual components, profiles and finishes, and maintenance recommendations for each type of sign.

- B. Shop Drawings: Include construction details, material descriptions, dimensions of individual components, profiles and finishes, and fabrication and installation details for each type of sign.
 - 1. Show sign mounting heights and locations.
 - 2. Provide message list for each sign, including large-scale details of wording, lettering typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.
- D. Samples for Verification: For the selected color, texture and sign material indicated, of sizes indicated:
 - 1. Provide a full scale sample sign for the A2 sign type.
 - 2. Approved samples will not be returned for installation into Project.
- E. Sign Schedule: Use same designations indicated on Drawings and/or "Room Numbering Designations" schedule.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Sign types shall consist of room number and room function to meet referenced standards.

1.5 COORDINATION

- A. Coordinate installation with all other trades.
 - 1. Example: Paint shall be dry and completely cured before wall signs are adhered with tape to the walls.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of colors or sign lamination.
 - 2. Warranty Period: One year from date of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Store products of this section in manufacturer's unopened packaging until installation.
- B. Maintain dry, heated storage area for products of this section until installation of products.

1.8 REFERENCED STANDARDS

- A. ADAAG (ADA Accessibility Guidelines for Buildings and Facilities), current edition.
- B. ANSI (Americans National Standards Institute) A117.1.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, manufacturer offering products that may be incorporated into the Work include, but are not limited to:
 - 1. Mohawk Sign Systems, Inc.; Architectural Graphics, P.O. Box 966, Schenectady, NY, 12301-0966; 1-518-370-3433, or approved alternate.

2.2 GRAPHIC PROCESS

- A. All signs shall be manufactured so that:
 - 1. Tactile characters shall be raised the required 1/32 inches from the sign face. Glue-on letters or etched backgrounds are not acceptable.

2. All text shall be accompanied by Grade 2 Braille. Braille shall be separated 1/2-inch from the corresponding raised characters or symbols. May be machine or hand placed. If hand placed, Braille does not have to match the raised border color. Braille to comply with ANSI A117.1.

Grade 2 Braille translation to be provided by signage manufacturer.

3. All letters, numbers and/or symbols, and borders shall be Architectural Gray 3279 or approved alternate. Background shall be White 225 or approved alternate. If a backer plate is used it shall be Architectural Gray 3279, or approved alternate, to match border color. Characters and backgrounds shall have a non-glare finish and comply with ANSI A117.1.
- B. Plaque material shall be Special Purpose SP125 decorative thermosetting high pressure laminate or approved alternate. Material to be 1/8-inch thick laminate with melamine resin surfacing and a phenolic resin core which provides resistance to abrasion, stains, alcohol, solvents, boiling water, and heat. The material shall be NEMA rated and have flammability and smoke values that meet the standards for flammability of interior materials.
- C. Font shall be Franklin Gothic Book, upper case letters and numbers. Character spacing and line weight to comply with ANSI A117.1.
- D. Size of letters and numbers shall be as follows:
1. Room numbers shall be 3/4-inch high.
 2. Symbol size shall be 4 inches high.
 3. Outside corners of sign shall be square. Inside corners shall be filleted 1/4-inch maximum.

2.3 SIGN DESIGN

- A. The sign design is based on the Montana State University Interior Signage Standard Catalog, current edition.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces to receive signs have been finished and that finishes are dry and correctly cured.

- B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- C. Verify that items, including anchor device (double sided foam tape), provided under other sections of Work are sized and located to accommodate signs.
- D. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

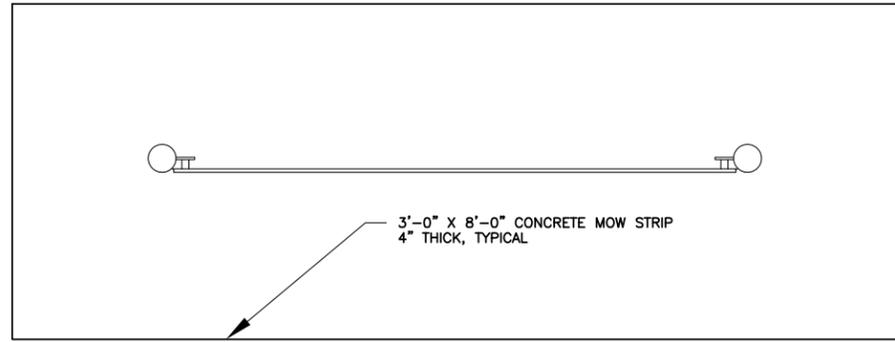
- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's instructions, except where more stringent requirements apply.
- B. Install signs level, plumb and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
- C. Sign shall be mounted on the latch side of the door. The top edge of the sign shall be mounted 60 inches above finish floor (AFF), typical. Mount sign with centerline of tactile text a minimum of nine inches from door opening, typical.
- D. Where there is no wall space on the latch side of a single door, sign shall be mounted on the nearest adjacent wall. Signs shall be located so that a clear floor area 18 inches minimum by 18 inches minimum centered on the tactile text is provided beyond the arc of any door swing between the closed position and a 45-degree open position.
- E. Where a tactile sign is provided at double doors with two active leaves, the sign shall be mounted to the right of the right-hand door.
- F. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Mount sign with centerline of tactile text on centerline of inactive leaf.
- G. Where there is no wall space on the right side of the double doors, sign shall be mounted on the nearest adjacent wall. Signs shall be located so that a clear floor area 18 inches minimum by 18 inches minimum centered on the tactile text is provided beyond the arc of any door swing between the closed position and a 45 degree open position.

- H. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- I. Mount the signs to the wall using the double sided foam tape on the back of the sign. For sand blasted or etched signs, use 100% silicon adhesive in addition to the double sided foam tape if the sign is heavy.

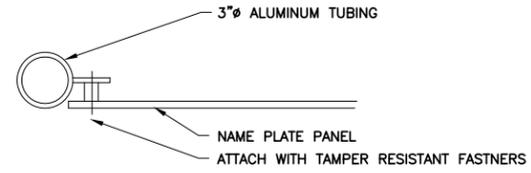
3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

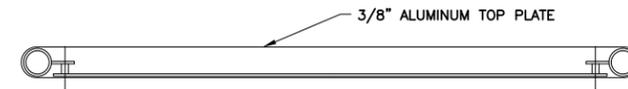
END OF SECTION 10431



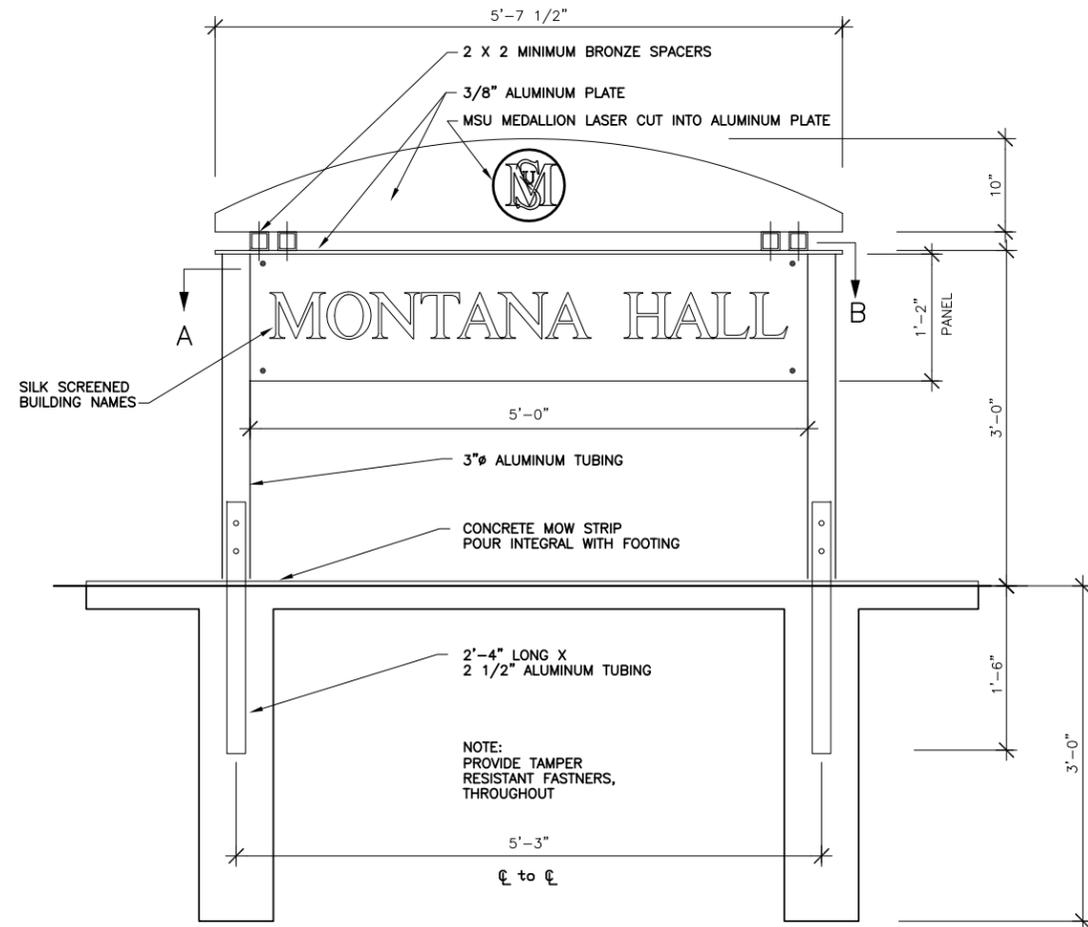
1
A1
1"=1'-0"



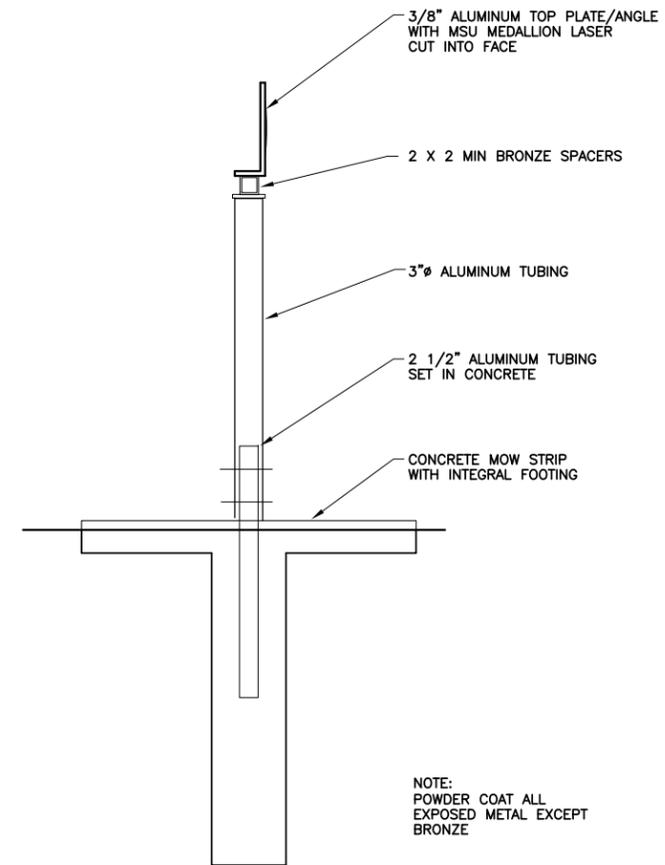
2
A1
2"=1'-0"



3
A1
1"=1'-0"



2
A1
1"=1'-0"



4
A1
1"=1'-0"

PPA # XX-XXXX
DATE XX-XX-XX DRAWN BY ??
DRAWING PATH: (i.e. C:\95-???)\XXXXXXXXXXXXXXXXXXXXXXXXXXXX

PREPARED BY:
FACILITIES PLANNING
PHYSICAL PLANT
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA 59717
(406) 994-4131

PROJECT TITLE
CAMPUS BUILDING
SIGNAGE
MONTANA STATE UNIVERSITY - BOZEMAN

DATE: XX-XX-XX

A1

PPA #: XX-XXXX

Montana State University - Building Informational Signage

The following pages detail the design of Montana State University's building informational signage. Main building entry signs will be placed near the primary building entrance or entrances. Other floors will use the single non entry floor sign. It will be placed near where elevators or stairways discharge onto the floor.

Buildings that have additional floors or constraints that would not permit the use of a standard sign will be custom designed to provide an appearance consistent with the standard signs.

Main building entry signs

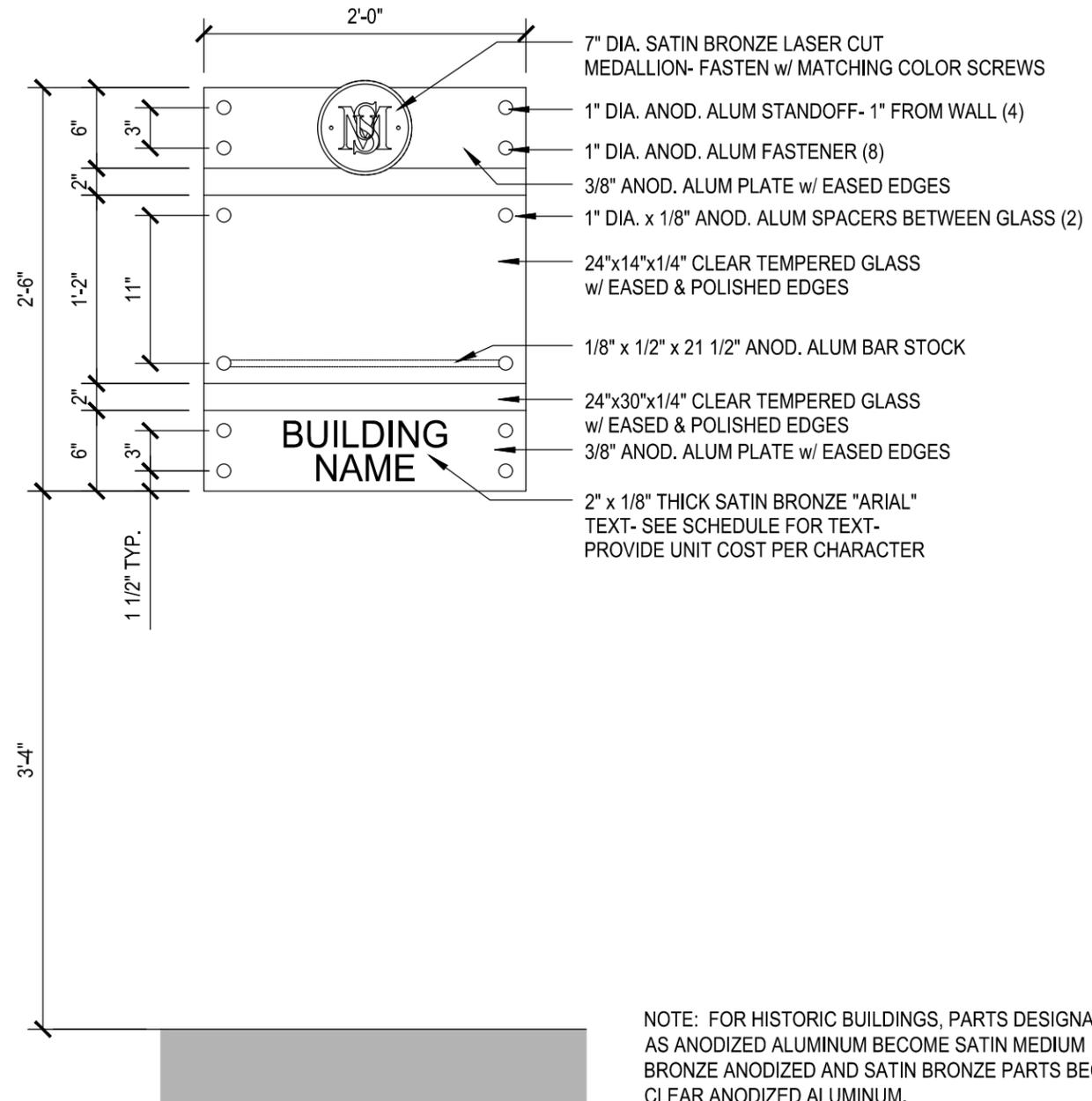
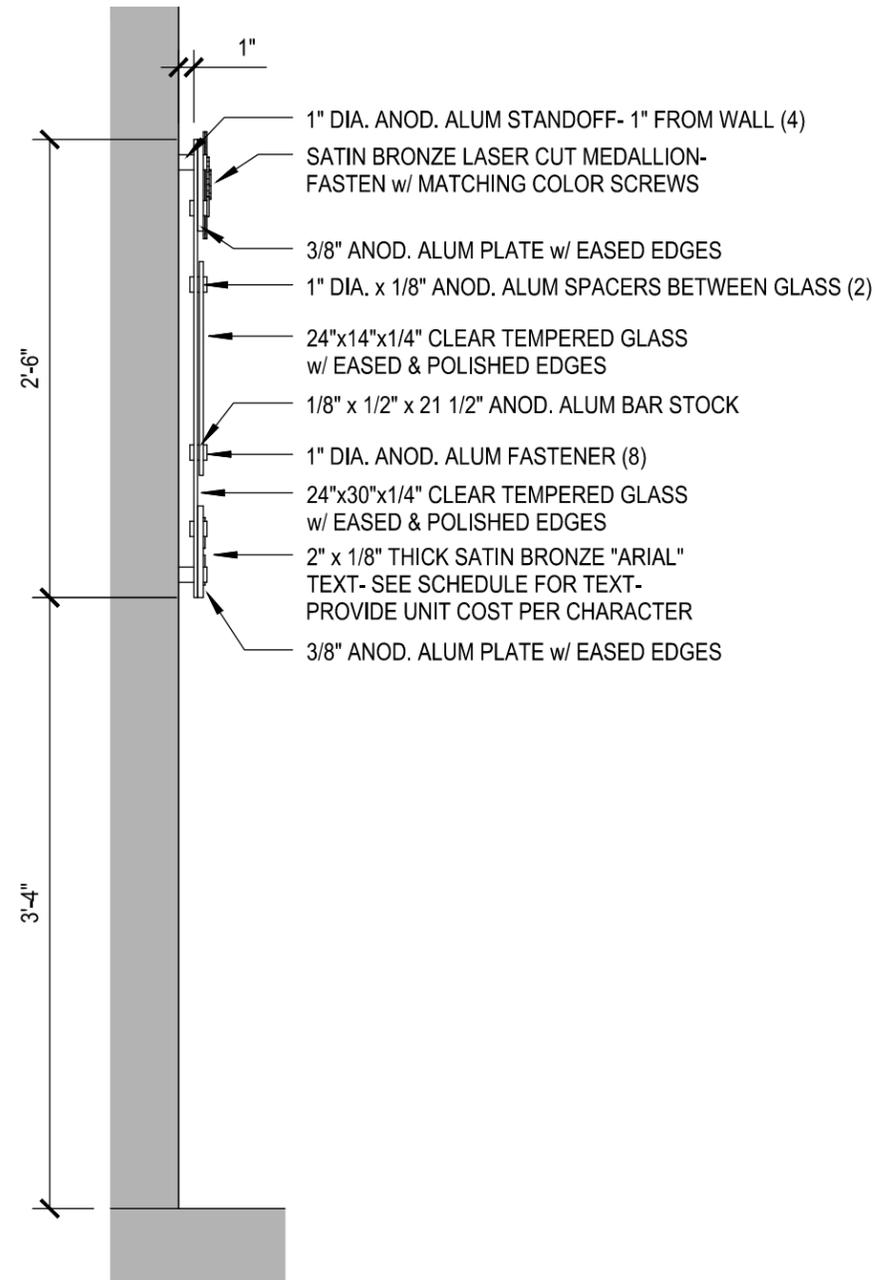
- A5.1 Single floor, main entry
- A5.2 Two floors, main entry
- A5.3 Three floors, main entry
- A5.4 Four floors, main entry
- A5.5 Five floors, main entry
- A5.6 Six floors, main entry (five floors if vertical wall height prevents use of A5.5)
- A5.7 Seven to eight floors, main entry
- A5.9 Nine to ten floors, main entry

Single non entry floor sign

- A5.10 For use only on floors that are not the main building entry floor

Other

- A5.11 Medallion sign section
- A5.12 Building name sign section
- A5.13 Medallion detail
- A5.14 Color Reference



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

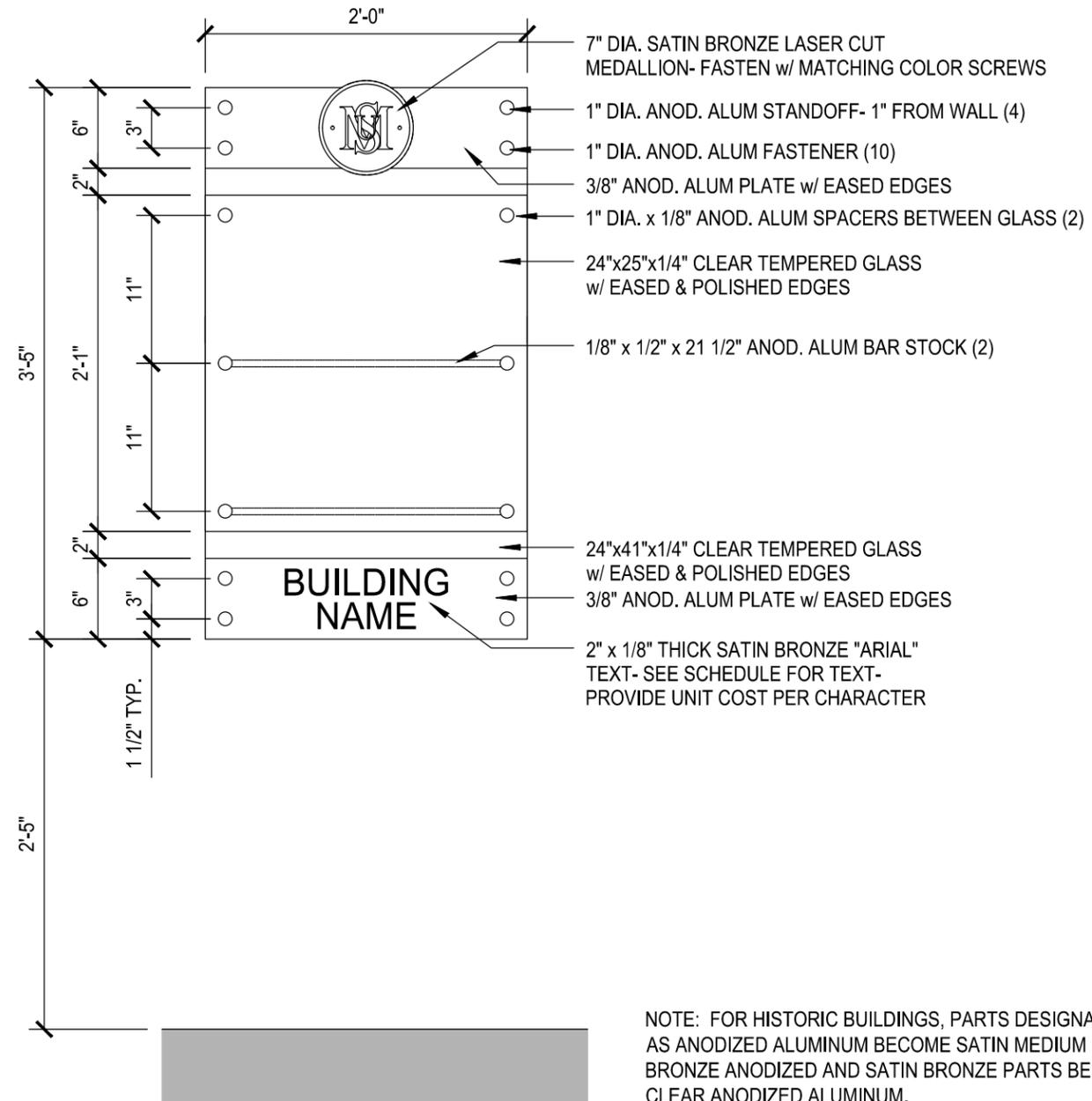
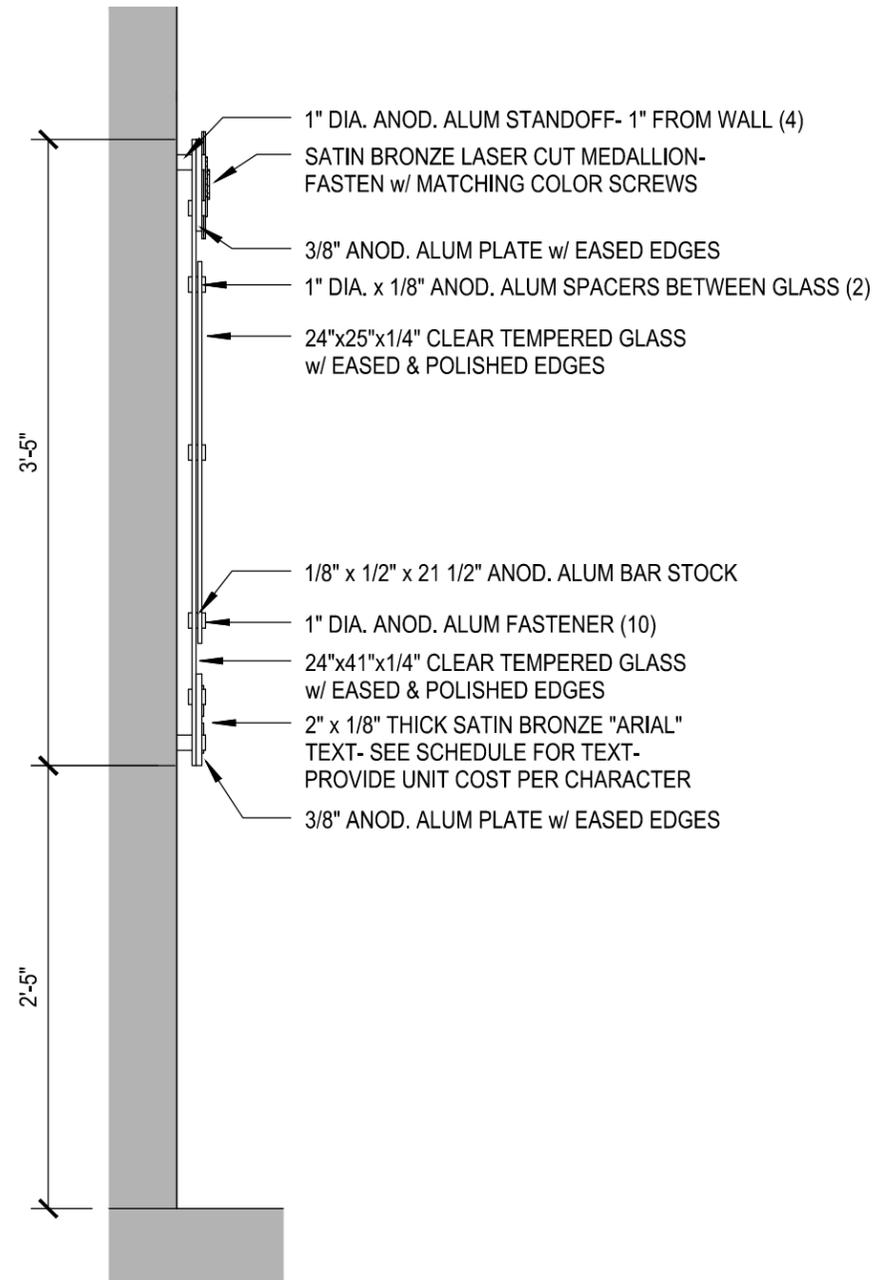
1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - SINGLE FLOOR
 SCALE: 1" = 1'

DRAWN BY: GAG		
REVIEWED BY:		
REV.	DESCRIPTION	DATE

PPA#11-0154

SHEET
A5.1

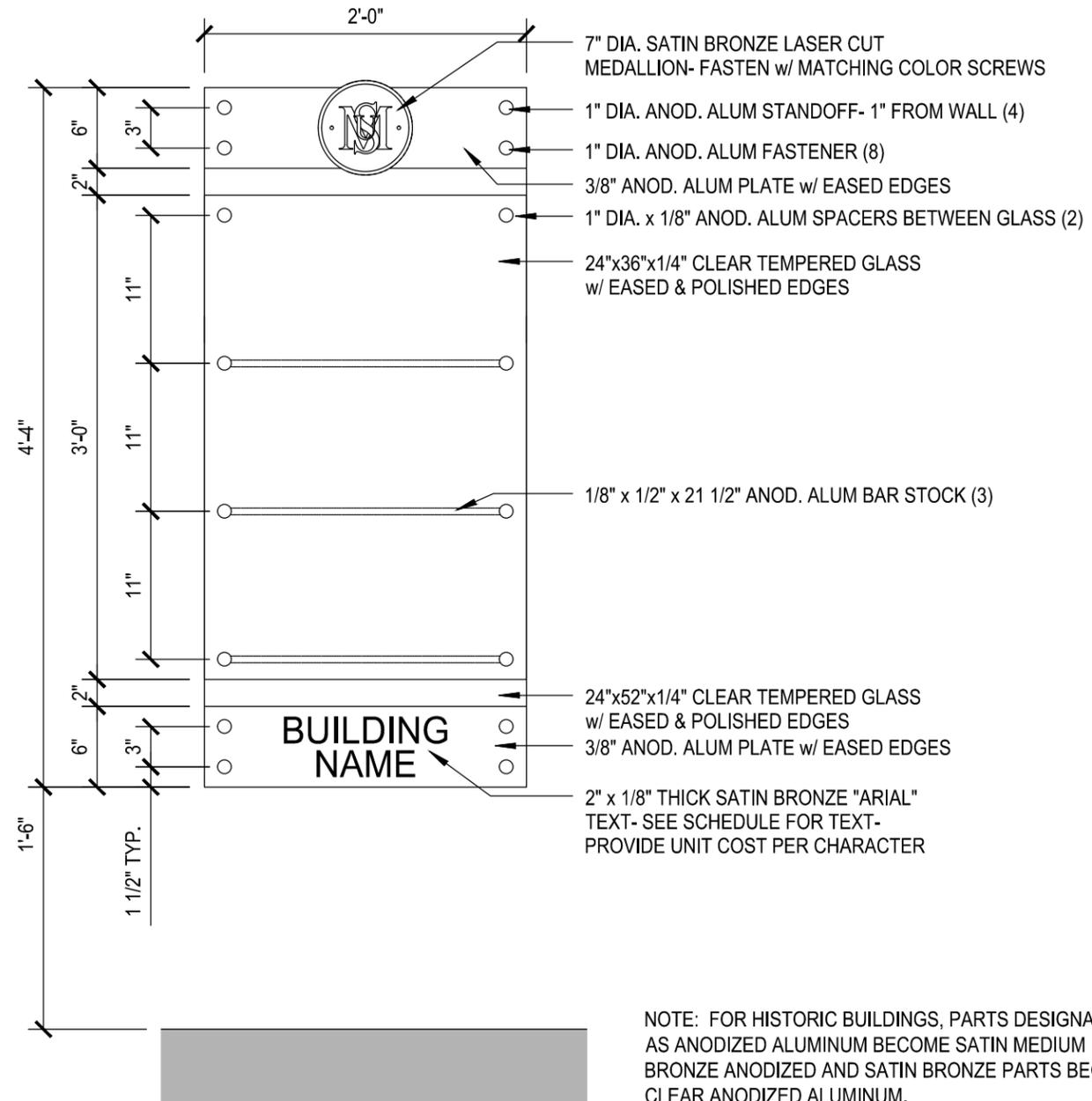
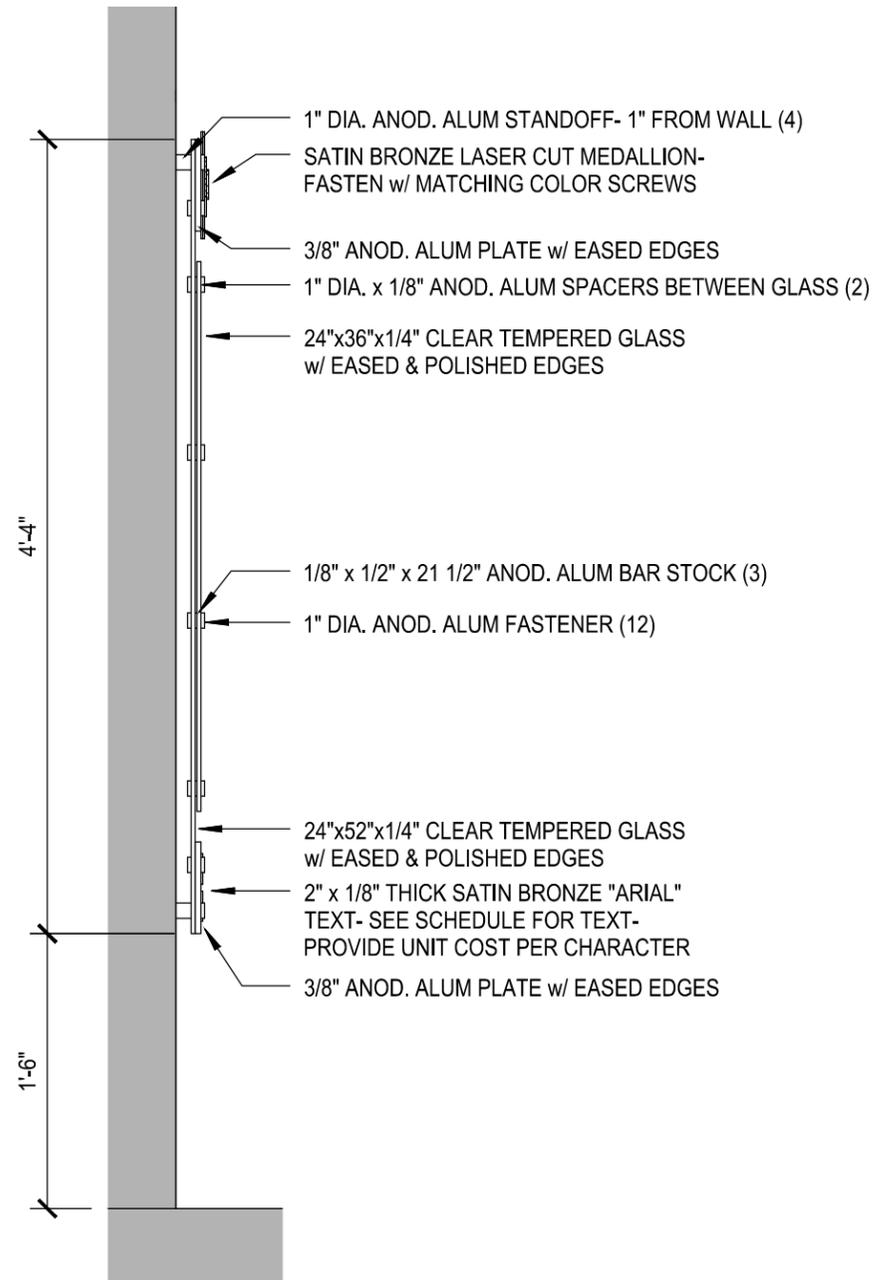
DATE
 11-22-11



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - TWO FLOORS
 SCALE: 1" = 1'

REV.	DESCRIPTION	DATE



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - THREE FLOORS
 SCALE: 1" = 1'

DRAWN BY: GAG

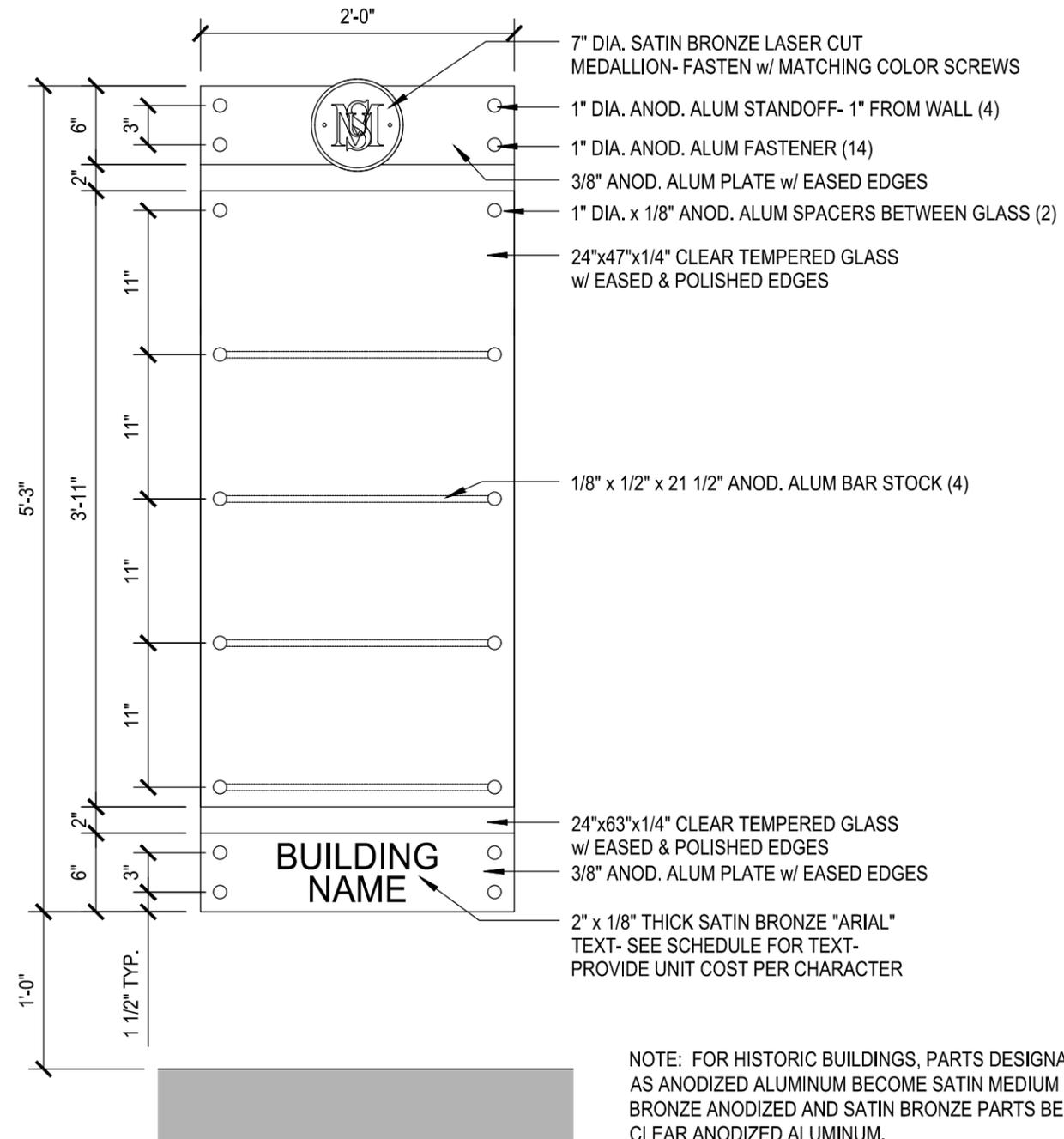
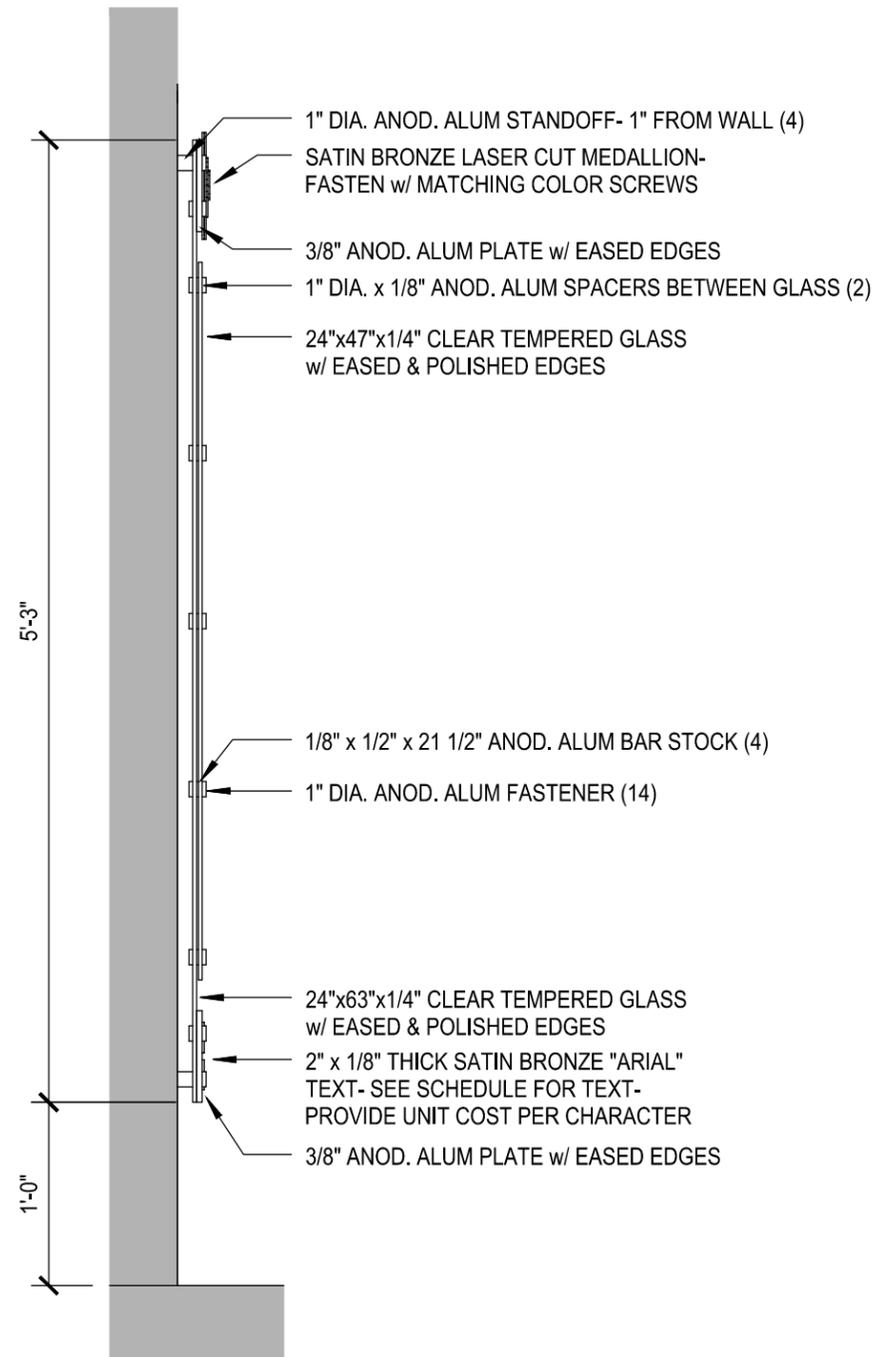
REVIEWED BY:

REV.	DESCRIPTION	DATE

PPA#11-0154

SHEET
A5.3

DATE
 11-22-11



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - FOUR FLOORS
 SCALE: 1" = 1'

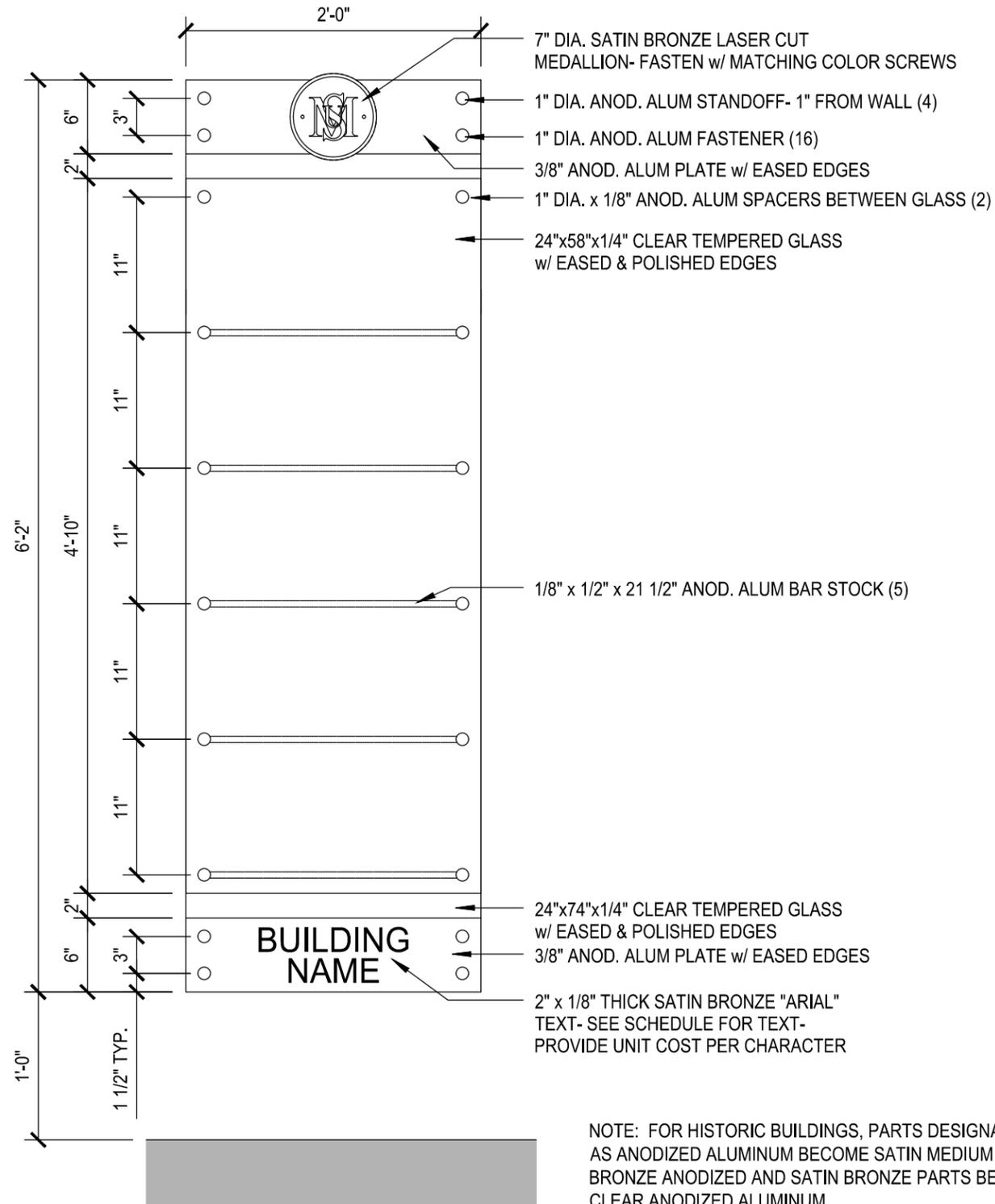
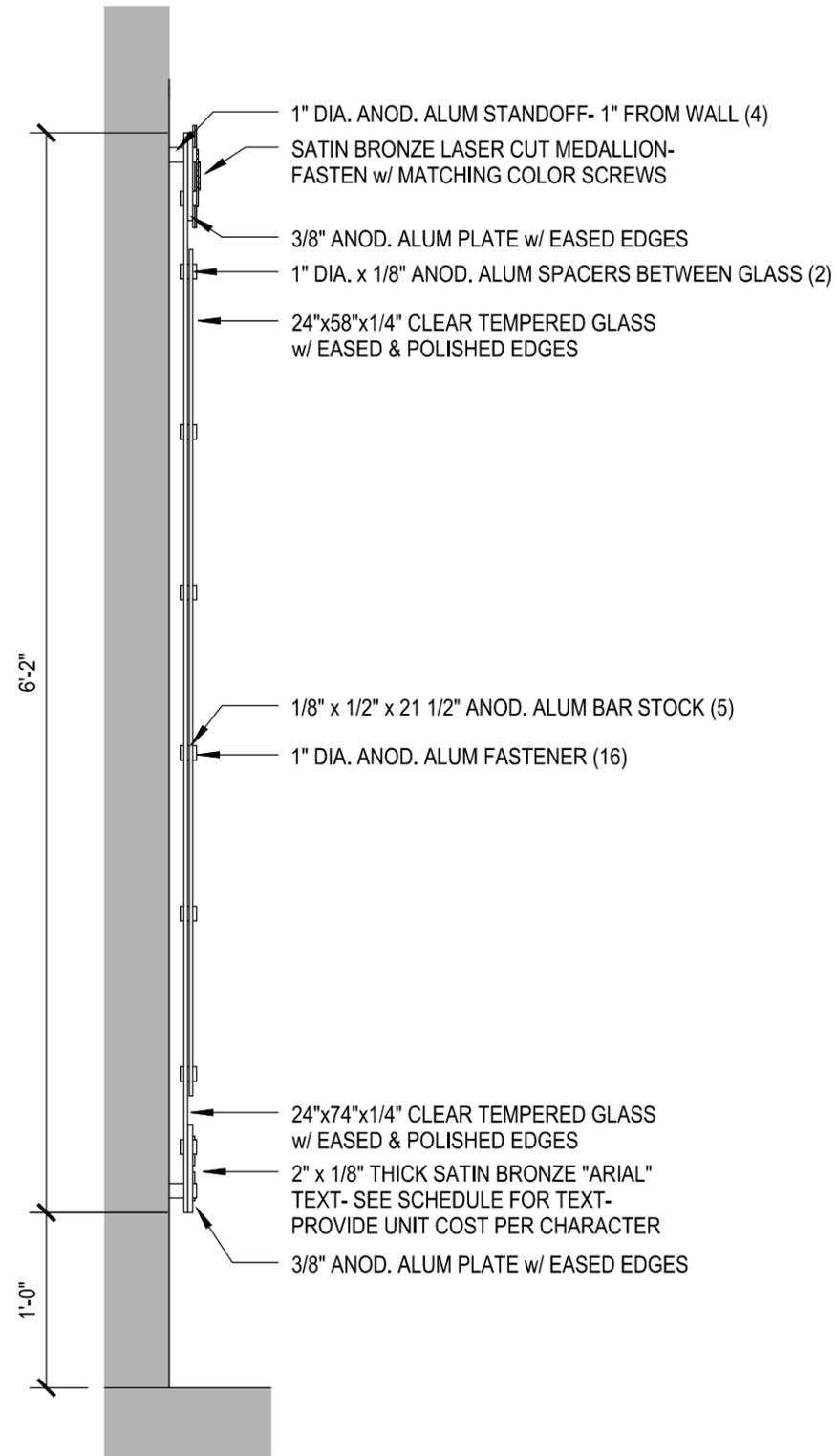
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REVIEWED BY:		
REV.	DESCRIPTION	DATE

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A5.4

DATE
 11-22-11

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NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - FIVE FLOORS
 SCALE: 1" = 1'



MONTANA STATE UNIVERSITY
 BUILDING INFORMATIONAL SIGNAGE

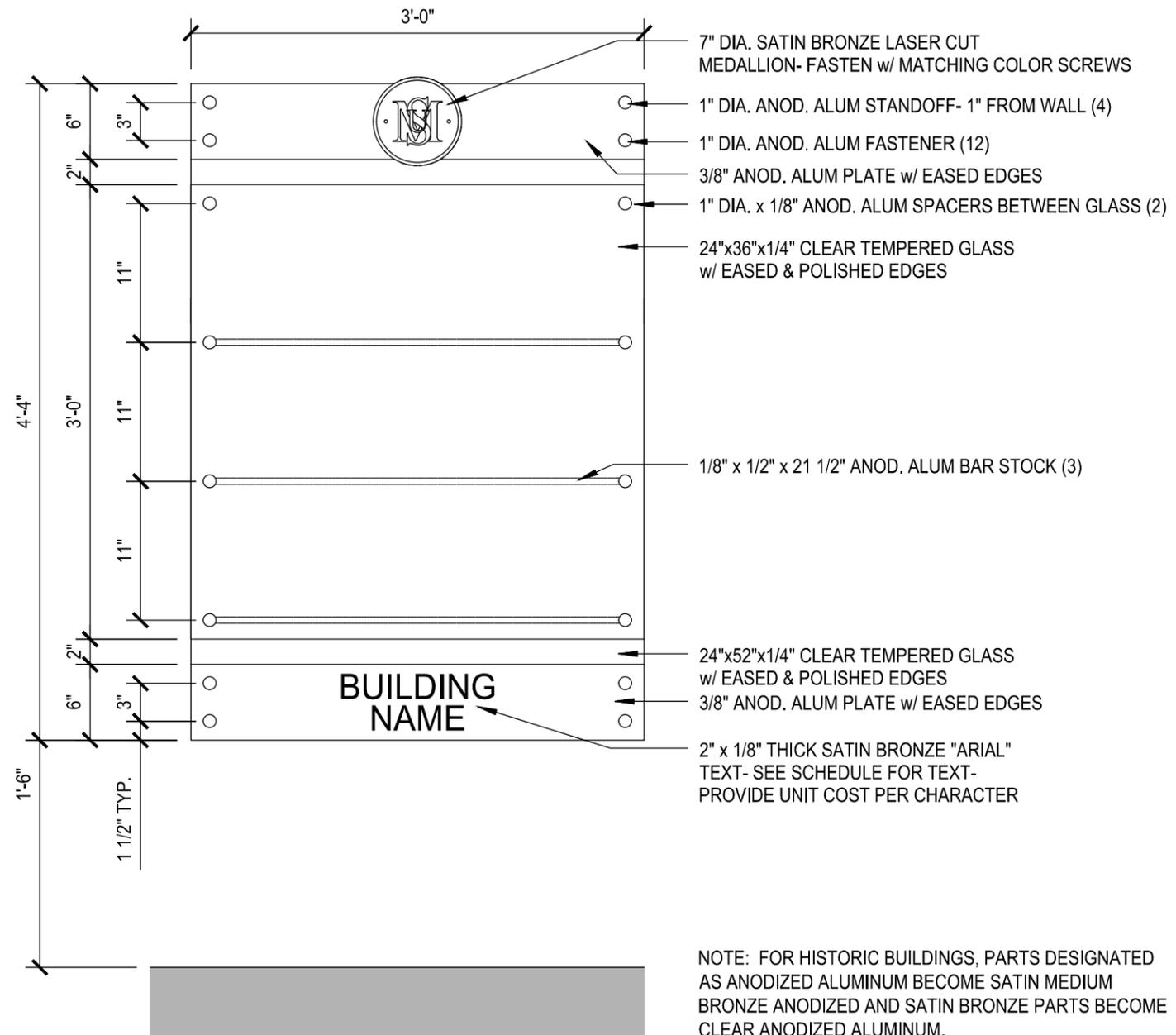
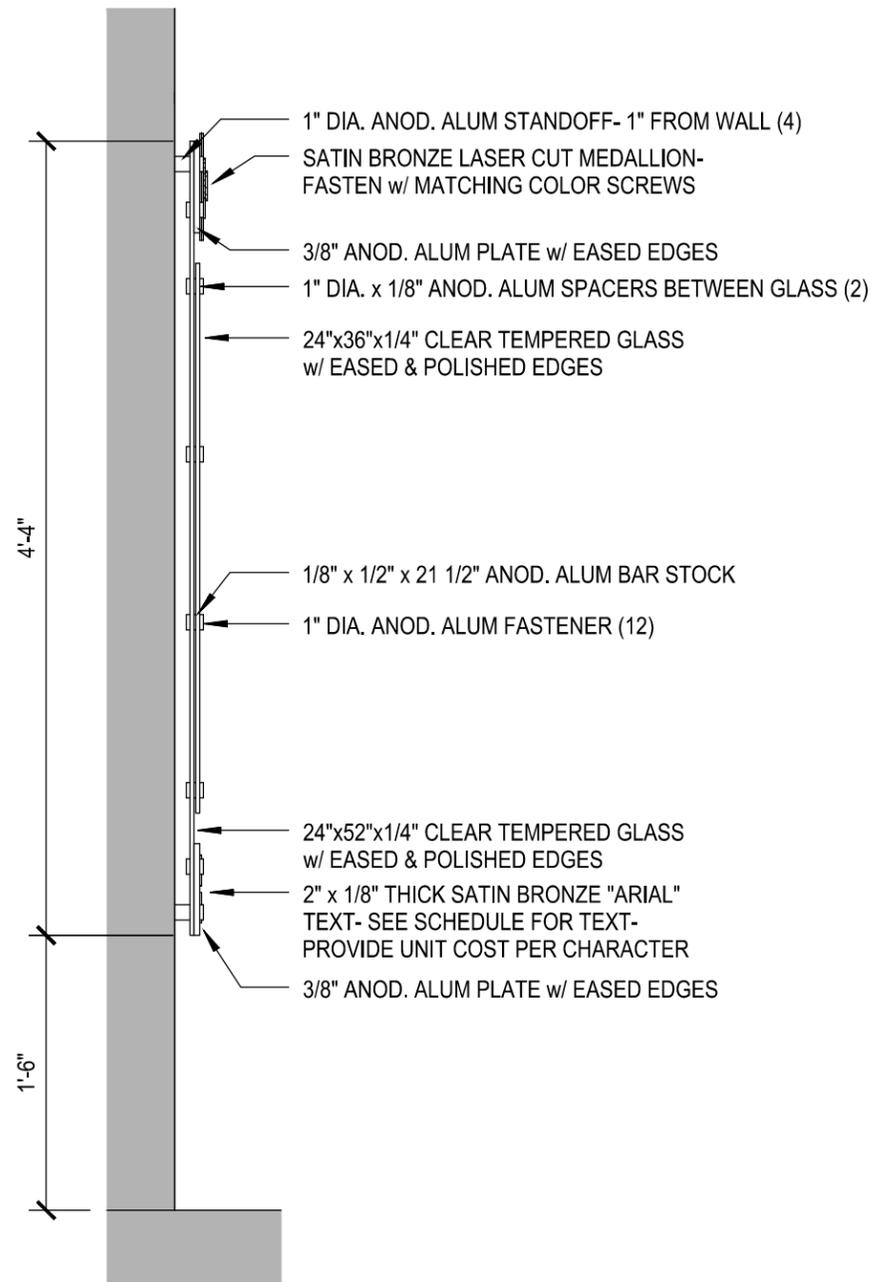
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 BOZEMAN, MONTANA
 PHONE: 406.994.4131 FAX: 406.994.6572

DRAWN BY: GAG		
REVIEWED BY:		
REV.	DESCRIPTION	DATE

PPA#11-0154

SHEET
A5.5

DATE
 11-22-11



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

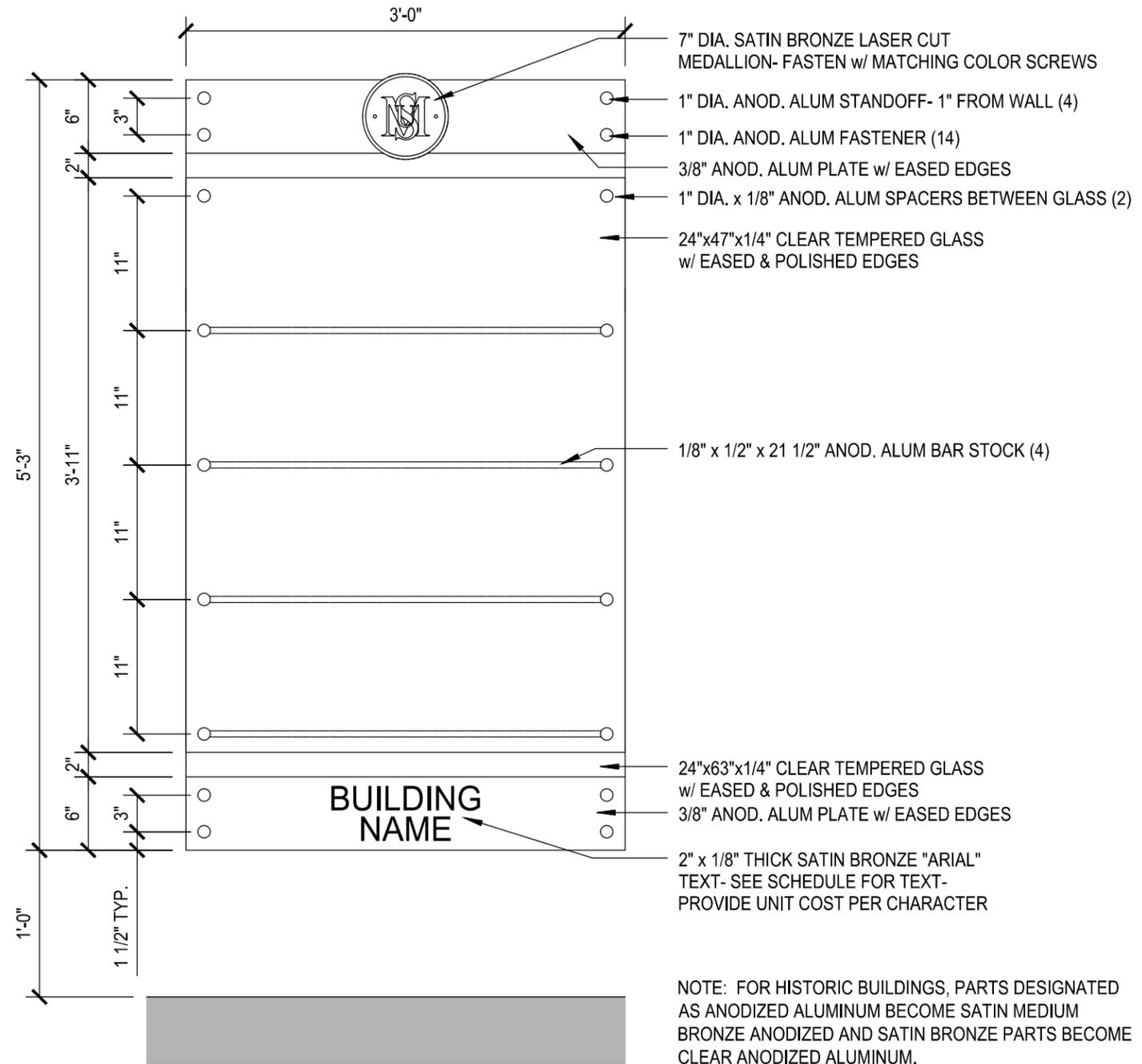
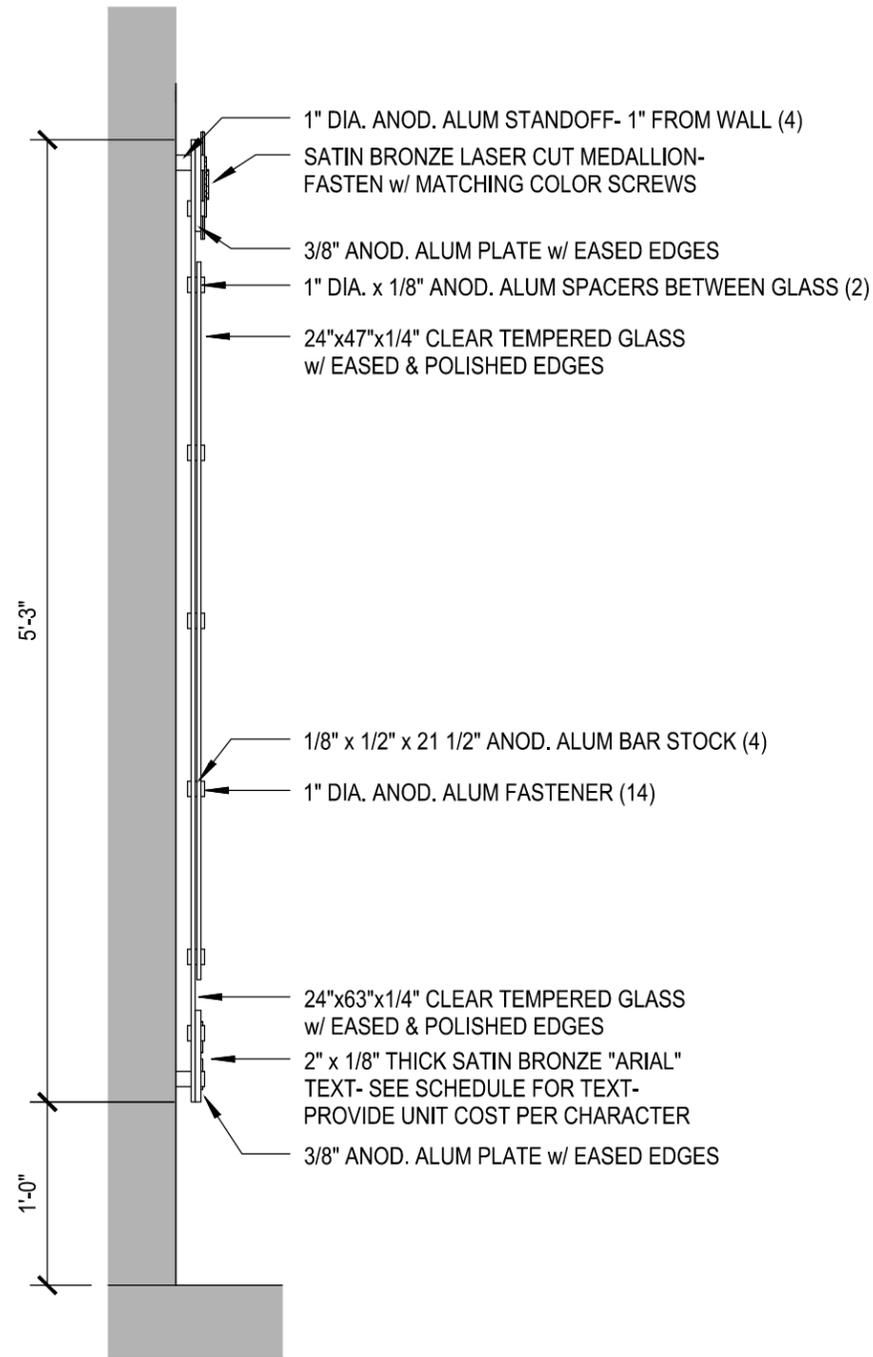
1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - SIX FLOORS
 SCALE: 1" = 1'

DRAWN BY: GAG		
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REV.	DESCRIPTION	DATE

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SHEET
A5.6

DATE
 11-22-11



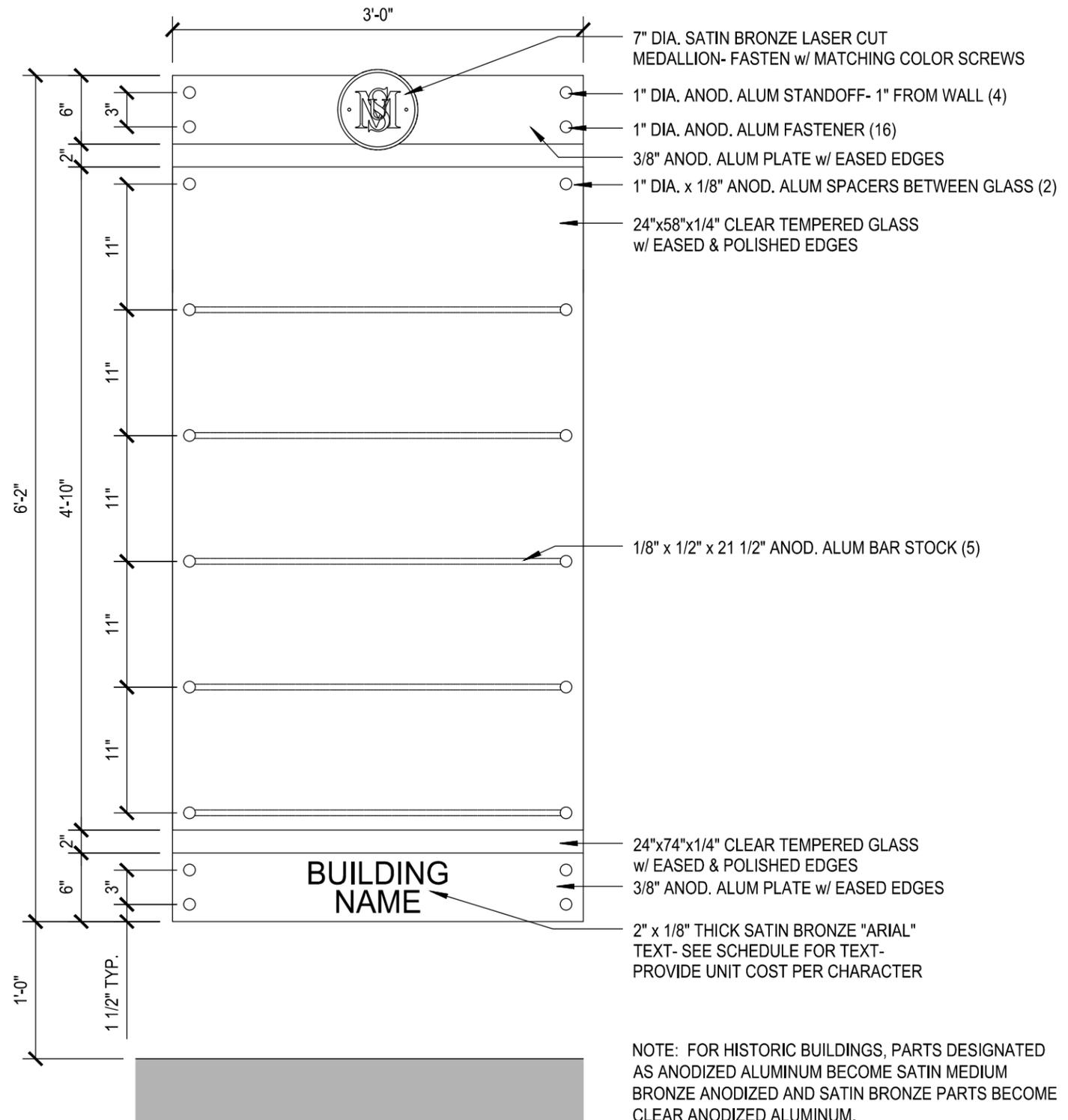
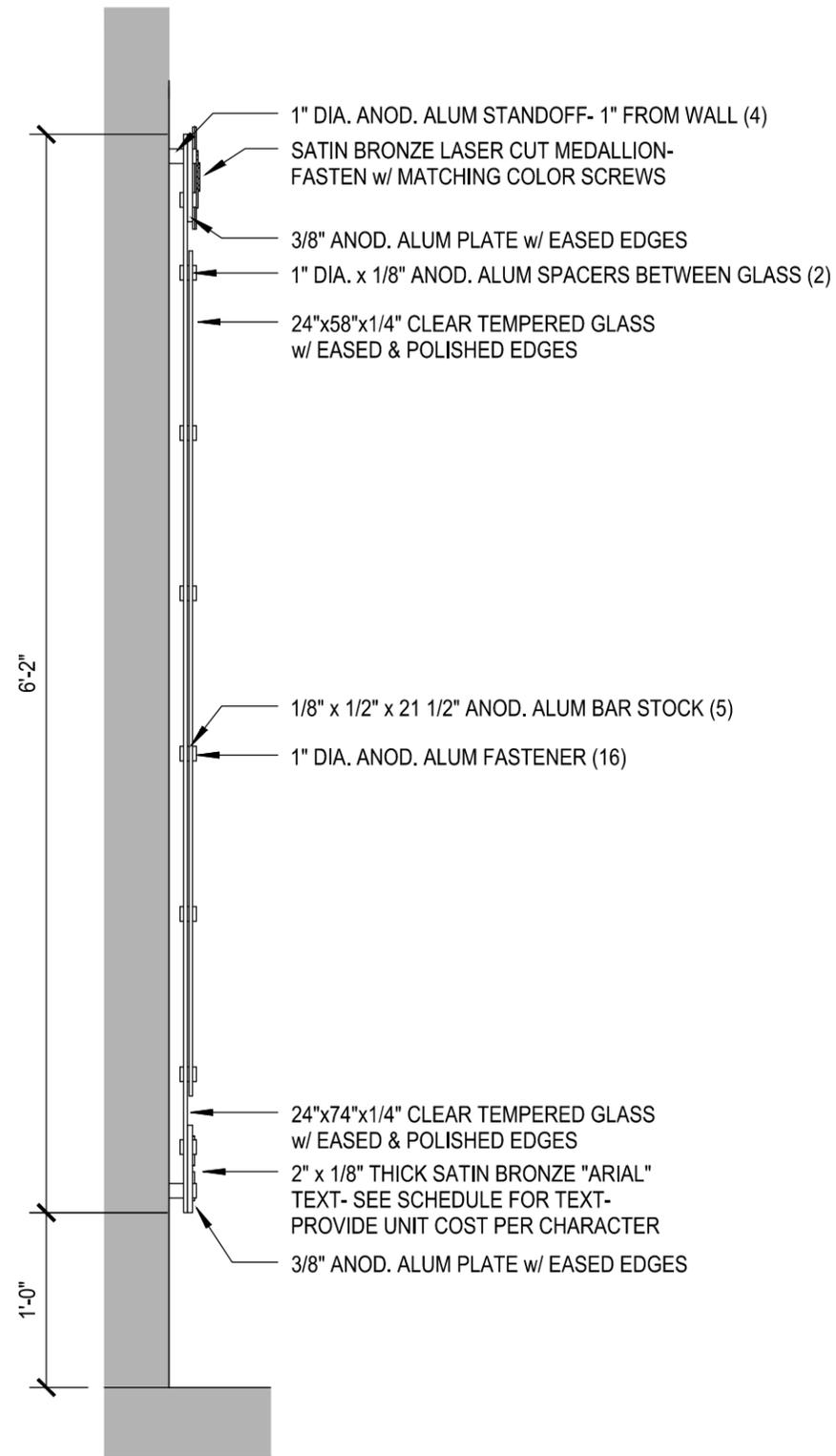
1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - SEVEN TO EIGHT FLOORS
 SCALE: 1" = 1'

DRAWN BY: GAG		
REVIEWED BY:		
REV.	DESCRIPTION	DATE

PPA#11-0154

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A5.7

DATE
 11-22-11



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

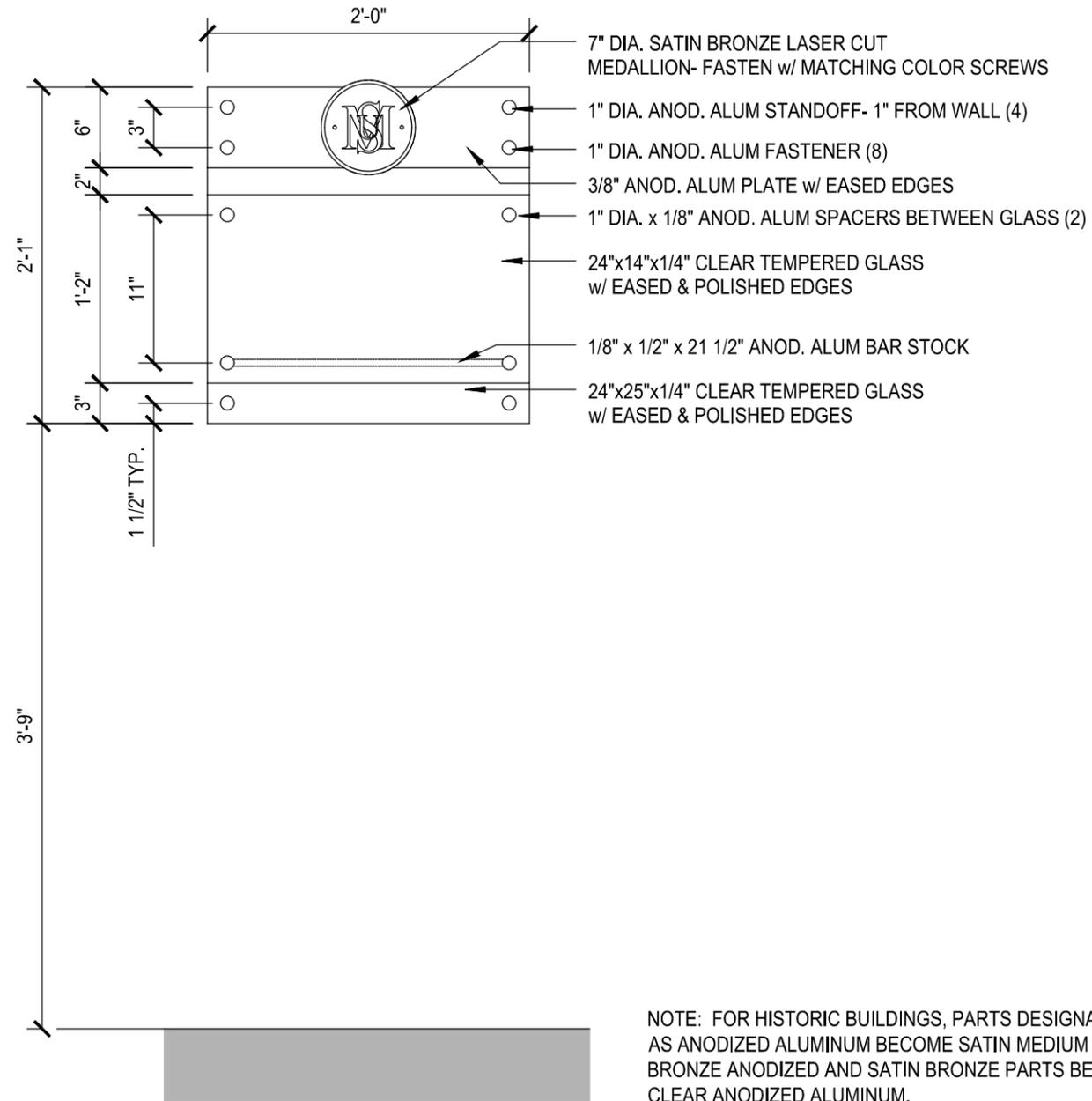
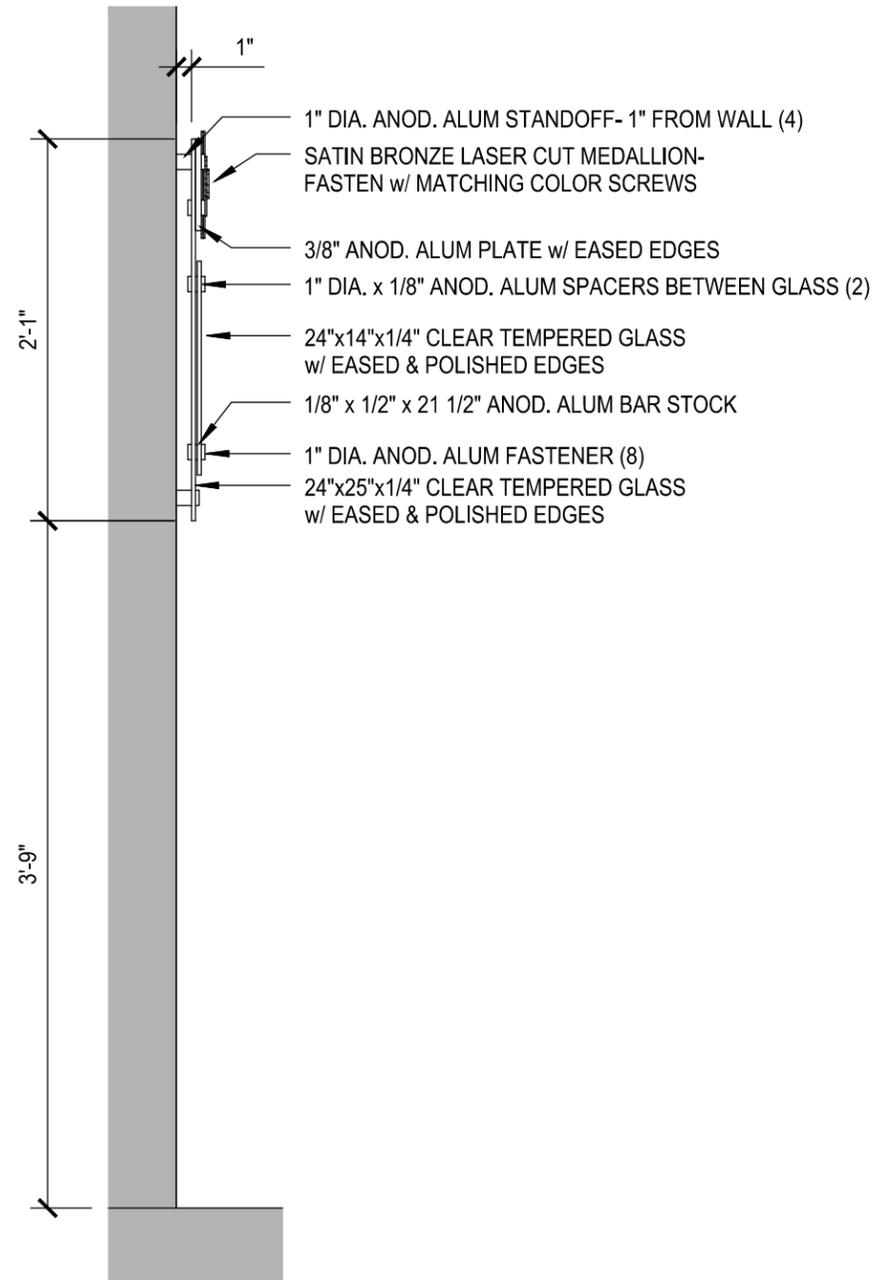
1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - NINE TO TEN FLOORS
 SCALE: 1" = 1'

DRAWN BY: GAG		
REVIEWED BY:		
REV.	DESCRIPTION	DATE

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A5.9

DATE
 11-22-11



NOTE: FOR HISTORIC BUILDINGS, PARTS DESIGNATED AS ANODIZED ALUMINUM BECOME SATIN MEDIUM BRONZE ANODIZED AND SATIN BRONZE PARTS BECOME CLEAR ANODIZED ALUMINUM.

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - NON ENTRY FLOOR
 SCALE: 1" = 1'

DRAWN BY: GAG

REVIEWED BY:

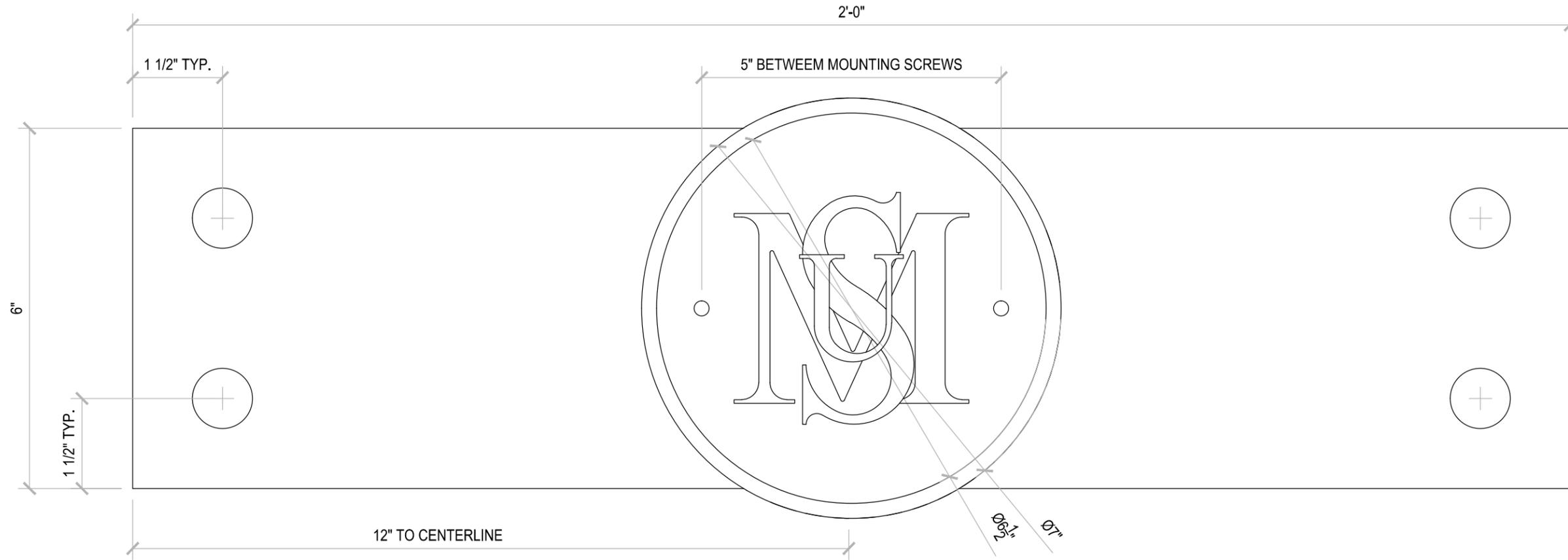
REV.	DESCRIPTION	DATE

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DATE
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1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - MEDALLION
 SCALE: 1/2" = 1"



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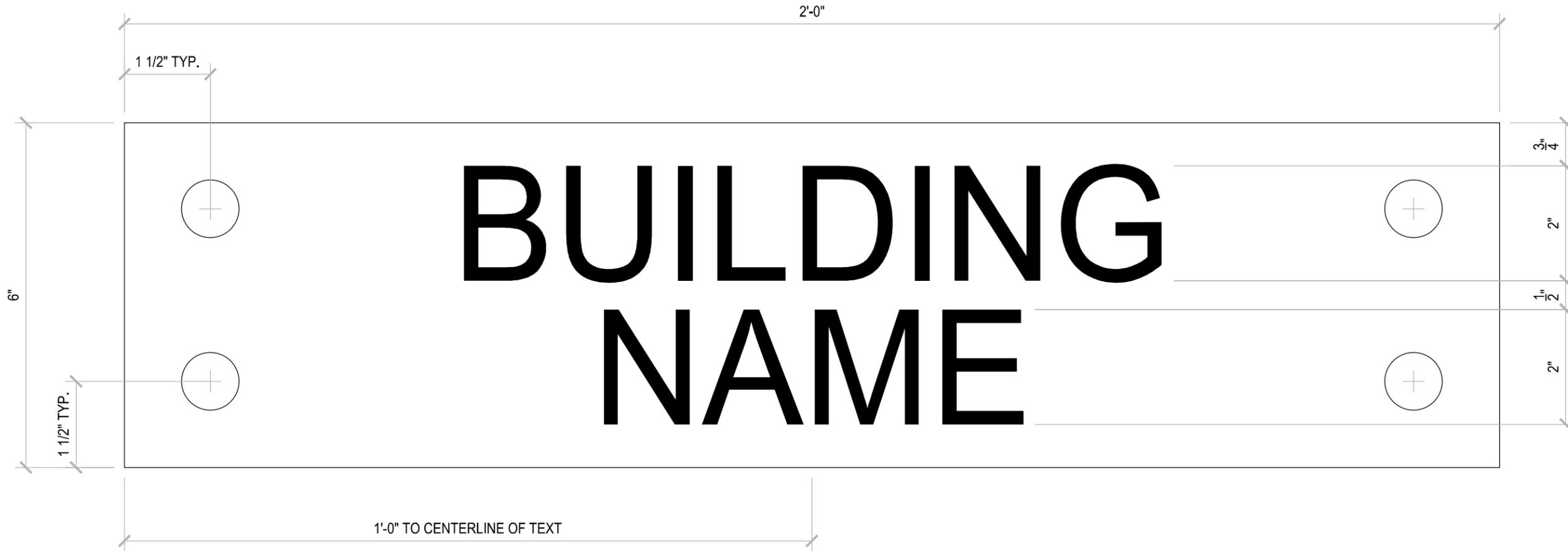
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DRAWN BY: GAG		
REVIEWED BY:		
REV.	DESCRIPTION	DATE

PPA#11-0154

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A5.11

DATE
 11-22-11



1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - BUILDING NAME
 SCALE: 1/2" = 1"



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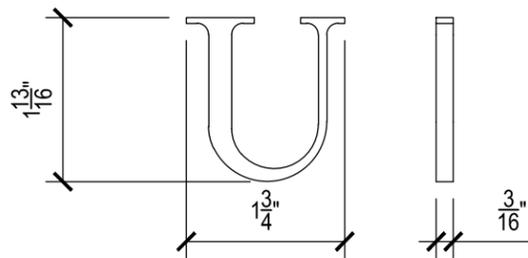
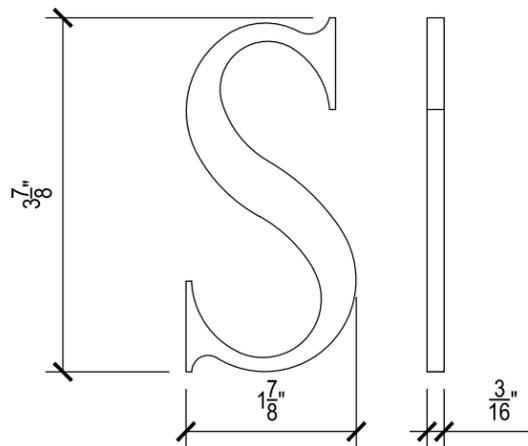
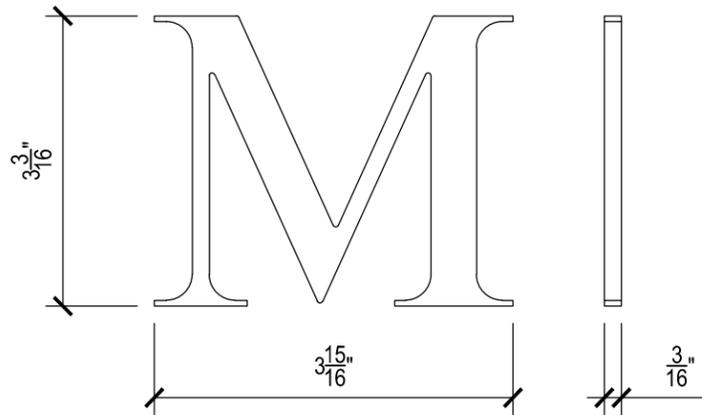
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REV.	DESCRIPTION	DATE

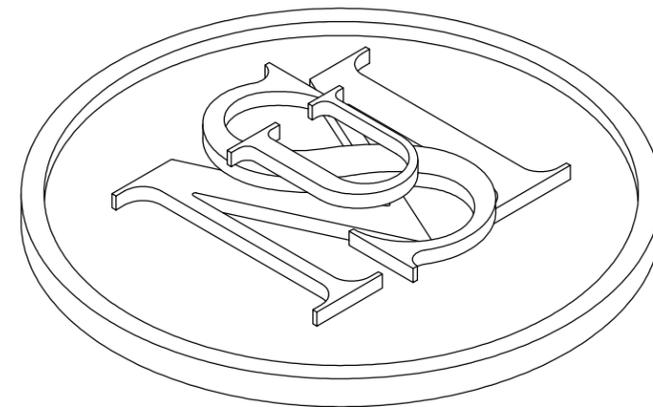
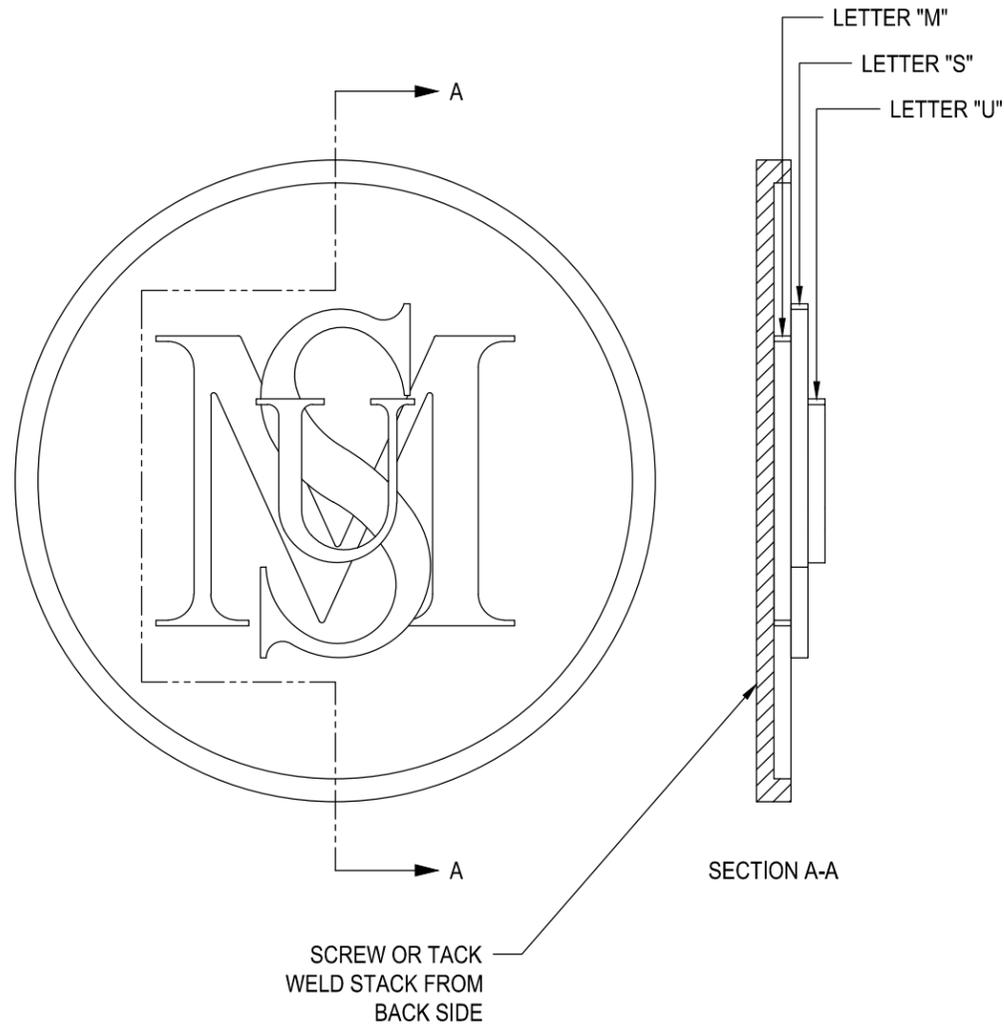
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A5.12

DATE
 11-22-11



NOTE: AUTOCAD FILE OF "M", "S" & "U"
 LETTERS PROVIDED UPON REQUEST



ISOMETRIC VIEW

1 CAMPUS BUILDING INFORMATIONAL SIGNAGE - MEDALLION DETAILS
 SCALE: 1/2" = 1"

DRAWN BY: GAG

REVIEWED BY:

REV.	DESCRIPTION	DATE

PPA#11-0154

SHEET
A5.13

DATE
 11-22-11



BUILDING INFORMATIONAL SIGNAGE COLORS FOR NEW BUILDINGS



BUILDING INFORMATIONAL SIGNAGE COLORS FOR HISTORIC BUILDINGS

1

CAMPUS BUILDING INFORMATIONAL SIGNAGE - COLOR REFERENCE

SCALE: NONE

DRAWN BY: GAG

REVIEWED BY:

REV.	DESCRIPTION	DATE

PPA#11-0154

SHEET

A5.14

DATE

11-22-11

Appendix 1.10-7 Construction Signage Standard

Each fenced construction site or fenced lay-down area shall have an identifying sign with the project information, required in the Contract Documents, and provided by the General Contractor, as follows:

- The sign shall be professionally made, painted or vinyl transfer process, on min. 3/4" MDO plywood
- The sign shall be 36" high x 48" wide, unless otherwise approved by the Project Manager
- The location of the sign on the construction fence shall be approved by the Project Manager
- A template for the sign layout is available from CPDC's CAD technician.
- A sample finished sign is provided on the next page

Appendix 1.10-8 Signage Documentation Checklist

Documentation will include, at a minimum:

Documentation	SD	DD (35% CD)	65% CD	95% CD
Compliant Room Numbering Designations <i>(per Appendix 1.10-4)</i>		X	X	X
Interior Signage Schedule			Draft for Review	X
Building Signage Schedule – <i>located on plans</i>			Draft for Review	X
Construction Signage – <i>located on plans</i>				X

The current MSU Long Range Campus Development Plan (LRCDP) can be found at

<http://www.montana.edu/campusplan/>

At this site individual chapters of, or the entire document, are available in pdf format

Appendix 2.1-2 - Site Survey Requirements

The following is a list of information that should be included, at minimum, on site surveys conducted by the Design Consultant for projects on the MSU campus. No survey should be conducted without meeting with the Project Manager to confirm that the various project constituents have been contacted with respect to information required on the survey.

1. Topography – 1' contours
2. Existing Underground Utilities – including valving; shutoffs; if origin is in building identify; size; characteristics; material; note viability; depth. Note: the survey team should meet with the Mapping Technician and obtain MSU information on underground utilities for the survey location as well as any other information that he may have that would be pertinent to the survey.
3. Existing utility meters, either freestanding or mounted on a building.
4. Existing surface utilities such as transformers, communication equipment, generators.
5. Abandoned Features/Utilities (locatable and un-locatable) – the surveyor should meet and discuss this with the Mapping Technician, who may suggest meeting with MSU trades foremen for their information as well.
6. Site survey should extend at least 20' beyond intended scope of work, but this is the most basic requirement. The extents of the survey should be approved by the Project Manager to assure that all areas that could potentially be included in an expanded scope of work are captured in the survey.
7. Existing pavement, edge of pavement, pavement markings, including handicap markings
8. All site features – incl. trees with caliper, realistic drip line and type; hydrants, vaults, light fixtures, signs, street signs, flagpoles, building entrances, bike parking, pavement marking, bollards, edge of pavement, irrigation (POC)
9. Edges and extents of landscaping beds and other ground coverings such as gravel beds.
10. Construction staking may be part of the scope of services of the surveyor or may be carried out by the General Contractor. This area of responsibility should be agreed upon at the time of contracting the surveyor so that there are not additional fees required at a later time.
11. Site plan should be in engineering scale – show illustrative scale, written scale and north arrow
12. Survey must be stamped and signed by a registered professional surveyor.



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DESIGN GUIDELINES

JANUARY 2012

APPENDIX 2.2-2

LANDSCAPING SPECIFICATION 02900

MODIFIED -



SECTION 02900 – LANDSCAPING

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

- A. The work in this section includes landscape construction, protection of existing site and landscape conditions and landscape maintenance during construction.
- B. See drawings for extent of landscaping.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01500 – Temporary Facilities and Controls
- B. Section 02210 – Tree Protection
- C. Section 02235 – Site Clearing
- D. Section 02300 - Earthwork
- E. Section 02810 - Irrigation System
- F. Section 02935 – Lawns and Grass

1.3 QUALITY ASSURANCE

- A. Comply with applicable Federal, state and local regulations governing landscape materials and work.
- B. Landscape Architect reserves right to review and reject materials at growing site and as delivered to site.
- C. Observation at growing site does not preclude right of rejection at job site. Remove rejected materials from site immediately.
- D. Personnel: Employ only qualified personnel familiar with required work.
- E. Contractor's Responsibilities: Landscape Contractor to coordinate activities with all other trades. Landscape Contractor to also secure utility locates prior to commencing work involving excavation or digging.

1.4 REFERENCED STANDARDS

- A. *ANSI Z60.1: American Standard for Nursery Stock*, latest edition, American National Standards Institute.
- B. *Hortus Third: A Concise Dictionary of Plants Cultivated in the United States & Canada*, Staff of the L.H. Bailey Hortorium, Cornell University, 1999.
- C. *ASTM C33: Specification for Concrete Aggregate*, American Society of Testing Materials.
- D. Alex Shigo, *Tree Pruning*, Shigo & Tree Associates, LLC, 1989.
- E. *Guide for Plant Appraisal*, latest edition, Council of Tree and Landscape Appraisers.
- F. *Species Ratings and Appraisal Factors Guide*, latest edition, International Society of Arboriculture, Rocky Mountain Chapter.
- G. *ANSI A300: Standards for Tree Care Operations*, American National Standards Institute.

1.5 SUBMITTALS

- A. File Certificates of Inspection of plant material by Federal, State and local authorities with Landscape Architect, if required.
- B. Submit within 30 days after award of contract, complete list of materials to be furnished under this section and confirmed sources for materials.
- C. Requests for substitutions shall be submitted in writing to the Landscape Architect prior to award of contract.
- D. Provide and pay for material testing. Submit the following materials certification and text report.
 - 1. Topsoil
 - a. pH factor
 - b. Mechanical analysis
 - c. Percentage of organic content

- d. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring topsoil to satisfactory level for planting.
 - e. Identify source location of topsoil proposed for use on the project if imported from off-site.
 - 2. Organic Additives
 - a. Loss of weight by ignition
 - b. Moisture absorption capacity
 - c. Percentage of organic matter
 - d. pH factor
- E. Submit the following material samples, in a size within reason to evaluate material thoroughly:
 - 1. Mulch
 - 2. Erosion control fabric
 - 3. Edging

1.6 PRODUCT PREPARATION, DELIVERY, AND STORAGE

- A. Preparation and Protection
 - 1. Balled and Burlapped (B&B) Plants: Dig and prepare shipment in a manner that will not damage roots, branches, shape, and future development.
 - 2. Container Grown Plants: Deliver plants in container sufficiently rigid to hold ball shape and protect root mass.
 - 3. Use all means necessary to protect and maintain materials before, during and after installation and to protect the installed work and materials of all other trades.
 - 4. All seed shall be delivered in the original bags certifying purity, germination, common, and botanical name for each species, and percent weed seed. Landscape Architect shall inspect all seed prior to application. Untagged seed bags shall be rejected. Immediately make all replacements necessary to the approval of the Landscape Architect and at no additional cost to the Owner.

5. Deliver all products, as specified, to site in original, sealed containers bearing manufacturer's guaranteed statement of analysis.

B. Delivery

1. Deliver packaged materials in sealed containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored on site.
2. Deliver only plant materials that can be planted in one day unless adequate storage and watering facilities are available on job site.
3. Protect root balls by heeling in with mulch if not planted within 24 hours of delivery.
4. Protect during delivery to prevent damage to roots at all times. Cover all materials during transport.
5. Notify Landscape Architect of delivery schedule 48 hours in advance so plant material may be observed upon arrival at job site and can be inspected immediately after being unloaded at site.
6. Remove rejected plant material immediately from site.
7. Do not lift, move, adjust to plumb, or otherwise manipulate plants by trunk or stems. Avoid damage or stress by proper handling. Plant material dropped on the ground, rather than gently placed into the storage area or planting bed, will be rejected.

C. Storage

1. Plant material shall be stored in a shady and secure location, and shall be watered regularly prior to planting to prevent drying out of the rootball.
2. Seed, fertilizer, herbicide, hydromulch, and tackifier shall be kept in dry storage away from contaminants, at a weatherproof location.

1.7 JOB CONDITIONS

A. Site and Plant Protection

1. Care must be exercised to minimize disturbance or compaction of areas adjacent to any project. Trees shall be protected as specified in the project manual.

2. In order to prevent excessive soil compaction and destruction of soil structure, no site work will be performed in cases where equipment or traffic must pass over wet soils or if wet soils must be handled or manipulated in order for the work to progress. Wet soil is defined as any soil within 90 percent of field capacity (saturation).
3. Do not move equipment over existing landscape or newly placed structures without approval of the Owner or Owner's Representative.
4. Provide board roading as required to protect paving. Protect other improvements from damage, with protection boards, ramps and protective sheeting.

B. Planting Restrictions

1. Perform actual planting per referenced standards.
2. Landscape Architect must approve all bedding plants and ground covers.
3. A buffer zone of turf grass, pavers or other solid, anchored materials of at least five feet in width must exist between the sidewalk margins and any planting bed. Paved walks or service drives wider than eight feet must have a buffer zone of ten feet minimum.
4. Plant materials must be installed with spacings that allow, at maturity, a maximum of 30 percent canopy overlap or inter-fingering. This does not apply to species of widely disparate mature sizes, such as between a large tree and understory shrubs, because their canopies do not grow together.
5. Trees that are medium and small at maturity must be planted no closer than fifteen feet to any building, sidewalk or paved surface unless otherwise indicated on the drawings. Trees that are large at maturity cannot be placed closer than 20 feet to any building, sidewalk or paved surface unless otherwise indicated on the drawings. Owner must approve exceptions to these requirements.

C. Utilities

1. Utility locates are required prior to digging and any construction activities.
2. Coordinate work with Owner, including irrigation specialist, in order to prevent damage to underground sprinkler system.

1.8 WARRANTY

- A. Warranty plant material for one year after final acceptance. Replace dead or dying materials not in vigorous, thriving condition as soon as weather permits and on notification by Landscape Architect. Replace plants, including trees, which in opinion of Landscape Architect have partially died, thereby compromising shape, size or symmetry.
- B. Replace plants with same kind and size as originally planted, at no cost to Owner. Provide one-year warranty on replacement plants. Trees should be replaced at start of next planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and other piping conduit or other work during replacement. Repair damage immediately.
- C. Warranty excludes replacement of plants after final acceptance because of injury by storm, drought, drowning, hail, freeze, insects, or disease. Materials damaged by "Acts of God" prior to final acceptance are responsibility of Contractor.
- D. At end of warranty period, remove staking and guying materials from the site.

1.9 MAINTENANCE

- A. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.
- B. Maintain plantings and trees by watering, cultivating, weeding, spraying, cleaning, and replacing as necessary to keep landscape in a vigorous, healthy condition.
- C. Coordinate watering schedules with irrigation contractor during installation and until final acceptance. Provide deep root watering to newly installed trees.
- D. Mowing: Mow newly planted grass area weekly after initial growth reaches two and one-half inches.
- E. Weeding: Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner's Representative.
- F. Fencing: Provide four (4') foot tall orange plastic snow fencing and metal tee fence post spaced at a maximum of eight (8') feet apart around all walks at seeded areas. Maintain until lawn is accepted.
- G. Tree Replacement

Trees removed during demolition or construction are to be replaced following consultation with Owner's Arborist or Owner's Representative. Appraised values of existing trees have been determined according to industry standards and will be provided by the Owner if applicable.

PART 2 – PRODUCTS

2.0 PLANTS

A. General

Plant quality must be equal to well formed No. 1 grade nursery stock. Listed plant heights are from tops of root balls to nominal tops of plants. Plants shall be specimen quality, typical of their species or variety.

B. Shrubs and Ground Covers

Plants shall be nursery grown, healthy and vigorous, of normal habit of growth for the species, free from disease, insect eggs, and larvae. Specified sizes are before pruning and measured with branches in normal position. Plants shall be well rooted and established in the container.

C. Ornamental and Shade Trees

Trees shall be healthy, vigorous, full-branched, well-shaped, trunk diameter, and height requirements as specified. Root balls shall be firm, neat and slightly tapered and well burlapped. Trees with loose or damaged root balls at time of planting shall be rejected. Root balls should meet the American Standard for Nursery Stock, Edition approved 1985 by American National Standards Institute, Inc. (Z6O.1) standard.

D. Special Requirements

Shade trees are to be procured a minimum of 30 days prior to scheduled installations. Trees to be shipped in enclosed truck or the branches/leaves protected by appropriate fabric during shipping. Trees are to be healed in at job site or at Contractor's holding facility and maintained until site is ready. Landscape Architect will review trees at holding area prior to planting.

E. Collected Trees

Spray field grown trees immediately prior to digging with anti-desiccant. Insure adequate coverage to trunks, branches and foliage. Direct planting from the spade site is preferred. Coordinate with Owner for utility locates and scheduling of sidewalk closures or other logistical issues.

2.1 SOIL PREPARATION MATERIALS

A. Soil Amendments: Soil amendments are not to be used unless approved by Owner.

B. Topsoil

1. Friable, fertile, dark, loamy soil, free of clay lumps, stones and other extraneous material and reasonably free of weeds and foreign grasses, with a pH of 5.0 to 8.0.
2. Organic matter shall be four to 12 percent total dry weight.
3. Provide tests for certification.

C. Sharp Sand

Sharp sand shall be clean, washed and fine aggregate and shall meet ASTM C33 standards.

D. Peat Moss

Peat moss shall be commercially produced, sterilized, reed-sedge peat, equivalent to Martins Peat, Big Fork, Montana. Peat must have a pH between five and seven and organic matter content not less than 90 percent.

E. Fertilizer

1. Type A – as recommended by testing agency.
2. Type B – Scotts “Osmocote” at a 14-14-14 ratio, incorporated into the soil according to instructions on the bag.

2.2 MISCELLANEOUS MATERIALS

A. Edging

As indicated on drawings.

B. Mulch

1. Shredded, medium grade, Douglas fir bark with a chip size of one and one-half inch to two and one-half inch average, free of wood chips and sawdust, as manufactured by Model Log Homes, 75777 Gallatin Road, Gallatin Gateway, Montana, 59730 (or approved equal).
2. One and one-half inch round, native, washed, river rock.
3. Landscape Architect approved equivalent.

C. Landscape Fabric

Heavy, professional grade, spun-bonded nylon landscape fabric with six-inch anchoring pins. Woven fabric is unacceptable.

D. Anti-Desiccant

1. Protective film emulsion for protection of plant surfaces during transport. Permeable to permit transpiration, as manufactured by Wilt Pruf, Inc., P.O. Box 4280, Greenwich, Connecticut, 06830. Mixed and applied in accordance with manufacturer's instructions.
2. Landscape Architect approved equivalent.

E. Staking and Guying

1. Tie Wire: 12-gauge, galvanized wire
2. Metal stakes: 24-inch t-stakes
3. Metal posts: 8'-0" t-stakes
4. Nylon strap: three inches wide, 12 inches long white or black nylon strap with one 1/2" brass grommet in each end or Landscape Architect approved equivalent.

F. Drainage Fill

Drainage fill shall be mill run 3/8 inch to 3/4 inch native crushed stone.

G. Native Topsoil

Refer to Montana Standard Specifications Subsections 203.80 Topsoil Salvaging and placing, 610.00 Topsoiling and 713.06 Topsoil Material.

H. Imported Topsoil

In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner's Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil.

PART 3 - EXECUTION

3.0 INSPECTION

Examine sub-grade and verify conditions under which work is to be performed. Notify General Contractor and Landscape Architect of unsatisfactory conditions.

3.1 BED PREPARATION

- A. Scarify all sub-grade of bed areas to six inches, all areas.
- B. Contractor shall spread topsoil evenly throughout bed after thoroughly mixing soil, amendments and fertilizer together on site.
- C. Remove any debris and rocks larger than one inch.

3.2 SHRUB AND GROUNDCOVER PLANTING

- A. Provide one-foot deep top soil in all shrub beds.
- B. Place plants in a position on bed areas before removal from containers. Obtain approval from Landscape Architect of plant layout in the field. Landscape Architect reserves the right to shift locations of plants prior to planting.
- C. Remove burlap from upper one-half of root ball on all B&B plants.
- D. Plant all plants as located, setting plants with tops of balls even with the tops of bed grades. Backfill with native soil and compact soil carefully around each plant ball. Water thoroughly to eliminate air pockets. Carefully prune plants to remove dead or broken branches and hand-rake bed areas to smooth even surfaces.

3.3 TREE PLANTING

- A. Ornamental Trees and Shrubs
 - 1. Stake locations for approval by Landscape Architect.
 - 2. Plant in pits two times larger than ball for trees and shrubs.
 - 3. Fill material should be the native soil removed from the hole. No planting mix or soil amendments should be used.
 - 4. Glazed sides of mechanically dug holes should be roughened or scarified to allow root penetration.
 - 5. Carefully settle by watering to prevent pockets.
 - 6. Root collar shall not be planted below finish grade level.

B. Root Balls

1. Root balls shall be properly located in relationship to adjacent soil as required by referenced standards.
2. Balls set too deep or too shallow shall be carefully removed and replanted as required by the Landscape Architect.

3.4 TREE MOVING AND TRANSPLANTING

- A. Tree moving and transplanting shall be done in accordance with standards outlined in *ANSI A300: Standards for Tree Care Operations*, American National Standards Institute.
- B. All tree moving and/or transplanting operations shall be coordinated with the Owner prior to commencement of work.
- C. All removal and receiving areas shall have a comprehensive utility locate done according to current standards prior to commencement of work.

3.5 PERENNIAL PLANTING

- A. Prepare planting beds as indicated on drawings. Provide two feet of thoroughly mixed and prepared soil consisting of 50 percent sand loam topsoil; 25 percent coarse pumice, 3/8 inch size; and 25 percent peat moss. Thoroughly mix in 20 pounds of Scott, Ortho or Lilly-Miller nitrogen fertilizer per cubic yard with formulation of 10-20-10.
- B. Replace existing soil with planting mix.
- C. Space plants as indicated on drawings. Obtain approval of plant layout of Landscape Architect before planting. Landscape Architect reserves the right to change the location of plants prior to planting.

3.6 LANDSCAPE FABRIC

After planting has been completed and approved by the Landscape Architect, install landscape fabric across planting beds. Sheets of fabric should have a minimum six-inch overlap. At the bed margins, fabric should be installed under the bottom of the plastic edging. Fabric lapping outside the edging should be trimmed to below grade and buried when the edging is backfilled. Fabric should be well anchored with 6 inch stakes pounded flush with the grade. Plant openings must be large enough to allow for future growth.

3.7 TOP DRESSING

After landscape fabric has been installed and accepted by the Landscape Architect, top dress bed areas with mulch, as indicated on drawings, a minimum of three inches deep. Fabric must not be exposed or protrude above the mulch or edging. Mulch should be clean, whether organic or mineral mulch, and should be free of debris and soil.

3.8 TREE WRAPPING

Tree wrapping will not be accepted.

3.9 PRUNING OF NEW TREES

- A. Do not cut back terminal branches. Properly remove sucker growth from the base and badly broken or bruised branches. Thin native trees more heavily than nursery grown plants.
- B. Follow referenced standards and prune material as directed.

3.10 TREE SAUCERS

Form a four inch high saucer around each new tree for deep watering. Contractor is responsible for deep watering until final acceptance. Tree saucers are not required for trees with drip irrigation system installation.

3.11 TREE GUYING AND STAKING

- A. Stake and guy trees immediately following planting operation. Take precautions during guying operation to prevent damage or injury to branches and roots. Orient all stakes within each cluster or row of trees in the same direction or as directed by Landscape Architect.
- B. Trees of over one inch caliper should be staked with woven nylon straps and wire. Tension on ties should be adequate to support tree, but slack enough to permit movement and the development of reaction wood. Ties cannot be fastened tightly to trunks; free movement or slack equal to at least twice the caliper must be allowed.

3.12 PLANTING BED EDGING

Install edging per manufacturer's directions. Set edging as indicated in true lines as designed with top of edging one inch above finish grade.

3.13 CLEANUP

- A. Keep premises neat and orderly including organization of storage areas. Remove trash and debris from excavated planting areas, preparing beds, or planting plants from site daily as work progresses. Keep paved areas clean by sweeping or hosing.

B. Repair all damage caused by landscape operations.

END OF SECTION 02900

SECTION 02935 – LAWNS AND GRASS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

- A. Work in this section includes:
 - 1. Furnishing all plants, labor, equipment;
 - 2. Performing all operations to finish grade topsoil;
 - 3. Prepare seed and sod beds;
 - 4. Sod all lawn areas; and
 - 5. Maintenance and protection of all sodded and seeded areas.

- B. All areas within the contract limits, except surfaces occupied by paving and areas indicated to be undisturbed shall be hydroseeded or sodded as shown on Plans. Areas repaired due to Contractor damage shall be hydroseeded.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 02200 - Earthwork

- B. Section 02215 - Earthwork for Surface Restoration

- C. Section 02810 - Irrigation System

- D. Section 02900 - Landscaping

The Montana Department of Transportation Standard Specification for road and bridge construction, 1987 Edition, Section 610, roadside development shall govern the work as if bound herein. Where provisions of this section and the referenced standard conflict, this section shall govern.

1.3 QUALITY ASSURANCE

- A. Qualification of Workmen

Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this section.

B. Contractor Qualifications

The Contractor shall have at least two (2) years of weed control spraying experience. Proof of experience will be required. The Contractor must have a valid Montana Commercial Herbicide Applicator's License.

C. Chemical Registration

All weed control chemicals must be registered with the Environmental Protection Agency and the State of Montana.

D. Equipment Requirements

The Contractor shall furnish, operate, and maintain suitable and adequate equipment necessary to perform the above operations in an approved and workman-like manner without delays. Spray nozzles shall be raindrop or similar drift control type.

E. Liability and Contractor's Responsibilities

Weather conditions must be such that no damage outside the sprayed area will occur and the Contractor will cease spraying whenever the application of spray could cause such damage.

The Contractor agrees to hold harmless the Owner and Landscape Architect and/or Engineer against any and all claims for damage arising from operations covered in this proposal.

F. Time of Application

Because of varied climatic conditions, it will be the Contractor's responsibility to coordinate spraying activities to achieve the best results. To avoid possible chemical exposure and general alarm among campus users, time of application must not coincide with other nearby outside campus activities. If nearby activity encroaches during spraying operations, spraying must cease immediately until people leave the area.

1.4 PRODUCT HANDLING

A. Protection

1. Use all means necessary to protect and maintain materials before, during, and after installation and to protect the installed work and materials of all other trades.
2. All seed shall be delivered in the original bags certifying purity, germination, common, and botanical name for each species, and percent weed seed. Owner shall inspect all seed prior to application. Untagged seed bags shall be rejected. Immediately make all replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.
3. Deliver chemical fertilizers and herbicides, as specified, to site in original, sealed containers bearing manufacturer's guaranteed statement of analysis

B. Storage

Seed, fertilizer, herbicide, hydromulch, and tackifier shall be kept in dry storage away from contaminants, at a weatherproof location.

C. Notice to Proceed

The Contractor shall not proceed with seeding or sodding operations until the irrigation system has been tested and approved by the Owner's Representative.

D. Schedules

Install lawn seed mixes during the specified time periods. If special conditions exist that may warrant a variance in the specified plant dates or conditions, a written request shall be submitted to the Owner's Representative stating the special conditions and proposed variance.

The Contractor shall provide a weed control plan and schedule prior to bed preparation, for approval of the Owner's Representative.

E. Substitutions

Requests for substitutions shall be submitted in writing to the Owner's Representative prior to award of contract.

1.5 SPECIAL LANDSCAPE PROVISIONS

A. Water

Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.

B. Maintenance

Until final acceptance, and until as approved stand of grass is achieved, maintain plantings by watering, cultivating, mowing, weeding, spraying, cleaning and replacing as necessary to keep lawns in a vigorous, healthy condition.

Watering: Water as necessary to keep top two inches of soil moist. Coordinate with Irrigation Contractor.

Mowing: Mow newly planted grass area weekly after initial growth reaches 2-1/2 inches.

Weeding: Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner's Representative.

Fencing: Provide four (4') foot tall orange plastic snow fencing and metal tee fence post spaced at a maximum of eight (8') feet apart around all walks at seeded and sodded areas. Maintain until lawn is accepted.

1.6 CONDITION OF SURFACES

Lawn areas will be left at ± 0.1 feet of finish grade as shown on plans.

1.7 ACCEPTANCE

The work will be accepted when a completed stand of grass at the three-leaf stage or beyond is achieved and all provisions of Section 3.5.C, "Performance" have been met as approved by the Owner and Owner's Representative.

PART 2 - MATERIALS

2.1 GRASS SEED

A. General

1. Seed shall be used only in areas where an irrigation system is absent or has been removed.
2. All seed shall be:
 - a. Free from noxious weed seeds, and re-cleaned;
 - b. Grade A recent crop seed;
 - c. Treated with appropriate fungicide;
 - d. Delivered to the site in sealed containers with dealer's guaranteed analysis.

B. Irrigated Grass Seed Mixture: Seed at the minimum rate of three (3) pounds per one thousand (1000) square feet (130 lbs./acre).

<u>Name of Grass</u>	<u>Proportion by Weight</u>	<u>Percent Purity</u>	<u>Percent Germination</u>
'Midnight' Kentucky bluegrass	25%	95%	85%
'Rugby II' Kentucky bluegrass	25%	95%	85%
'Ram I' Kentucky bluegrass	25%	95%	85%
'Delaware' Dwarf Peren. Rye Grass	25%	95%	85%

C. Non-irrigated Grass Seed Mixture: must be 'Kitty Hawk' turf-type tall fescue seeded at three (3) pounds per thousand (1000) square feet (130 lbs./acre).

2.2 SOD

A. General

1. Sod all areas where site is substantially disturbed.
2. Sod shall be from a commercial sod farm located in the Gallatin Valley.
3. Sod type, condition and source shall be approved by the Owner's Representative.

B. Sod Characteristics

Sod shall be well-established lawn turf grasses similar to the seed mix described in 2.1 B.

Sod shall be vigorous, well-rooted, healthy turf, well hydrated and possessing excellent color.

Sod shall be free from disease, insect pests, weeds, other grasses, stones, and any other harmful or deleterious matter.

C. Sod Handling

Cut sod in uniformly wide strips, uniformly 1-1/2 inches thick with clean cut edges.

Sod shall be rolled or folded prior to lifting. Handling of sod shall be done in a manner that will prevent tearing, breaking, drying, or any other damage.

Sod shall be installed in place on the site not more than 24 hours after cutting.

2.3 FERTILIZER

A. Soil Testing

1. Verify fertilization needs by sampling and testing soil prior to purchasing fertilizer. The test sample shall be obtained by sampling six different locations at the project site. Soil from sampled locations shall be mixed in equal parts to provide a compiled sample for testing.

Testing by an approved laboratory shall include:

- a. A test for soil pH,
- b. A test for electrical conductivity (EC),
- c. A test for the amount of nitrogen, phosphorus and potassium present (NPK),
- d. A test to determine the amount of organic matter present (OM).

2. Results of tests shall be reviewed by the Owner and Engineer prior to purchase of fertilizer. If tests results are typical for the general campus area, fertilization operations may commence as specified. If test results are not typical for the general campus area, Owner will provide modified formulation and application rate specifications by Change Order.

B. Formulation

1. Fertilizer shall be manufactured by Anderson ProTurf, or equal approved by the Owner. Application rates shall be in accordance with manufacturer recommendations. Fertilizer shall be complete, uniform in composition, dry and free flowing. The fertilizer shall be delivered to the site in the original waterproof containers, each bearing the manufacturer's statement of analysis.
2. Fertilizer to be spread on areas to be seeded shall be commercially prepared by Anderson ProTurf or an equal product pre-approved by the Owner. Fertilizer shall be a slow release, Poly-S urea, and shall contain the following percentages by weight:
 - 10% Nitrogen
 - 20% Phosphorus
 - 10% Potassium
 - 12% Sulfur
3. Grow - in Fertilizer shall be a slow-release, Poly-S urea, and shall be formulated as 25-3-4-Fe-2% and commercially prepared by Anderson ProTurf or equal approved by the Owner.

C. Special Protection

If stored at the site, protect fertilizer from the elements at all times.

2.4 Mulch

Wood cellulose fiber for hydromulch – Weyerhaeuser, Conweb, or approved equal.

2.5 Mulch Tackifier

Mulch tackifier must be natural, non-asphaltic, vegetable gum with gelling and hardening agents, Terra Tack or approved equal.

2.6 Water

Water shall be clean irrigation quality water.

2.7 Pre-Planting Herbicide

Roundup, provide compatible surfactant and drift control agents as required.

2.8 Post-Emergent Herbicide

"TRIMEC" 2,4-D.M.C.P.P. DICAMBA (BANVIL) manufactured by P.B.I. Gordon 816-421-4070 distributed by Wilbur Ellis Company (406)-248-1176 or West Chemical Agricultural Chemicals, Inc., (406)-252-3834, or other appropriate control which best fits the weed problem and necessary applications.

2.9 Native Topsoil

Refer to Montana Standard Specifications Subsections 203.80 Topsoil Salvaging and placing, 610.00 Topsoiling and 713.06 Topsoil Material.

2.10 Imported Topsoil

In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner's Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

Verify that seeding may be completed in accordance with the original design and the reference standards.

B. Discrepancies

1. In case of discrepancy, immediately notify the Owner's Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 FINISHING

A. Topsoil Spreading

Contractor shall provide a 6" minimum compacted, depth of topsoil on all lawn areas. Topsoil shall be graded smoothly and evenly. Lawn area sub grade particularly on slopes shall be roughed and scarified 6" minimum depth to except and bind with the finish layer of topsoil. Topsoil shall be spread in a non-muddy, unfrozen condition. Surface finish shall be +/- 0.1 foot. Compaction of the topsoil layer shall be $\pm 85\%$ maximum dry density. Refer to Montana Department of Highways Standard Specifications Subsections 610.00 Topsoiling, 203.08 Topsoil Salvaging and Placing, 713.06 topsoil material.

B. Finish Grading

Grade lawn areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth uniform grade. All lawn areas shall slope to drain minimum 2% slope. Where no grades are shown, surfaces shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basins, and elevations at steps or building). Loosen and fine rake areas to receive seed or sod to break up lumps and produce a smooth, even grade, free from unsightly variations, ridges, or depressions. Remove stones one inch or larger, sticks, roots or other debris exposed during this operation. All finish grades shall meet the approval of the Owner's Representative before grass seed is sown or sod is placed.

C. Weed Control

1. Prior to application of seed or sod, the bed shall be roughed up to a depth of 1/8th inch.
2. Moisten the seedbed to a depth of 1" to promote germination of any seeds contained in the topsoil. If rhizomatous grasses, field bindweed (morning glory) or noxious weeds are evident, the Contractor shall be required to eliminate those undesirable plants prior to seeding or sodding, at the discretion and direction of the Owner's Representative.
3. Spray areas showing weed growth with approved herbicides, mow, and remove clippings prior to final grading. Seeding and sodding shall be executed 72 hours following Roundup application.

3.3 PLANTING

A. Preparation

1. Hydroseed bed preparation shall pertain to the preparation of the surface of the ground to receive the seed. The ground shall be hand or machine raked to remove all debris, clods, rocks, and other material larger than 1 inch, to a depth of 4 inches. Such debris, clods, rocks, and other material so removed shall be disposed of off the immediate property. Hydroseed bed preparation shall not commence until the moisture conditions make the ground area and soil friable.
2. If there has been a time lapse following the placement of the topsoil to allow it to become settled and compacted on the surface, the areas to be seeded shall be thoroughly worked to a depth of 3 to 4 inches so as to provide a surface of such condition that it will allow application of the seed in compliance with these specifications.
3. Hydroseed beds shall be permitted to settle or firmed by rolling before seeding.
4. Initial application of fertilizer shall be applied evenly at the rate of 600 lbs. of material per Acre prior to seeding and incorporate into the prepared seedbed ½" deep by light raking.

B. Sowing

1. Immediately prior to the application of the seed, the soil shall be loose to a depth of at least 1 inch and free from all material as specified. If soil is too loose or dry for good handling, it should be moistened and rolled lightly.
2. Hydroseed all irrigated areas as shown on the plans. Irrigated areas may be seeded any time between April 15 and June 1, and August 10 and September 10, provided the irrigation system is operational. Hydroseed all dry land areas as shown on the plans. Seed to overlap limits of irrigated lawn by one half the distance between sprinkler head and limits of coverage between April 1 and May 15, and September 20 and October 30.
3. Lawn grass shall be sown at 3 pounds per 1000 square feet, (130 lbs./acre) using approved methods that allow for the even precise hydroseeding and incorporation of the seed into the top ½-inch of the prepared seedbed. If seed can be drilled, reduce rate to 60 pounds per acre. A drill type seeder with spacing greater than 3½" is not acceptable. When seed is drilled and the surface is unduly loose, the seedbed shall be compacted by an agricultural roller, cultipacker, or compactor not more than 24 hours after seeding.

4. Apply tackifier on all slopes greater than 4 to 1 at a rate of 100 pounds per acre.
5. Seed and mulch shall be applied in separate and distinct operations except that a minimal amount of mulch may be added to the seed slurry as a visual aid during the seeding process. Mulch applied with seed shall not exceed of mulch for each five (5) gallons of water. This mulch shall be deducted from the total quantity to be applied. The application of the seed slurry shall be made with the equipment having a built-in agitation system and operating capacity sufficient to agitate, suspend, and homogeneously mix slurry containing water, seed, and mulch. The slurry shall be sprayed over the soil in a uniform coat. Wherever practical, the slurry shall be applied normal to the surface being treated to effectively drill the seed in to the seedbed. Hydromulch application shall follow seeding as soon as practical, with consideration for minimal soil erosion through washing. All seeded areas shall be mulched before work is terminated on any day.

C. Mulching

1. Mulch all hydroseeded areas. Topsoil or seed that washes out for reasons attributable to the Contractor's activities or failure to take proper precautions shall be replaced at the Contractor's expense.
2. All structures shall be protected from hydraulic application of mulch material. Any material deposited on walks, streets, inlets, or other structures, shall be removed.
1. Mulch shall not be applied in the presence of free surface water, but may be applied on damp ground.
2. Organic mulch shall be mixed with water at a rate of one pound of mulch (dry weight) to one gallon of water, hydraulically applied as per manufacturer's recommendations at a rate of 2000 pounds per acre.

D. Tackifier

Mulch tackifiers shall be mixed with water at a rate specifically by the manufacturer and shall be applied at a minimum rate of 40 pounds per acre.

3.4 SOD INSTALLATION

A. Preparation

Bed preparation shall be similar to that required for seedbed preparation.

B. Application

1. Sod may be placed at any time when the ground is not frozen.
2. A string or line of boards may be used as a guide for setting the first course of sod across the area. Each course is matched against the edge of this course, staggering successive courses. All work should be done on boards laid on top of the sod to avoid footprints or other injuries to the surface.
3. All sod is to be laid on topsoiled areas. The joints shall be butting.
4. Lay sod across slope.
5. Roll or lightly tamp, with suitable wooden or metal tamper, all new sod sufficiently to set or press sod into underlying soil.
6. Before sod is laid, apply fertilizer specified, at the rate of six (6) pounds per 1000 square feet.
7. After sod installation is completed, clean up and thoroughly moisten areas of newly laid sod.

3.5 MAINTENANCE

A. General

Maintain original grades of all lawn areas after commencement of planting and during maintenance period until final acceptance of the job, but in no case less than forty-five (45) days.

B. Work Included

1. All irrigated areas shall be watered as required to establish a mature stand of grass.
2. All areas shall be watched closely so that they are not permitted to dry out or to form puddles of water, or to be washed by over-application.
3. Mow all seeded lawn at 2½" each time its height reaches 3½". Maintain through a minimum of three mowings to provide an even stand over the entire seeded area, until final inspection and acceptance.
4. Provide a "grow-in" fertilizer, as specified, for all irrigated lawns. Apply six weeks after seed germination. In the case of fall seeding, apply prior to May 1, the following year.

5. Apply post emergence herbicide per the manufacturer's recommendations and application rates, whenever and wherever weed growth jeopardizes or inhibits the development of a mature grass lawn. Apply herbicide in late spring or early summer. Apply only when mean high temperatures are between 60° and 85° F with wind velocities less than five (5) miles per hour. Prior to application, Contractor shall notify Owner, in writing, of the proposed schedule for applying herbicides. Written notice shall include the following items:
 - a. Date of proposed application
 - b. Specific area of proposed application
 - c. Proposed herbicide for application
 - d. Proposed concentration and application rate.

The application area must be signed with Owner-approved signs informing the public of the application and duration of restricted use.

A. Performance

1. Establish a dense lawn of permanent grasses, free from lumps and depressions. Any part failing to show uniform cover and grades free from lumps and depressions shall be redone, and such replacement shall continue until a dense lawn is established. Scattered bare spots will not be allowed. Adequate germination shall equate to 11 to 15 seedlings per square foot over 95 percent of area seeded for native grass areas.
2. Finish grades at the edges of sidewalks, curbs or other hard surface boundaries must be at a level such that the established turf surface will be one (1) inch below the plane of the hard surface for a minimum distance of six (6) feet from the edge.
3. Maintain entire lawn area until the above performance is achieved throughout the project.

D. Replacements

1. Any area that fails to produce an adequate stand of grass shall be re-sodded or reseeded by the Contractor at no additional expense to the Owner.
2. Replacements required because of vandalism or other causes beyond the control of the Contractor are not part of the Contract.
3. For acceptance, the established grass will be judged by the stand's fullness, health, maturity and number of weeds present. Determination and acceptance of grass areas shall be made by the Owner's Representative.

E. Extension of Maintenance Period

Continue the maintenance period at no additional cost to the Owner until all previously noted deficiencies have been corrected, at which time the final inspection shall be made.

3.6 CLEAN-UP

Keep premises neat and orderly including organization of storage areas. Remove trash and debris resulting from lawn preparation from site daily as work progresses. Leave paved areas in a broom clean condition by sweeping or hosing.

END OF SECTION 02935

SECTION 02210 – TREE PROTECTION

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

The work in this section includes protection, trimming and maintenance of existing trees, shrubs and groundcover that are affected by execution of the Contract Documents, whether temporary or permanent construction.

- A. The Contractor assumes responsibility for all coordination of work within the Critical Root Zone (CRZ) of protected trees.
- B. Plant protection applies to all trees to remain within the Limit of Work as well as those, which are adjacent to the Limit of work and could be affected by new construction. Work to include:
 - 1. Protection of existing trees and indicated vegetated areas.
 - 2. Watering of existing trees and vegetated areas to be protected.
 - 3. Maintenance of existing and newly installed tree and vegetation protection elements including but not limited to fencing, organic bark mulch, landscape fabric, cabling, and signage.
 - 4. Pruning of existing trees to be protected.
 - 5. Removal of pruning debris and other excess material not used. On-site chipping and re-use of pruned material is encouraged.
- C. Contractor shall perform all tree protection installation and removal, and any necessary pruning work required for construction under the supervision of the Owner.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01500 – Temporary Facilities and Controls
- B. Section 02235 – Site Clearing
- C. Section 02300 - Earthwork

- D. Section 02810 - Irrigation System
- E. Section 02900 - Landscaping
- F. Section 02935 – Lawns and Grass

1.3 DEFINITIONS

- A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.
- B. Drip Line: The areas encompassing the base of the tree as delineated by an imagined vertical line drawn from the farthest extent of the branches to the ground.
- C. Diameter at Breast Height (DBH): Diameter at breast height as measured at four and one-half feet (4'-6") above the existing grade at the base of the tree.
- D. Critical Root Zone (CRZ): An area up to one and one-half the radius of the drip line of the tree.

1.4 REFERENCED STANDARDS

- A. *ANSI Z60.1: American Standard for Nursery Stock*, latest edition, American National Standards Institute.
- B. *Hortus Third: A Concise Dictionary of Plants Cultivated in the United States & Canada*, Staff of the L.H. Bailey Hortorium, Cornell University, 1999.
- C. *ASTM C33: Specification for Concrete Aggregate*, American Society of Testing Materials.
- D. Alex Shigo, *Tree Pruning*, Shigo & Tree Associates, LLC, 1989.
- E. *Guide for Plant Appraisal*, latest edition, Council of Tree and Landscape Appraisers.
- F. *Species Ratings and Appraisal Factors Guide*, latest edition, International Society of Arboriculture, Rocky Mountain Chapter.
- G. *ANSI A300: Standards for Tree Care Operations*, American National Standards Institute.

1.5 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm with a minimum of five years of experience that has successfully completed tree protection and trimming work similar to that required for this project.
- B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where the project is located.
- C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), “Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Pruning).”
 - 1. Owner’s Arborist shall be present for all pruning, thinning and tree protection work.
- D. Pre-Construction Conference: Conduct conference at project site to comply with requirements in ANSI A300 Division 1, Section “Project Management and Coordination.”
 - 1. Before tree protection and trimming operations begin, meet with representatives of authorities having jurisdiction, Owner’s Arborist, Landscape Architect, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated below.
- B. Product samples:
 - 1. Tree protection area signage.
 - 2. Cabling materials.
 - 3. Landscape fabric.
 - 4. Organic bark mulch.
- C. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that are affected by construction.
- D. Tree Protection Plan: Contractor shall submit a tree protection plan that confirms that use of the tree protection fencing plan provided in the Contract Documents. Contractor shall notify the Owner of all work activities within 20 feet of trees to be protected, anticipated work methods, proposed tree and root avoidance techniques, and Arborist’s on-site confirmation of CRZ for each tree.

1.7 JOB CONDITIONS

- A. Site Work Restrictions: In order to prevent excessive soil compaction and destruction of soil structure, no site work will be performed in cases where equipment or traffic must pass over wet soils or if wet soils must be handled or manipulated within the Tree Protection Zone in order for the work to progress. Wet soil is defined as any soil within 85 percent of field capacity (saturation).
- B. Utilities
 - 1. Utility locates are required prior to digging and any construction activities.
 - 2. Coordinate work with Owner, including irrigation specialist, in order to prevent damage to underground sprinkler system.

1.8 MAINTENANCE

- A. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.
- B. Maintain existing plantings and trees by watering, cultivating, weeding, and spraying as necessary to keep landscape in a vigorous, healthy condition.
- C. Coordinate watering schedules with irrigation contractor during installation and until final acceptance. Provide deep root watering to newly installed trees.

PART 2 – PRODUCTS

2.0 MATERIALS

- A. Topsoil Depth: Natural or cultivated surface-soil layer containing composted organic matter and sand, silt and clay particles; friable, pervious, and black or darker shade of brown, gray or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than two inches in diameter; and free of weeds, roots and toxic and other non-soil materials.
- B. Filter Fabric: Manufacturer's standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- C. Chain-Link Fence:
 - 1. Fencing shall be galvanized chain link as specified below, six feet minimum height. Plastic fencing and wood stakes, or snow fencing are not acceptable.
 - 2. Includes posts, braces and mesh that may be salvaged materials or other used material to form a minimum six foot high enclosure.

2. Posts shall be a minimum diameter of 1-1/2-inch steel pipe.
 3. Mesh shall be two inches by two inches by 11 gauge minimum chain link fabric.
 4. Posts to be driven directly into ground to point of stability. No surface post piers are to be used.
- E. Signage: Provide weather resistant 8-1/2 inches by 11 inches fluorescent green or yellow signs that identify Tree Protection Zone and list restrictions.
- F. Cabling: Cabling materials shall meet the ANSI A300 standards for cabling of trees.
- G. Tree Tags: Rack track shaped aluminum engraved numbered tags.
- H. Organic Mulch: Shall be free from weed seed, sawdust and splinters and shall not contain resin, tannin, wood fiber or other compounds detrimental to plant life. Bagged mulch shall have moisture content not in excess of 22%. Bulk mulch shall have a size range of 1/2 inch to 1-1/4 inch with a maximum of 20% passing a 1/2 inch screen.
- I. Mycorrhizae Fungal Inoculants: “mycogrow gel” as manufactured by Fungi Perfecti, Olympia, WA, 1-800-780-9162, or approved alternate.
- J. Slow Release Fertilizer: Osmocote Plus, 15-9-12, or approved alternate.
- K. Anti-Desiccant: Protective film emulsion for protection of plant surfaces during transport. Permeable to permit transpiration, as manufactured by Wilt Pruf, Inc., P.O. Box 4280, Greenwich, Connecticut, 06830, or approved alternate. Mixed and applied in accordance with manufacturer’s instructions.
- L. Staking and Guying
1. Tie Wire: 12-gauge, galvanized wire
 2. Metal stakes: 24-inch t-stakes
 3. Metal posts: 8’-0” t-stakes
 4. Nylon strap: three inches wide, 12 inches long white or black nylon strap with one 1/2” brass grommet in each end or Landscape Architect approved equivalent.

PART 3 - EXECUTION

3.0 INSTALLATION OF TREE PROTECTION FENCING

- A. Prior to the start of any construction activity install temporary fencing at the designated tree protection zones to protect existing trees and vegetation to remain from construction damage. Maintain temporary fence and remove when construction (including irrigation and planting) is complete. Owner shall approve fence installation prior to mobilization of the site.
1. Install chain-link fence according to ASTM F 567 and manufacturer's written instructions. All fencing to be locked securely and only entered with owner's permission and in the presence of the Owner's Arborist.
 2. Drive posts a minimum of two feet below existing grade and deep enough to remain rigid during subsequent excavation and grading. Posts located on paving shall be set in 100-pound concrete blocks. Take care not to compact soil inside the fence line during placement of posts. Do not use heavy equipment for this operation.
 3. Provide diagonal bracing to vertical posts at corners of enclosures and wherever needed to ensure rigidity of the fencing.
 4. Chain-link fabric shall be tight to grade at the bottom edge and stretched uniformly between posts. Top of fabric shall be a minimum of six feet above grade.
 5. Install fabric to form completely closed area around tree(s). Attach fabric to posts 12 inches on center with 11 gauge wire ties securely fastened, or with bolted ring clips and to top rail not over three feet on center.
- B. Fencing shall be installed as follows: In the vicinity of coniferous trees, this includes an area of a radius from the trunk equal to one and one-half times the radius of the drip line of the tree. In the vicinity of deciduous trees, this includes an area of a radius from the trunk equal to one and one-half times the radius of the drip line of the tree. For areas with shrubs plants, include the entire edge of the area planted in the fence.
- C. Area within tree protection fencing must be mulched with organic bark mulch to a depth of two inches.
- D. Attach orange flag strips 12 inches long at three feet on center along the fence, five feet above grade.
- E. Place tree protection signs at thirty-foot intervals along fence with a minimum of two signs if the fence is less than 30 feet in length.

3.1 FENCE MAINTENANCE AND REMOVAL

- A. Maintain fence in specified location and in good condition until completion of site operations and of delivery of equipment and material, except where directed otherwise in writing by Owner's representative.
- B. Fencing shall be immediately repaired when damaged.
- C. Remove protection fencing at Substantial Completion.

3.2 USE OF AREA WITHIN FENCE

- A. Do not use area within fence for operation, storage, vehicles, or foot traffic. Contractor shall notify Owner's representative 24 hours in advance of the need to move a tree protection fence or access inside of it.
- B. Do not alter grades within the required protective fence line except as directed during the fine grading operations at the conclusion of site development.
- C. Control soil moisture within the protected area. Prevent flooding, ponding, erosion, or excessive wetting of the soil and root systems caused by dewatering operations. Protect root areas from leachate, concrete, oil, fuel, lubricating oil, and from other contaminants.

3.3 USE OF AREA ADJACENT TO FENCE

- A. Do not store materials potentially harmful to tree roots within 20 feet of protected areas. Potentially harmful materials include, but are not limited to petroleum products, cement and concrete materials, cement additives, lime, paints coating, waterproofing agents, from coatings, detergents, acids, and cleaning agents.
- B. All heavy equipment work to be performed within the CRZ that is not possible to protect shall be done in such a manner to minimize compaction.
 - 1. Tie-back all flexible limbs and branches, which may be damaged during construction, under the supervision of the Owner's Arborist.
 - 2. Use steel construction planking or timber planking made of four inch thick material over CRZ. Each plank will cover a minimum of eight square feet. Place a 12-inch uncompacted layer of organic bark mulch over CRZ and under planking.

3.4 DAMAGES FOR LOSS OR INJURY TO TREES

- A. Trees removed or damaged and deemed unviable, during demolition or construction, are to be replaced following consultation with Owner's Arborist or approved other.

- B. Trees removed during demolition or construction are to be replaced following consultation with Owner's Arborist or Owner's Representative. Appraised values of existing trees have been determined according to industry standards and will be provided by the Owner if applicable.
- C. Contractor is to replace any and every tree lost or irreparably damaged as a result of failure of the Contractor to protect or to adequately maintain existing trees. Trees that fail to fully foliate in the spring following completion of construction operations may be presumed to have been lost due to construction operations.
- D. In the event of injuries to the crown, trunk or root system of any tree to remain that are the result of the Contractor's failure to protect and/or maintain such tree, the Owner's Representative may elect to retain the tree and hold the Contractor liable for compensation.
- E. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to Owner's Arborist's hand written instructions. Work required by the Owner's Arborist shall be performed by the Contractor at no additional cost to the Owner.
- F. Trees, which are removed without authorization, shall be replaced with a tree of the same size and species. If a tree of the same size and species is not available the Owner's Representative shall provide alternatives. If a tree cannot be replaced because the size exceeds the maximum which can be relocated using latest technology, the Contractor shall compensate the Owner at amount equal to the appraised value.
- G. Should replacement work of large trees be required as a result of Contractor's failure to protect or maintain trees, a subcontractor specializing in relocating large trees shall conduct all replacement work. Submit qualifications of tree relocation Contractor to the Owner's Representative. The cost of the subcontractor will be at the Contractor's expense.
- H. Completely remove and dispose of any tree killed or irreparably damaged as a result of Contractor's failure to protect or maintain trees. Remove those trees damaged or killed as a result of vandalism, natural acts or other causes. Removal and disposal shall include stumps and roots to a depth of two feet below finished grade.

3.5 PRUNING OF EXISTING TREES

- A. Limbs and branches that have been broken shall be cut off cleanly above the nearest crotch in accordance with good horticulture practice. Cut limbs and branches greater than one-half inch in diameter. Sterilize equipment with alcohol prior and during trimming and pruning operation. All pruning of damaged trees shall be carried out to the complete satisfaction of the Owner's Representative.

- B. The Contractor shall provide a professional tree surgeon to assess and recommend treatment of any damage to trunks or major limbs three inches in diameter or over.
- C. All existing trees to be saved shall be limbed and pruned by a licensed Arborist. Limbs shall be pruned to ensure safety and promote health of the tree. Inform the Owner's Representative prior to commencement of pruning.

3.6 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within Tree Protection Zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots. Work shall be performed under the supervision of the Owner's Arborist.
 - 1. Redirect roots into backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately three inches back from new construction.
 - 2. Do not allow exposed roots to dry out before placing permanent backfill. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with approved soil.
 - a. Straw Mulch: Thoroughly wet excavated sub-grade where roots of existing trees to remain have been exposed. Apply four inches of wet organic bark mulch on horizontal area and wet burlap mats along exposed trench sides.
 - b. Watering and Maintenance: Thoroughly and evenly water protected areas at a rate not to exceed two inches per hour during dry periods. Coordinate water procedures and schedules with the Owner's Representative or the Project Manager. Maintain root protection procedures throughout the term of the Contract, as required.
- D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.7 POST CONSTRUCTION TREE MAINTENANCE

- A. Ensure that existing trees remaining on the project site shall be in as good condition at completion of the work as at the commencement of the work. If such a condition does not exist at the completion of the work, assume responsibility to provide corrective or replacement with new material as directed by the Owner's Representative.
- B. All existing trees within the protected areas shall be injected with mycorrhizae upon direction of the Owner's representative. Injection shall be provided with a soil injection needle attached to an FMSC 785 spray gun or approved equal. Injection shall be performed by an ISA certified Arborist. Aerate surface soil compacted during construction as required by the Arborist, ten feet beyond drip line and no closer than 36 inches to tree trunk. Drill two-inch diameter holes a minimum of 12 inches deep at 24 inches on center. Backfill holes with an equal mix of augured soil and sand. Avoid tree roots.

END OF SECTION 02210

Appendix 2.2-5 – MSU Plant Palette

MSU wishes to have a great deal of input on the design and selection of plants to be installed as part of campus projects. That said, MSU does not wish to dictate the use of or avoidance of specific plant materials. The Design Consultant is encouraged to create a planting plan that is consistent with the project and the location of the project within the existing campus environment. MSU will review and comment on the plan and is happy to work with the Design Consultant to achieve a mutually satisfactory landscape solution.

Many variables associated with different plant types are important not only from an aesthetic standpoint, but from a maintenance standpoint as well. The following are things that should be considered in selection and design of planting plans for campus projects:

- Existing planted areas, trees, and plant species adjacent to the project area
- Is the Project in an irrigated area of campus?
- Proposed plant and tree materials must be suitable to the Bozeman micro climate
- All plant materials must be designed and placed according to their mature scale
- A list of plant materials should be submitted and discussed with the Director of Landscape and Grounds for consideration of issues including suitability and maintainability
- A complete set of landscaping specifications should be written and submitted for review by MSU no later than the submission of the 65% construction document set.

SECTION 02810

IRRIGATION SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of each Contract, including General Conditions and Supplementary Conditions, apply to work of this section.

1.02 DESCRIPTION

The work of this section consists of all items necessary to install the proposed irrigation system as indicated on the plans, and the protection and splicing required to maintain all parts of the existing irrigation system in operation. Any irrigation that is damaged by any portion of the project shall be repaired or adjusted using materials and installation methods in accordance with this specification to restore head-to-head sprinkler coverage, provide uniform precipitation rates, and ensure control zone integrity, with the exception of those parts designated to be removed or abandoned. This includes required sleeves for pipe and wire, back-flow prevention devices, reconnections, and miscellaneous modifications to the existing irrigation distribution lines including, but not limited to:

- A. Automatic controller and remote control valves.
- B. Lawn and planting beds sprinkler system.
- C. Connection to proposed irrigation water source and power supply.

1.03 RELATED WORK DESCRIBED ELSEWHERE

- A. Site Clearing Section 02230
- B. Earthwork/Restoration Section 02301
- C. Landscaping Section 02905
- D. Lawns and Grass Section 02935

1.04 QUALITY ASSURANCEA. Qualifications of Installer

Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials of installation and who shall direct all work performed under this section. All work of this section and related work listed above shall be performed by the same CONTRACTOR.

B. Codes and Standards

1. In addition to complying with all pertinent codes and regulations, comply with the latest rules of the National Electrical Code for all electrical work and materials.
2. Comply with National Plumbing code at all connections to potable water systems.
3. Where provisions of pertinent codes and standards conflict with the requirements of this section of these Specifications, the more stringent provisions shall govern.

1.05 SUBMITTALSA. Material List

Before any irrigation system materials are delivered to the job site, submit to the ENGINEER a complete list of all irrigation system materials to be furnished and installed.

1. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to method of installation. Where materials proposed differ from those specified, furnish complete shop drawings and design calculations to demonstrate equivalent performance of the proposed installation.
2. Do not permit any irrigation system component to be brought onto the job site without prior approval by the ENGINEER. Provide one sample of each element of the system to the ENGINEER for approval (sprinkler heads, valves, couplings, etc.). These samples will be returned to the CONTRACTOR, and if approved, may be used in the project.

B. Shop Drawings

CONTRACTOR shall submit Five (5) copies of the proposed sprinkler layout in a schematic form to the ENGINEER for approval. Any modifications to these proposed drawings will be returned to the CONTRACTOR for the preparation of five (5) copies of the final revised layout. The material list will be coordinated with the final shop drawings by the CONTRACTOR. Show all sleeve locations.

C. Field Verification

CONTRACTOR shall field verify all dimensions, existing and proposed conditions, and as required to provide one complete and operable system.

D. As-built Drawings

Provide a complete set of Mylar reproducible as-built shop drawings to the ENGINEER for approval prior to final payment.

1.06 PRODUCT HANDLING**A. Protection**

Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements

In the event of damage immediately make all repairs and replacements necessary to the approval of the ENGINEER and at no additional cost to the OWNER.

1.07 PERFORMANCE REQUIREMENTS**A. Minimum Requirements**

The following shall be the minimum requirements of the system. They are not intended to limit the overall intent, which is to obtain a fully operational and completely automatic sprinkler system. Specific requirements of this project manual shall apply to all elements typically. Conflicts between the drawings and the project manual or between specific and general performance of material requirements shall be assumed to be the most expensive.

B. Project Zones

Refer to the drawings for the general zones to be served by this system.

1. Irrigation layout must be adaptable to the future modification of the system to smaller heads, more intense head arrays and minimal spraying over the sidewalks. This should be accomplished by running the laterals near sidewalk edges whenever possible, and by positioning the mains with this future intent.
2. CONTRACTOR will advise himself of all existing and proposed site conditions and related planting and grading as required to coordinate and schedule with the work of other contractors.
3. Heads shall be positioned to prevent damage from spraying on the building envelope and/or causing inside flooding in any and all cases.
4. Organize zones to allow walking across the area on dry sidewalk while the irrigation system is on.

PART 2 - MATERIALS**2.01 PIPE****A. Plastic Pipe**

1. Plastic pipe shall be rigid non-plasticized Schedule 40 PVC IPS solvent-welded conforming to ASTM D-1784 and D-2241 standard specifications for PVC plastic pipe. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious material, wrinkles, and dents.
2. All pipes shall be continuously and permanently marked with the following information:

Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 deg. F and National Sanitation Foundation (N.S.F.) approval.
3. All lateral lines shall be a minimum of one and one-half inches (1-1/2") in diameter.
4. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring-

tite seal, or screwed connections. All pipe six inches (6") in diameter and above shall be Schedule 40 PVC IPS gasket end. All smaller pipes shall be Schedule 40 PVC IPS solvent-welded.

5. Slip fitting socket taper shall be so sized that a dry unsoftened pipe end, conforming to these specifications, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 pipe may be threaded.
6. When connection is plastic to metal, plastic male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon Tape on Water Based Teflon Paste.
7. All mainline pipes shall be traceable via purple or blue-colored 14 gauge single strand direct burial wire attached to the pipe at 10' intervals. The tracer wire shall surface at and be secured to the controller. This is not necessary for lateral pipelines with irrigation heads attached.

B. Pipe Sleeves

Pipe sleeves shall be Schedule 40 PVC pipe, six-inch (6") diameter unless noted otherwise, or equal approved by ENGINEER.

1. Installation

Provide empty sleeves along all pathways as noted on the drawings or every 100 feet. Extend sleeves at least one foot (1') beyond pavement on both sides. Sleeves shall be installed 18 inches below finished grade. Cap ends of empty sleeves with duct tape.

2. Sleeve Location Marking

a. New Pavement

The location of each sleeve must be marked along both of the extreme edges of any new pavement installed over the sleeve. This shall be accomplished by pressing the end section of one and one half inch (1 1/2") pipe into the uncured pavement surface to make an imprint.

b. Existing Pavement

For sleeves pushed under existing pavement, sleeve locations shall be marked along the extreme edges of the pavement on both sides where the sleeve emerges from under the pavement. Markings shall consist of scoring the surface of the existing pavement with a 2" O.D. core drill just enough to make the impression of a circle in the pavement surface.

2.02 RISERS/SWING JOINTS

A. Flexible Risers

Stationary Pop-up and Surface Sprinkler Heads shall be installed using "funny pipe" or four-piece swing joints. Sprinkler Heads with one-half inch (1/2") and/or three-quarter inch (3/4") inlets shall connect with "funny pipe" exclusively, in lengths no longer than three feet (3'). Sprinkler Heads with one-inch (1") inlets shall connect with four-piece swing joints only.

1. Installation with "funny pipe", which is one-half inch (1/2") low density, polyethylene pipe, rated 80 PSI at 100 deg. F, must use Teflon-taped barbed street ells. Use of flexible pipe such as "funny pipe" is limited to connecting laterals to irrigation heads.
2. Four-piece swing joints shall consist of an assembly using three (3) one inch (1") Marlex street elbows, with a 1" SCH 80 Nipple of correct length to get head installed level at finish grade.

B. Rigid Risers

All risers for shrub spray heads, bubblers, etc., that are in shrub or flowerbed areas and planters, shall be schedule 80 PVC plastic pipe, unless otherwise specified or shown on the plans. The risers shall be of sufficient height so as not to cause any interruption of the stream from the sprinkler nozzle when the plant material has reached its optimum growth.

2.03 VALVES

A. Ball Valves

1. All manual ball valves, sizes 1-1/2 inches and smaller, shall be all bronze double with integral taper seats and with rising stem.

2. Manual ball valves 2 inch and larger are not permitted.
3. All ball valves shall be full port, with chromium or stainless ball with Teflon seats 150 PSI rated, Hammond, or equal.

B. Pressure Reducing Valves

Provide pressure-reducing valves on main lines only, Watts, Series U5, U5B ½" to 2" Standard Capacity, or equal.

C. Gate Valves

1. All manual gate valves, sizes four-inch (4") and smaller, shall be made in the U.S.A., brass body, threaded, non-rising stem, full port, 200 PSI/13.8 bar non-shock cold working pressure up to 180 deg. F./82 deg. C., NSF/ANSI 61-8 compliant: NIBCO model TI-8 or equal.
2. All gate valves of 6-inch (6") size or larger shall be at least 150 PSI rated, AWWA-C509 resilient wedge gate valve, made in the U.S.A., featuring non-rising stem, iron body, epoxy coated interior, mechanical joint with appropriate size gaskets for corresponding pipe as per drawing.

D. Quick-Coupler Valves

Provide Rain Bird #3 DNP Quick Coupler valves.

E. Automatic Remote Control Valves

Automatic control valves shall consist of one of two types of valves:

1. Rain Bird PESB Series, 24 volt, contamination resistant valve with a pressure operating range of 20-200 psi and a 0.25 to 200 gpm flow range. Glass-filled nylon construction, one-piece solenoid with captured plunger, flow control handle adjusts, manual internal and external bleeds, nylon screen scrubber and purple flow control handles for easy identification of non-potable water systems.

F. Back-Flow Preventers

Back-flow preventers shall be Rain Bird Model DCA2-0-OR.

2.04 VALVE BOXES

All remote control valves, pressure regulating valves, manual control valves, zone shut-off valves, gate valves or globe valve filters and drains, unless otherwise indicated, shall be installed in a valve access box of proper size as required for easy access to the valve. Valve box to be Carson, with round, locking green cover ten inches (10") in diameter for quick coupler valves, and 10" x 15" standard for all others unless described otherwise in the contract drawings, or approved equal. All round valve boxes shall be supported underneath the bottom edges with two bricks (minimum). All rectangular valve boxes shall be supported underneath the bottom edges with three bricks (minimum).

2.05 AUTOMATIC IRRIGATION CONTROLLERA. Controller Type

The automatic controller shall be 120 volt input, soft-wired, 26.5 volt output, with the number of valve stations and in the type and model number indicated on the plans, and shall be a Rain Bird ESP SAT LS or ESP SAT LW. Wall or pedestal mount type must be pre-approved by the ENGINEER and OWNER for the site situation. All wall mount controllers shall be mounted above a 24" wire trough, and connected with both a 2" electrical conduit for tying in field wires and a 3/4" conduit for controller power supply. Controller station size and quantity specified per drawing. Station wiring and timing schedule specified per drawing. All station wiring must be terminated in a Rain Bird ESPSATOB24 mounted in the pedestal or wall mounted wire trough. All controllers must be equipped with a Rain Bird RMK450NAR3 with a University licensed and authorized frequency, hooked to a Rain Bird Maxilink Ant 01 or Antenex Directional Yagi Model Y4503/Y4505 or University approved substitute.

B. Electrical Power

Power for the controllers shall be the responsibility of the sprinkler installer. Meet all electrical specifications for installation of controllers and power to the controllers. The controllers must be wired to the power source in the pedestal or wall via an Isobar Ultra 4 surge protector and a two-receptacle Ground Fault Interrupter (GFI) outlet. A pigtail that can reach from the controller to the outlet is required. Power source must be pre-approved by Owner prior to connection.

C. Sleeves

Provide minimum of three inches (3") diameter PVC sleeves through any tunnel walls

or six inches (6") diameter sleeves under paved areas at a minimum depth of 18" as necessary to run all control wiring for sprinkler zones. Coordinate with concrete work prior to forms being set.

D. Location

After pre-approval by the ENGINEER and OWNER, locate controllers on outside walls of buildings or on pedestals at locations that will maximize the view of the zones serviced by each controller. Verify locations with the ENGINEER to avoid compromising buildings systems and/or appearance concerns.

Pedestals must be mounted to a concrete slab of dimensions 1.5' x 1.5' x 0.33'. Two bollards consisting of three inch (3") steel pipe filled with concrete and anchored in concrete shall be installed against the edge of the slab in front and in back of the controller. The bollards shall be primed and painted with a black, epoxy-based paint. The concrete at the top of the pipe must be domed and finished to a smooth, even surface, without concrete residue on the outside surface of the pipe.

E. Flow Meter

A MaxiCom-compatible flow meter must be installed at every point of connection. This may be either a Rain Bird Brass Insert Sensor (FS350B) for pipe three inches or larger, or a Rain Bird PVC Tee Sensor of the appropriate size: FS150P for 1-1/2" pipe, FS200P for 2' pipe, and FS300P for 3" pipe. The flow meter must be directly connected to the controller using PE43 communication cable (the blue/blue white wire pair must be used for the flow meter/pulse transmitter connection) and a PT 322 pulse transmitter. All splices using this type of cable must meet Rain Bird MaxiCom standards.

F. Certified Installation

All MaxiCom components must be ordered and installed by a MaxiCom-certified installer.

2.06 IRRIGATION HEADS

A. Rotary Sprinklers

All rotary sprinkler heads shall be Model I-20-04-R, manufactured by Hunter Industries, San Marcos, California, or Rain Bird 5004 PLPCSAMNP, 5505 NP, or

8005 NP Series, manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California.

B. Spray Heads

All spray head sprinklers shall be Rain Bird Model No. 1804 SAM for all lawn applications and 1812 SAM for all planting bed applications utilizing MPR set arc nozzles or variable arc nozzles (VAN), manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California.

C. Bubblers

All bubbler zones must be controlled by a Rain Bird PESB Series Valve incorporating a Rain Bird PRS regulator. There must be a Rain Bird WYE Filter System installed directly downstream of the valve, located inside the valve box in a manner that allows easy maintenance. The bubbler heads must be Rain Bird 1300A-F Series mounted on Rain Bird 1804 Spray Bodies.

D. Drip Irrigation

No drip irrigation systems are allowed at Montana State University.

2.07 CONTROL CABLE

A. Type

All electrical control and ground wire shall be Baron irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for connecting the automatic remote control valve to the automatic controllers shall be Type "UF", 600 volt, stranded or solid copper, single conductor wire with PVC or polyethylene insulation and bear UL approval for direct underground burial feeder cable.

B. Insulation

Insulation shall be four-sixty-fourths inch (4/64") thick minimum covering of ICC-100 compound for positive waterproofing protection. All control or "hot" wires shall be red, all common or "ground" wires shall be white, all master valve wires shall be yellow, and all locate wires shall be blue. A black extra wire shall be included in the wiring run for every four (4) wires installed.

C. Code Compliance

Verification of wire types and installation procedures shall be checked to conform to local codes.

D. Splices

All splices are to be completed within valve boxes using one-piece, jelly-filled, water-proof wire connectors with 20 expansion coils per splice. All splices shall be located on as-built drawings.

E. Trench Installation

1. Tape and bundle all wiring at ten-foot (10') intervals.
2. Attach tracer wire to main line pipe only at ten-foot (10') intervals.
3. All 120 volt wiring shall be in conduit with marker tape installed in the ditch six inches (6") above the conduit.
4. All wiring under pavement and through sleeves shall be in conduit.
5. Tie a loose twenty-inch (20") loop in wiring at all changes in direction greater than 30 degrees. Untie all loops after making connections.

2.08 VAULTS

A. Water Service Connection

A vault shall be installed at domestic water service connection. Vault shall house domestic water back-flow preventers, blowout assembly and isolation valves. Consult with City of Bozeman for specifications on accepted style of vault.

B. Location

Review location of vault with ENGINEER prior to installation.

2.09 OTHER MATERIALS

A. Tools To Be Furnished

1. Supply as part of this contract the following tools:
 - a. Two keys for each automatic controller
 - b. Two quick-coupler keys, Rain Bird Model 33K with matching hose swivels.
2. The above equipment shall be turned over the OWNER at the conclusion of the project. Before final inspection can occur, evidence that the OWNER has received materials must be shown to the ENGINEER.

B. Concrete

Provide and coordinate installation of all concrete thrust blocks. Refer to Division 3 for concrete requirements. Provide thrust blocks for all lines larger than 3-inch diameter, at all tees and ells.

C. Other Materials

All other materials not specifically described but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the ENGINEER.

PART 3-EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the ENGINEER.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 FIELD MEASUREMENTS

Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design.

3.03 TRENCHING AND BACKFILLING

A. General

1. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these specifications.
2. Make all trenches in accordance with OSHA Requirements with sufficient width to provide free working space at both sides of the trench and around the installed item as required for gluing, joining, backfilling, and compacting while minimizing width of trenches.
3. The CONTRACTOR will be required to conduct his work so that trenches will remain open a minimum possible time.

B. Depth

1. Trench as required to provide the elevations shown on the Plans.
2. Trench to sufficient depth to give a minimum of eighteen inches (18") of fill above the top of the pipe measured from the adjacent finished grade under driveways and sidewalks.
3. All mainline and control cables shall have a minimum cover of eighteen inches (18") above the pipe or wire. All laterals shall have a minimum cover of twelve inches (12") above the pipe.
4. All sleeves shall be installed at a depth of 18". Sleeves with excessive or shallow invert depth will be rejected.

C. Correction of Faulty Grades

Where trench excavation is inadvertently carried below proper elevations, backfill

with material approved by the ENGINEER and then compact to provide a firm and unyielding sub grade to the approval of the ENGINEER and at no additional cost to the OWNER.

D. Trench Bracing

1. Properly support all trenches in strict accordance with all pertinent rules and regulations.
2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind will be fully protected from damage.
3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the ENGINEER and at no additional cost to the OWNER.
4. Arrange all bracing, sheeting, and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.

E. Removal of Trench Bracing

Exercise care in the driving and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.

F. Grading and Stockpiling Trenched Material

1. Control the stockpiling of trenched material in a manner to prevent water from running into the excavation.
2. Do not obstruct surface drainage but provide means whereby storm and wastewater are diverted into existing gutters, other surface drains, or temporary drains.

G. Methods

1. All trench excavation shall be made by open cut. During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading, and to prevent slides or cave-ins. All material not required for backfill or not suitable for backfill shall be

removed from the site by the CONTRACTOR. Banks of trenches shall be kept as nearly vertical as possible, and shall be properly sheeted and braced as may be necessary to prevent caving.

2. The CONTRACTOR shall provide, place and maintain all necessary barricades, warning signs, and other safety devices to prevent pedestrians from falling in open trenches.
3. Trench widths in paved streets or in areas where proximity to other structures requires vertical cuts, shall not be wider than is required for proper handling, jointing and bedding of the pipe.
4. The bottom of the trenches shall be accurately graded to line and grade, and provide uniform bearing and support for each section of the pipe on undisturbed soil, at every point along its entire length. Depressions for joints shall be dug after the trench bottom has been graded, and shall be only of such length, depth, and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated.
5. Where rock occurs in trench excavation, the rock shall be removed to a depth of six inches (6") below the established grade line, and to a width of twelve inches (12") greater than the outside diameter of the pipe to be installed in the trench.
6. No water shall be permitted to rise or stand in trenches not yet backfilled until after the pipe has been placed, tested and covered with backfill for a depth of at least ten inches (10"). Any pipe having its alignment or grade changed as a result of a flooded trench shall be removed and re-laid after the trench is graded once again at no additional cost to the OWNER.

H. Pavement Removal

1. Where excavation of trenches requires the removal of pavement, the pavement shall be cut in a straight line along the edge of the excavation by use of a spade-bit air hammer, concrete saw or similar approved equipment to obtain straight, square and clean break. After backfilling and sub grade preparations are completed, the pavement section and surfacing shall be replaced.
2. Excess material, including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill, shall be removed from the site and disposed of by the CONTRACTOR.

3.04 BORING

A. Locations

Boring shall be used to route pipe, wiring, or both under structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.

B. Method

Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the ENGINEER capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures.

3.05 SLEEVES

A. Locations

Sleeves shall be installed wherever routing of a pipe, wiring, or both crosses a paved area or passes through a bored hole.

B. Methods

1. Sleeves laid in open trenches shall be uniformly and evenly supported by undisturbed soil on the trench bottom. Backfill shall conform to standards hereinafter specified.
2. Sleeves installed in borings shall be forced through and shall have a snug fit throughout the length of the bored hole. Sleeves cracked or broken shall not be accepted.

3.06 BACKFILL

A. Material

Backfill material shall be free of clods, lumps of frozen material, or stones larger than one-inch (1") in their maximum dimension. The bedding and select material under, around and six inches (6") above the top of the pipe shall be placed by hand in maximum layers of six inches (6") and carefully compacted in a manner which will not displace the pipe. Compaction of the select backfill shall be at least ninety percent (90%) of the maximum density as determined by AASHTO T-180. Water settling will not be allowed.

B. Inspection

The trenches shall not be backfilled until inspection has been completed and the pipe installation, including the grade, alignment and jointing has been found to be in compliance with the requirements of the plans and specifications.

C. Around and Over the Pipe

1. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than three-quarters of an inch ($\frac{3}{4}$ ") shall be used in backfilling around and over the installed pipe.
2. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The CONTRACTOR may at his option and expense provide an acceptable imported material.
3. This backfill material shall be carefully deposited around and over the pipe in layers not more than six inches (6") thick, loose measurement, unless otherwise permitted by the ENGINEER, wetted to optimum moisture content and uniformly compacted to at least ninety-five percent (95%) of the maximum density obtainable at optimum moisture content as determined by ASTM D698 (latest revision), until the pipe has a cover depth of at least one foot (1').

D. Remainder of Trench Backfill

1. The remaining depth of the trench shall be backfilled with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.
2. This material shall be carefully deposited in layers not to exceed six inches (6") in compacted thickness and compacted to at least ninety-five percent (95%) of the maximum density as determined by ASTM D698 (latest revision). The method of compaction selected by the CONTRACTOR shall not cause damage of any nature to the installed pipe. Replace topsoil on trench fill and compact to eighty-five percent (85%) of maximum density at optimum moisture.
3. The use of water settlement for this portion of the trench backfilling is permissible if the specified density can be obtained and the backfill material is suitable for this type of trench compaction.

3.07 INSTALLATION OF PIPING

A. General

1. Layout the piping system in strict accordance with the Plans.
2. Where piping is shown on the Plans to be under paved areas but running parallel and adjacent to planted areas, the intention is to install the piping in the planted areas.

B. Line Clearance

1. All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades, except through pipe sleeves.
2. Parallel lines shall not be installed directly over one another.

C. Inspection of Pipe and Fittings

Carefully inspect all pipe and fittings before installation, removing all dirt, scale, and butts and reaming as required; install all pipe with stamped markings oriented up to allow visual inspection and verification.

D. Plastic Pipe

1. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
2. All plastic joints shall be solvent-weld joints or slip seal joints. Only the solvent cement recommended by the pipe manufacturer shall be used and it must be a two-part system consisting of primer and cement. No single part cement system shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the CONTRACTOR's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The CONTRACTOR shall assume full responsibility for the correct installation.
3. All plastic (PVC) to metal joints shall be made with plastic threaded male adaptors into female metal fittings.

4. The solvent-weld joints shall be made dry.
5. The solvent-weld joints shall be allowed to set at least 24 hours before pressure is applied to the system on PVC pipe.

E. Metal Pipe

Direct buried copper pipe connections shall be made using silver solder.

F. Thrust Blocks

Provide concrete thrust blocks for all pipes as shown on the plans. All thrust blocks shall bear directly on undisturbed earth. Center the pipe in the middle of the thrust block.

3.08 INSTALLATION OF EQUIPMENT

A. General

1. All fittings, valves, etc., shall be carefully placed in the trenches with concrete thrust blocks, placed where required.
2. All sprinklers, having adjustable nozzles, shall be adjusted for proper and adequate distribution of the water over the coverage pattern of the sprinkler.
3. All nozzles on stationary pop-up sprinklers or stationary spray heads shall be tightened after installation. All sprinklers having an adjusting screw, adjusting stem or adjusting friction collars shall be adjusted as required for the proper arc of coverage, radius, diameter and/or discharge.
4. All control wires shall be clearly labeled by zone, using weatherproof material, at the controller. Water proof tags providing controller name and zone number shall be installed at each valve.

B. Sprinkler Heads

1. Install lawn sprinkler heads where indicated on the plans and in strict accordance with the manufacturer s recommendations and as necessary to provide complete uniform coverage and precipitation.

2. Upon completion of installation, reset all lawn sprinkler heads flush with grade and firmly anchored with soil.

C. Master Automatic Control Valves

A master automatic control valve shall be installed at the point of connection to the main for any remotely controlled portion of the irrigation system. In cases where there are multiple points of connection, a master valve shall be installed for each, with no more than three points of connection allowed.

3.09 TESTING AND INSPECTION

A. Covering or Enclosing Work Prior to Inspection

Do not allow or cause any of the work in this section to be covered up or enclosed until it has been inspected, tested, and approved by the OWNER's Representative.

B. Flushing

Before backfilling the mainline, and with all control valves in place, but before lateral pipes are connected, completely flush and test the mainline and repair for all leaks; flush out each section of lateral pipe before sprinkler heads are attached.

C. Testing

1. Make all necessary provisions for thoroughly bleeding the line of air and debris.
2. Before testing, fill the line with water for a period of at least twenty-four (24) hours.
3. After valves have been installed, test all live water lines hydrostatically for leaks at a pressure of one hundred fifty (150) psi for a period of two (2) hours, with all couplings exposed and with all pipe sections center loaded.
4. Furnish all necessary testing equipment and personnel.
5. Correct all leaks and retest until acceptance by the ENGINEER.

D. Final Inspection

1. Thoroughly clean, adjust, and balance all systems.

2. Demonstrate the entire system to the ENGINEER and OWNER, proving that all remote control valves are opening and closing on command, that all heads are properly adjusted for radius and arc of coverage, that all emitters are functioning, and that the installed system is workable, clean, and efficient.
3. Existing irrigation system(s) or portions of systems which have had their performance altered by any of the work related to this project shall be repaired or adjusted using materials and installation methods in accordance with this specification and in a manner to restore head-to-head sprinkler coverage, uniform precipitation rates, control zone integrity, and elimination of the spraying of water on building walls and sidewalks.

3.10 PAVEMENT REPLACEMENT

Pavement replacement shall utilize the same materials and design as the original pavement.

3.11 CLEANUP

Upon completion of the work, the entire site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present a neat and workmanlike appearance. Cleanup shall be considered an incidental item, and no additional payment shall be made for any cleanup item. All improvements or other obstructions removed during construction shall be replaced in a condition at least equal to their existing condition.

3.12 MAINTENANCE

- A. The CONTRACTOR shall, for a period of one (1) year after completion and final acceptance of the work, maintain and repair any trench or boring settlement which may occur, and shall make suitable repairs to any pavements, or other structures which may become damaged as a result of settlement. All such maintenance and repair shall be at the CONTRACTOR's expense.
- B. The CONTRACTOR shall inform the OWNER of the location and the nature of all damage done to the existing irrigation system not slated for demolition within eight hours of the occurrence of the damage.
- C. The CONTRACTOR shall maintain the existing and proposed irrigation system in operation during the construction period. Upon completion of the proposed irrigation

work the CONTRACTOR shall balance and adjust the entire (new and existing) system.

- D. The CONTRACTOR shall winterize the entire system in the fall following project completion and live testing. The CONTRACTOR will perform system start-up in the spring following completion, and is responsible for any system damage that may have occurred during the winter.

3.13 AS-BUILT DRAWINGS, CHARTS AND EQUIPMENT MANUALS

A. Record Drawings

1. Record accurately on one set of black and white prints of the site plan all installed work including both pressure and non-pressure lines.
2. Upon completion of each increment of work, transfer all such information and dimensions to the print. The dimensions shall be recorded in a legible and workmanlike manner.
3. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on as-built drawings shall be kept day-to-day as the project is being installed. All dimensions noted on drawings shall be one-eighth-inch (1/8") in size (minimum).
4. Show locations of the following items:
 - Point of connection
 - Routing of pressure lines (max. dimension=one hundred feet {100' } along lines)
 - Gate/ Ball valves
 - Automatic control valves
 - Quick coupling valves
 - Routing of control wires
 - Sprinkler heads
 - Other related equipment
5. Maintain as-built drawings on site at all times.
6. Make all notes on drawings in pencil (no ball point pen).

B. Controller Charts

1. ENGINEER must approve as-built drawings before charts are prepared.
2. Provide one controller chart for each controller supplied showing the area covered by automatic controller, of the maximum size controller door will allow.
3. The chart is to be a reduced drawing of the actual as-built system.
4. Chart shall be black line print and different colored shading used to show area of coverage for each station.
5. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic.
6. The chart shall be mounted using Velcro or equal type of semi-permanent fastening device.
7. These charts must be completed and approved prior to final acceptance of the irrigation system by the OWNER.

C. Operation and Maintenance Manuals

1. Prepare and deliver to the ENGINEER within ten calendar days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two (2) individually bound copies of the operations and maintenance manual. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:
 - a. Index sheet stating CONTRACTOR's address and telephone number, duration of guarantees period, list of equipment with names and addresses of local manufacturer representatives.
 - b. Complete operating and maintenance instructions on all major equipment.
 - c. System start-up and shut down instructions.
2. In addition to the above maintenance manuals, installer shall schedule and conduct an onsite commissioning meeting, and provide the maintenance personnel

with instructions for system operation and show written evidence to the OWNER at the conclusion of the project that this service has been rendered.

3.14 GUARANTEE

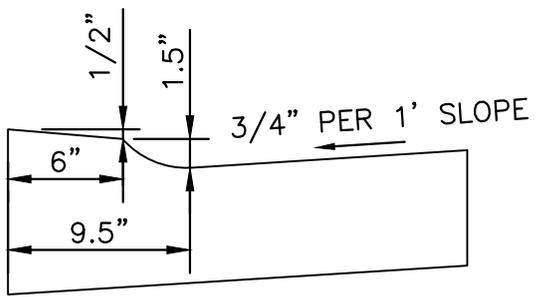
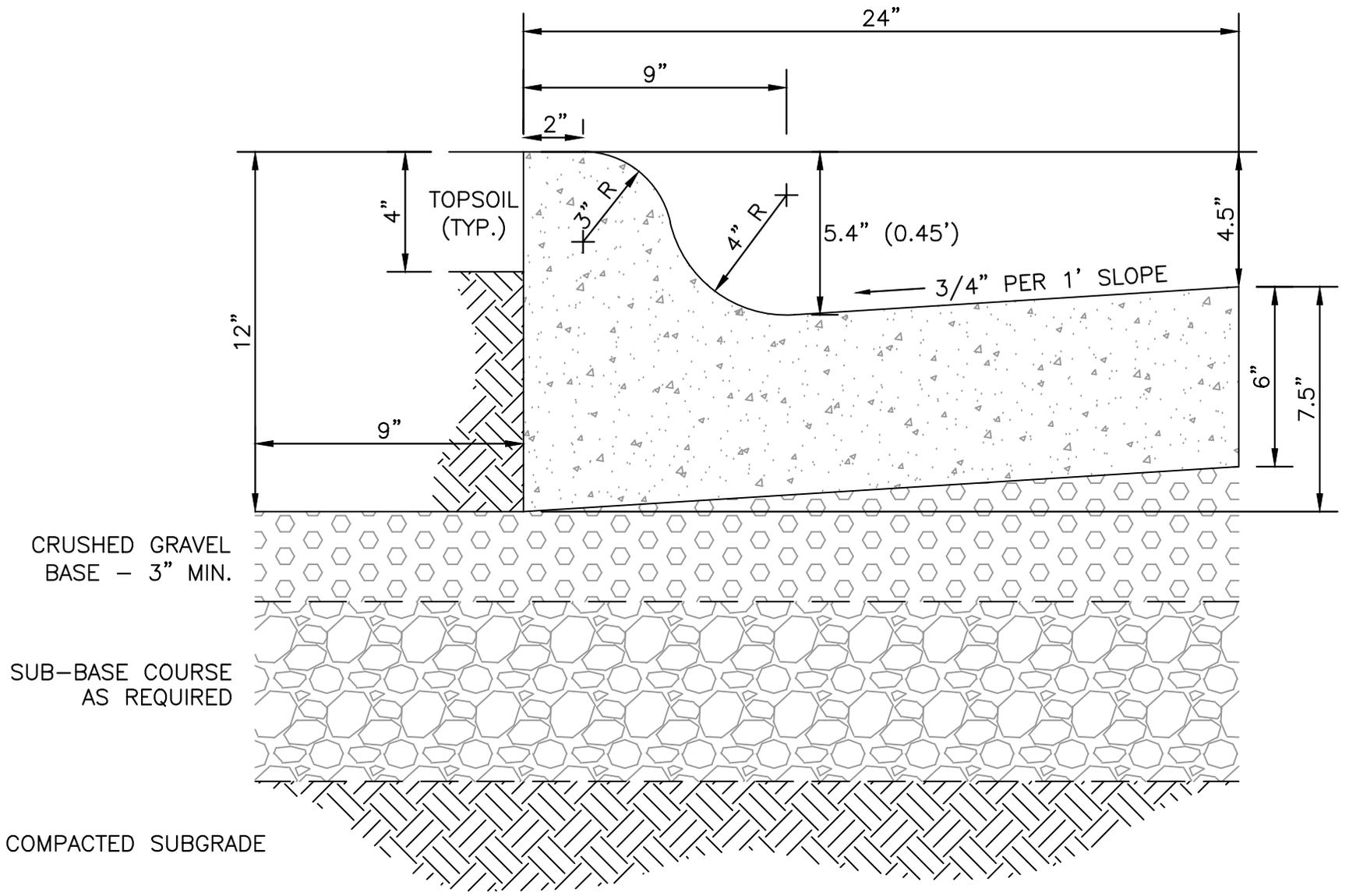
A. Warranty

1. The entire irrigation and water system shall be guaranteed to give satisfactory service for a period of one year from the date of acceptance by the OWNER.
2. Should any trouble develop within the time specified above due to inferior or faulty materials or workmanship, the trouble shall be corrected at no expense to the OWNER.
3. Any and all damages resulting from faulty materials or workmanship shall be repaired by the CONTRACTOR to the satisfaction of the OWNER, at no cost to the OWNER.

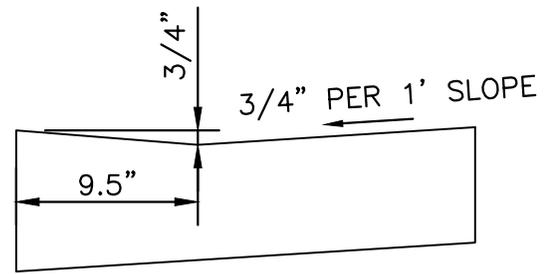
B. Guarantee Period Services

1. The CONTRACTOR shall winterize the system and perform spring start-up of the system during the guarantee period. These functions shall be coordinated in advance with the OWNER, and the OWNER's personnel shall be encouraged to participate.
2. First year winterization by the CONTRACTOR shall be part of the guarantee. Repair any damage due to freezing.

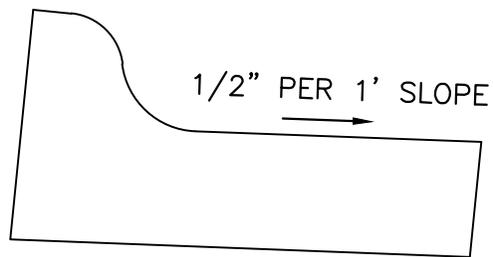
End of Section 02810



LOW PROFILE CURB



DROP CURB FOR PEDESTRIAN RAMPS



SPILL CURB

INTEGRAL CONCRETE CURB & D GUTTER DETAIL

NO SCALE

Appendix 2.4-2 Construction Parking Displacement & Construction Staging on Parking Lots

Background

Montana University System parking operations are required by state statute to function as independent, non-state funded, self sustaining business entities. All costs associated with the development, management, operations, and maintenance of the parking enterprise and parking facilities must be covered by revenue generated through user fees and enforcement fines. MSU is prohibited from using either state appropriated funding or student tuition to support parking facilities or operations.

Parking fees are charged to legitimate users and customers of the parking system (faculty, staff, students, visitors). Fees include revenue from permits and the MSU pay lot. Fees are tied to capital improvement reserves, maintenance of existing assets, planning activities, and purchased services (e.g., snow removal, cleaning, etc). Therefore, the capital investment in existing parking assets made by parking customers must be preserved and protected.

Construction Staging in Parking Lots

The University has determined that construction staging areas in general negatively impacts the areas / surfaces upon which they are placed, regardless of duration, and that the negative impacts have associated repair / restoration costs (UPF13 July, 2007). It has also been determined that the restoration costs associated with locating construction staging areas on landscaped surfaces are greater than the costs associated with staging on parking surfaces. Therefore, it is generally preferable for construction staging areas to be located on hard surfaces, such as parking areas, than on open spaces or landscaped areas.

When staging on parking areas, the following parameters must be met:

1. Use of parking lots for construction staging areas shall be coordinated with and approved by the manager of Parking Services. Coordination should begin as early in the project process as possible in order to minimize impacts to parking assets and parking customers, and to identify and account for project budget impacts early in the process.
2. Any changes in approved staging parameters must be coordinated with and approved by the manager of Parking Services.
3. Since each parking space represents an individual annual revenue source, and any loss of revenue negatively impacts the future costs to all parking customers, the construction / building project budget must pay the parking account the cost of an annual permit (S/B average - or less if staging on less than S/B parking area), prorated to the actual months used for staging.
4. In selecting / proposing construction staging locations, also consider that since the parking lots are constructed and maintained by fees paid by the users, and competition for prime convenient parking spaces is intense, even short-term use for construction staging can be perceived by parking customers as a significant and unjust inconvenience. Therefore, staging areas should be sized for the minimum possible area and duration required for the project at hand.
5. Staging areas must be fenced and secured to prohibit the dangers of the public walking through a staging area.
6. Staging areas should be monitored throughout the construction project to assure appropriate use and the earliest possible release of the area for general parking use.
7. Staging areas are provided for construction materials, equipment, trailers and work vehicles being

actively used for the construction project - NOT for long-term storage of infrequently used equipment or for parking personal transportation vehicles of construction personnel. All contractors and their employees shall abide by MSU's Parking Regulations including purchasing parking permits and registering their vehicles.

8. Haul routes from the staging area to the project site to be used by the contractor shall be designated on the project drawings, marked on the site and maintained in clean, safe condition by the Contractor. Construction traffic shall be confined to the designated haul routes.
9. Contractor shall maintain existing paving in staging areas, promptly repair breaks, holes, low areas and other damage to maintain paving and drainage in original condition and to prevent accumulated damage throughout the use period.
10. Protect parking surface from damage by storing any heavy objects on appropriately sized pallets.
11. Do not store petroleum products or caustic/volatile materials anywhere in staging areas located on parking lots. Tracked vehicles are not allowed to be used in staging areas located on parking lots. Do not store site materials, loose gravel, dirt or demolished materials such as masonry, roofing, etc., in staging areas located on parking lots.
12. At the end of staging use the contractor shall:
 - a) Remove all materials and sweep surface to clean condition.
 - b) Remove any fence posts or similar appurtenances.
 - c) Repair any damage to depth required to assure structural strength and surface continuity with original adjacent lot conditions.
 - d) Repair any damage to signage, lighting, landscape elements, sprinklers, etc.
 - e) Repair any damage to haul routes and approaches to original condition.
 - f) Renew all pavement markings in areas where existing markings have been degraded and on new pavement areas.

Parking Permanently Displaced by a Building Project

As noted above, the construction and maintenance of existing parking facilities have been paid for by the legitimate users of the parking system with the expectation that their investment will be preserved for their continued use throughout the life time of their investment - in most cases at least 45 years. Therefore, if a building project (including but not limited to buildings, landscaping, service areas, plazas, etc.) permanently displaces existing parking, the project budget must pay the parking account the estimated cost equal to the full current replacement value of the area and number of parking spaces being displaced - without discount relative to depreciation or condition. The only exception to this requirement is for projects funded through State LRBP funding process, when the State project budget will not reimburse University Parking for the value of lost parking. The parking enterprise will determine how, when, where and if the displaced parking is to be replaced in the future.

Appendix 2.7-1 – Trash and Recycling

Every campus building is serviced with trash removal, performed by Custodial Services which is a branch of Facilities Services. Ordinary building trash is deposited in dumpsters adjacent to most campus buildings. These dumpsters are serviced by Facilities Services and the trash is taken to the Bozeman landfill location.

Each campus building must have provision for trash removal. All new buildings must have access to a service yard with standard campus trash and recycling containers. All building remodeling projects must accommodate the existing trash removal services for that building or, for major remodeling projects, consider whether or not the design of new or modified service facilities is warranted as part of the scope of the project.

The design of a service yard shall be reviewed and approved by CPDC, Facilities Services, and the Environmental Services Manager. The Project Manager will facilitate a preliminary meeting for the Design Consultant to get information regarding current standards for trash and recycling containers, design parameters for access by collection vehicles, etc., prior the Schematic Design submittal.

The following is general information regarding trash and recycling on campus:

TRASH

Building Refuse Policy:

- Building refuse is removed according to a schedule outlined on colored floor plan maps provided to the custodian(s). Building users can obtain cleaning schedule information from either the custodian in their area or by calling ext. 6868. All public and circulation areas have the trash removed daily.
- Anything in or on top of or in contact with a standard desk-side trash receptacle can be considered trash and is likely to be discarded. Valued items should not even be in the vicinity of a trash container for greatest safety. Custodians are instructed to leave behind any material or object for which they have any doubt whether or not it is refuse. Such items can be discarded the next day after checking with the building user responsible for the item with no real harm done.
- If something has a note on it identifying the object or material as refuse, the custodian is advised to take it to the outside container. Nevertheless, miscommunications can and do occur, and again, if there is any doubt about whether or not an item is refuse, the custodian is instructed to leave it behind until the proper double-checking can be performed.
- If there is anything in or about the building refuse that makes the custodian think the material might be hazardous and/or unsafe to handle, the custodian is instructed to leave it alone and call his or her supervisor. This goes for any unknown substance on any surface.
- If a custodian comes upon a spill that looks like blood, they are instructed to leave it alone and call their supervisor. The supervisor will assist on how to clean it up, and probably will use a clean-up kit provided by Safety and Risk Management.
- Burned out light-tubes without green ends or stamps are collected and carefully placed into an empty light-tube shipping carton for recycling. Custodial supervisors collect full cartons and take them to storage off-site. The carton is marked with the number of tubes contained within when the ends of the carton are sealed. A dated, running inventory of burnt-out or broken light tubes is kept on a tablet by the supervisors at the storage facility. Light-tubes that are manufactured with green metal ends are environmentally friendly and can be placed in a dumpster, preferably unbroken and in a carton.
- All electronic office equipment, computer monitors, CPUs (central processing units or “towers”, the brain part of a personal computer), computer keyboards, mice and assorted peripherals are recycled. Recycling of these items is coordinated through the E-Scrap program, see below.

RECYCLING

Recycling Stations: Cans, Plastic, Office Paper, and Newspaper (Mixed Paper) are collected by student employees on a weekly basis from the MSU Office of Sustainability recycling stations located in most campus buildings and residence halls. The pick-up schedule generally changes each semester to accommodate employee class schedules.

Recycling Dumpsters: Several large well-marked dumpsters for Office Paper and Cardboard are provided for "self serve" use in convenient outdoor locations around campus. MSU Office of Sustainability owns these receptacles and contracts with an off-campus recycler to service them. Cardboard is picked up multiple times per week and office paper is picked up about once every 3 weeks as needed.

Special Pick-ups: If you are planning an office clean-out or have other large volume recycling needs, please use the nearest recycling dumpster or contact our office to arrange an extra pick up. Please do not use the indoor recycling stations for large volume deposits, as this may lead to an overflow between scheduled pickups.

Note: The large recycling containers located on 13th St. in Family/Grad Housing are *not* part of the MSU Recycling program. These are public drop-off locations provided by [Gallatin County](#).

E-Scrap Program: MSU Safety & Risk Management operates an E-Scrap program for the campus (computer, printers, and other electronics). This program is paid for by a fee charged on all university computer purchases (a percentage of purchase price). For more information about MSU E-Scrap and proper disposal options for electronics, visit <http://www.montana.edu/wwwsrms/escrap/index.html>.

Appendix 3.2-1 Door & Door Hardware Documentation Checklist

Documentation will include, at a minimum:

Documentation	Schematic Design	Design Development	50% CD	95% CD
Preliminary Door Hardware Meeting	x			
Identify Access Control Doors	x			
Submit Door Hardware Product Data		x		
Submit Door Schedule and Floor Plans		x	X	X
Opening Details (head, jamb, threshold)			X	X
Access Control Diagrams (incl. Electrical)			x	x
Specifications		x	x	x

Montana State University
Campus Stores – 6th and Grant
Bozeman, Mt 59717

Contact: Lester Dennis or Chuck Albert

Title: Facilities Locksmith

Phone: 406-994-5468

Email: ldennis@montana.edu or charles.albert@montana.edu

Door Hardware

Specification Guideline

The hardware listed as preferred is stocked by facilities for quick repair. Those item list as preferred alternative have be proven to be replaced quickly by or quickly adapted to stocked hardware.

Locks:

A. General Requirements:

1. All lockset will be of lever type
2. Shape of lever shall be easy to grasp with one hand and not require tight grasping, tight pinching, or twisting of wrist.
3. Provide each lockset with a curved lip strike 4 7/8" X 1 1/8" conform to ANSI A115.2. Finish shall match.
4. Provide locks and cylinders that will accept the small format 7 pin Medeco Keymark X4 interchangeable cores.
5. Hardware supplier and/or Contractor to supply and install construction cores that will fit into the permanent locks and/or cylinders
6. Contractor will supply to Montana State University (MSU) Locksmith shop with a copy of the construction core master and core key.
7. Contractor will supply 3 keys per permanent core to be cut as directed by the MSU Locksmith Shop and to be delivered to the MSU Locksmith
8. Contractor will turn over to MSU locksmith shop throw member for installed locks/cylinders.
9. Provide small format 7 pin Medeco Keymark X4 interchangeable permanent cores pinned as specified by Montana State University Locksmith shop.
10. Cores are to shipped to Montana State University Locksmith Shop

11. Mounted at the appropriate height per ADA.
12. Montana State University Locksmith are to install permanent cores
13. Electrified locks and exit devices shall be preferred over electric strikes. Electrified locks afford better security than electric strikes and this type of hardware allows for greater flexibility when making functional changes to openings in the future.
14. Exit devices outside trim to be equipped with levers.
15. All Hardware is to be installed per manufacturer's specifications

B. Cylindrical Lockset

1. Lockset must be extra heavy-duty
2. Backset 2 ¾ inch or greater as need to accommodate frame , door or other hardware, with a 9/16 inch throw latch bolt
3. Lockset provide for 7 pin interchangeable core for the Medeco Keymark X4
4. Lockset to have solid shank with no opening for access to keyed lever keeper
5. Keyed lever to be removable only after core is removed by authorized control key, to allow access to lever keeper.
6. Lockset and latches must conform to ANSI A156.2 Series 4000, Grade 1, and be UL listed
7. All locksets shall be provided with a lever as per American Disabilities Act (ADA) requirements.

Preferred: Best 9K3 Series, 15D Trim

Preferred alternative: Schlage ND Series, Rhodes Trim

C. Dead Bolt Tubular

1. No exposed mounting screw on exterior
2. Full 1" stainless steel throw deadbolt
3. Free turning, wrench-resistant, tapered cylinder ring
4. Self-aligning
5. Field reversible
6. Backset 2 ¾ inch or greater as need to accommodate frame , door or other hardware
7. ADA turn lever on interior
8. Accommodates 7 pin interchangeable core for the Medeco Keymark X4
9. Conform to ANSI A156.5-1992 Auxiliary Locks, Grade 1 and be UL listed.

Preferred: Best 83T Deadbolt

Preferred alternative: Schlage B600 Deadbolt

D. Exit Devices

1. Provide Rim type device
2. Devices are to be non-handed
3. Provide keyed lever trim
4. Concealed or surface vertical rod devices are not acceptable
5. Provide heavy duty ANSI grade 1 devices

6. Non-electric devices must be able to be field-converted on-site to electric operation by simply adding a new base assembly
7. Install according to manufactures instructions

Preferred: Von Duprin 99

Preferred Alternative: Precision Apex

Cylinder:

1. Are to accept the small format 7 pin Medeco Keymark X4 interchangeable core
2. Are to have the proper tailpiece or cam for correct operation of lock

Preferred: Best

Preferred Alternative: Medeco Keymark, Arrow, Falcon

Door Closers:

A. General Requirements:

1. All manual closers shall carry a manufacturers ten (10) year warranty
2. All closers with electrical components shall carry a manufacturers two (2) year warranty
3. Fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.
4. Fluid of a type requiring no seasonal adjustments
5. Hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.
6. Separate adjustments for backcheck, general speed, and latch speed.
7. Closing power of non-sized cylinders shall be adjustable over a range of sizes
8. All closers for openings that must meet the minimum requirements of the ADA act.
9. All manual closers shall provide or be adjustable to less than 5 pounds opening force on a 36" door leaf and delay closing time in accordance with the ADA.
10. All automatic operator systems shall include the following features and functions.
 - a. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
 - b. The operator will be designed to prevent damage to the mechanism if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
12. Installation shall be in accordance with the templates and installation instructions packaged with the closers at the time of manufacture.
13. Installation shall be made with fasteners packaged with the closer by the manufacturer.
14. All electrical connections shall be made in accordance with the manufacturer's recommendations.

15. Clean installed closer to remove dirt, debris, and marks incidental to installation work.
16. Installation instructions, service manual and templates are to be turned over to the MSU Locksmith Shop upon completion of the installation work.
17. Install and regulate all closers in accordance with the installation instructions packaged with the closers at the time of manufacture.

- B. All electrohydraulic automatic operators shall include the following features or functions:
1. Low-speed and low energy movement of the door leaf, making safety pads and/or guard rails unnecessary
 2. Manual operation of the door without power assistance, permitting the continued use of the door in the event the operator mechanism fails
 3. Second Chance Feature: When an obstruction or resistance to the opening swing is encountered the operator will pause at that point, and then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
 4. Easily accessible main power and maintain hold-open switches will be provided on the operator
 5. An electronically controlled clutch to provide adjustable opening force
 6. A microprocessor to control all motor and clutch functions
 7. An on-board power supply capable of delivering both 12VDC and 24VDC outputs up to a maximum of 1.0 amps combined load.
 8. All input and outputs power wiring shall be protected by a resettable circuit breaker

Preferred: LCN 4041XP

Preferred Alternative: Stanley ODC100 Series

ADA Power Doors:

- A. Actuator
1. Hardwire low voltage with round stainless steel 4.5"
 2. Wireless remote is allowed for retrofit and areas where it is impossible to run wiring and must be preapproved by Facilities.
- B. Vestibule
1. Doors operate independent of one another
 2. Dual Vestibule Push plates are expectable, like the BEA PBDGP Series
 3. Card access attached to ADA power doors must work in conjunction with one another

Preferred: LCN

Preferred Alternative: Stanley D-4990

Card Access Readers:

1. There is to be a minimum of one door to have Card Access, this door is for the uses of the Facilities Services afterhours access to buildings. This is to be located at the Service Entrance to the building. If no Service Entrance, then door most convent for Facilities Services Personnal.

2. Provide electrified locking hardware
3. Provide power supply for the locking hardware per locking hardware manufacture
4. When in conjunction with ADA power Door, outside actuator will be de-active when locking hardware is in the lock position.
5. Own will provide the reader and access control hardware.
6. Coordinate wire requirement with owner

Electrical Power Transfer (EPT) :

1. When installing electrified locking hardware on new construction and major remodels are to use EPT 's.
2. Two wires EPT: Are to be of 18 gauge wire, Up to 2 amps @ 24VDC, with a 16 amps Maximum Surge
3. Ten wires EPT: Are to be of 24 gauge wires, Up to 1 amps @ 24VDC, with a 16 amps Maximum surge.
Preferred: Von Duprin

Mullions:

1. Mullions are to be steel keyed removable .
2. The steel mullion is to be 2"x3"x1/8"
3. Contractor is to supply and install cylinders

Preferred: Von Duprin

Hinges:

1. Are to be a minimum of three ball bearing butt
2. Are to be at least 4.5x4.5
3. Hinges on outside door are to be a non-removable pin
4. Aluminum door are to use a Heavy duty concealed geared continuous hinge
5. No pivots are to used on aluminum doors.

Doors and Door Frames

A. General:

1. Side jambs to be set and plumb and straight
2. Head jambs to be set level and straight

B. Wood:

1. To have blocking at a minimum of five points on each side
2. Blocking placed between jamb and framing member
3. Blocking to be included behind each hinge and lock strike plate
4. No point on side jambs or head jambs shall the distance between blocking exceed 18"
5. Jambs to be securely fastened at blocking points to framing members

C. Metal:

1. Frames to be installed as per manufacturer's written specifications
2. Concrete or grout, block-outs or insulating foam blocks to be placed behind hardware attachment points on frame
3. Doors to be a minimum of 18 gauge steel
4. Hardware reinforcement to be 14 gauge steel
5. Frame to be a minimum of 16 gauge steel

Preferred: Curries 707

D. Aluminum:

1. Be installed as per manufacturer's written specifications
2. Top rail to be a minimum of 6"
3. Bottom rail to be a minimum of 12"
4. Stiles to be a minimum of 6"

DRAFT

Appendix 3.3-1 Window Standards

This section applies to the design and installation of glazed curtainwalls, windows, and storefronts, and their coordination with other cladding systems.

Glazed curtainwalls, storefronts and individual windows are, by design, "barrier walls" with no back- up to protect the building interior. Curtainwall, storefront and window design, fabrication and installation must be done to strict standards to perform as expected.

- Life expectancy of curtainwalls, storefronts and windows is 50 years before major upgrade or replacement. This includes all manufactured joints within the curtainwall or window.
- Life expectancy of perimeter joints at the interface with other exterior building systems is 10 years for joint sealants and 50 years for cavity flashing.

Programming

- Determine standard of quality for curtainwalls, storefronts and windows. Standard of quality should be determined according to:
 - Size and location of the curtainwall, storefront or windows
 - Function and requirements of the space within the building
 - Budget for the project
 - Whether or not the project involves an Historic building (see Section 1.5)
- Curtainwalls, storefronts and windows with integral panel systems shall be designed as one system.
- Sub-frames shall be part of the curtainwall package.

Design Criteria

- All systems shall have an AAMA Certification Label and comply with applicable provisions of AAMA (American Architectural Manufacturers Association), ANSI (American National Standards Institute), ASTM (American Society for Testing Materials), AWS (American Welding Society), OSHA (Occupational Safety and Health Administration)
- Basis of design for curtainwall systems is to be Kawneer 1600 system.
- Storefronts and similar systems shall meet all criteria and specifications of curtainwall system.
- Curtainwall, storefront and window performance criteria: All systems shall meet the following minimum criteria in addition to industry standard practice.
 - Air infiltration: Test in accordance with ASTM E283.
 - Water penetration: Test in accordance with ASTM E331; no water shall penetrate to any inside surface.
 - Wind loading: Per Building Code for wind loading requirements for Bozeman, MT, wind zone.
 - Condensation Resistance Factor (CRF) and Thermal Transmittance (U-value), in accordance with AAMA 1503.1
 - Coordinate with IBC requirements for " Safe Access and Fall Protection "

- Individual opening windows shall meet the following requirements:
 - At historic buildings with wood windows or other locations for which wood windows will be used, the Basis of Design shall be Weather Shield “Premium Series” aluminum clad wood windows. Basis of Design for double hung windows for over-sized openings shall be Marvin “Ultimate Double Hung Magnum Series”.
 - At mid-century buildings with aluminum windows or other locations for which aluminum frame windows will be used, the Basis of Design shall be DeSCo 2500 Series.
- On-site representation by the manufacturer shall be required to advise on coordination with unforeseen conditions, for quality assurance and to assist with intersections at other building systems.
- Access to all windows surfaces, interior and exterior, shall not put maintenance personnel at risk and shall not require personnel to bring equipment such as ladders or lifts unless approved by University plan review. Further design requirements include:
 - The use of sunshades must be coordinated with the requirements for window cleaning.
 - Windows shall be designed to be cleaned by conventional, accepted methods.
 - Coordinate with Custodial Services.
 - Provide hose bibbs at roof and ground levels at every 100 feet of building perimeter.
 - Provide outside weather-proof power receptacles (125V & 15 amps) at ground level at every 100 feet of building perimeter.
- Specify Low-E coatings on glazing where applicable to reduce building heat loss. Basis of Design for exterior glazing in 1” PPG Solarban 60.
- Specify a minimum glazing system that consists of sealed, double glazed windows with thermally broken frames to reduce building heat loss.

Design Evaluation

The following information is required to evaluate the design:

- Schematic Design Phase: Statement of intent to use curtainwalls, storefronts and/or windows including configuration of system, i.e., custom or stock, materials, and performance standards.
- Design Development Phase (35% CD): Plans and elevations. Outline specification including system and materials description, performance standards, and integration with other cladding systems.
- 65% Contract Documents: Building elevations showing extent of curtainwalls, storefronts and windows including integral panel systems, all openings and operable sashes. Typical details including head, side, sill, connections to other cladding systems and special conditions. Draft specification.
- 95% Contract Documents: All information required for bidding and installation of the curtain wall, storefront, window and integral panel systems, all details of connection and integration with all other building systems including waterproofing, structure and anchoring. Final specification.

Construction Submittals

The Design Documents shall require the following minimum submittals from the Contractor:

- The submittals shall indicate, in addition to industry standard submittals, coordination with adjacent building systems.
- Fabrication details
- Back-up support system
- Fasteners and anchors
- Perimeter flashing conditions

- Samples for appearance and conformance to specifications

Quality Assurance

The following general quality assurance measures apply:

- Design Documents shall require that a mock-up be constructed for large projects. The mock-up may not be part of the work, may be used to train installers and may be part of adjacent wall mock-up. The mock-up must be approved prior to installation of the mocked-up system on the building. Use same sequencing and testing as proposed for the building. Test mock-up per "Field Testing" below. Test until pass.
- Field Testing: Test finished system in place in accordance with "Field Check of Metal Storefronts, Curtainwalls and Sloped Glazing Systems for Water Leakage", AAMA 501.2-94. Testing shall be on an installed system. Area to be tested shall be more than 1% and less than 10% of the installed system.
- Test shall be performed prior to installation of interior finishes.
- Test at least once for every design condition of the curtainwall, storefront, or window system.
- Retest until pass.
- On-site representation from manufacturer during construction
 - To assist with unforeseen conditions
 - To assist in quality assurance
 - To assist with intersections with other systems, i.e., metal wall systems

3.4-1 Roofing Documentation Checklist

Documentation will include, at a minimum:

Documentation	Schematic Design	Design Development	50% CD	95% CD
Roof plan: include materials, slope, drain locations	X	X	X	X
Fall protection		X	X	X
Identify fire-rated systems				
Roofing Details – parapets, eaves, intersections, expansion joints, etc.			X	X
Fall protection details				
Specifications		X	X	X

Montana State University
Elevator Requirements

- I. Elevator control systems, including but not limited to the elevator operations controller, motor-drive or soft-start system, selectors, door operators and car panels must be installed with all necessary software, tools, and on-board or remote devices necessary to maintain the elevator.
2. Any Service Tool available to the OEM's (Original Equipment Manufacturer's) installation/adjusting/service technicians, including but not limited to: handheld diagnostic tools, site-dedicated desktop or laptop computers, on-board diagnostic systems such as LCD screens with built-in keypads or remote access programs must be provided to MSU as part of the installation contract.
3. Along with Service Tools, all Installation, Service, Adjustor, and Repair Manuals with engineering level documentation regarding usage of said tools must be provided to MSU.
4. All levels of diagnostics and adjustment available to an OEM technician must remain accessible. No lockouts such as, but not limited to, software keys, software expiration, disabling of onboard keypad, removal of LCD screens, remote password blocks and/or changes, removal of SIM chips; usage, re-level, and/or fault counters, or date stamped shutdowns may be applied.
5. A Backup copy of the Job Software Program must be included with the installation, along with instructions and any tools necessary for its re-loading and programming. This may include, but is not limited to: EPROMs, EEPROMS, Floppy Discs, CD/DVD's, Flash Memory, SIM chips, and/or Pre-Programmed Micro-Controllers.
6. All parts of the elevator system, including but not limited to: mechanical, electrical, motor, drive, pump, door and selector controls, and tools must be available for purchase by MSU and/or its elevator service contractor. A published price list must be made available. Exchange-only provisions are not acceptable.
7. A technical support hotline shall be provided by the original equipment manufacturer whereby anyone designated by MSU shall be able to obtain assistance for installation, adjustment, maintenance or troubleshooting.
8. The original equipment manufacturer shall provide engineering support to any maintaining contractor so designated by MSU.
9. Manuals, engineering drawings, circuit diagrams and prints shall be provided with the equipment at time of delivery. All documentation shall be available for replacement purchase, at reasonable cost, by any installing or maintaining elevator contractor or persons so designated by MSU.
10. Factory and/or on-site training shall be available from the original equipment manufacturer for enrollment by anyone who wishes to learn about installation, adjustment, maintenance and troubleshooting the equipment. Training fees shall be reasonable and appropriate.
- II. All software or hardware upgrades, such as, but not limited to: product improvement, reliability, or safety of the system, shall be made available to MSU for installation and adjustment, either by the OEM or a service provider specified by MSU, at no cost to either party.

Appendix 4.3-2 Paint Finish Standards

**Interior Paint Finish Recommendations For New
Buildings and Major Renovations**

<u>Building Type</u>	<u>Wall Materials</u>					<u>Ceilings</u>	
	<u>Veneer Plaster</u>	<u>Taped Sheetrock</u>	<u>Brick/Masonry (2)</u>	<u>C.M.U.</u>	<u>Painted Wood (1)</u>	<u>Stained Wood</u>	
<u>Dormitories (2)</u>							
Halls	eggshell	N/A	stain or semi	semigloss	semigloss	satin	flat
Public Spaces	eggshell/semi	N/A	stain or semi	semigloss	semigloss	satin	flat
Student Rooms	eggshell	N/A	N/A	semigloss	semigloss	satin	flat/eggsh
Bathrooms (4)	semigloss	N/A	N/A	semigloss	semigloss	satin	semigl (4)
<u>Academic/Administrative</u>							
Halls	eggshell	eggshell	stain or semi	semigloss	semigl/satin	satin	flat
Public Spaces	eggshell	eggshell	stain or semi	semigloss	semigl/satin	satin	flat
Classrooms	eggshell	eggshell	stain or semi	semigloss	semigl/satin	satin	flat
Offices	flat	flat	stain or semi	semigloss	semigl/satin	satin	flat
Bathrooms (4)	semigloss	semigloss	N/A	semigloss	semigl/satin	satin	semigl (4)
<u>Laboratories/Research Facilities (6)</u>							
Halls	eggshell/semi	eggshell/semi	stain or semi	epoxy/semi	semigl/satin	satin	eggshell
Public Spaces	eggshell/semi	eggshell/semi	stain or semi	epoxy/semi	semigl/satin	satin	eggsh/semi
Laboratories (6)	epoxy/semi	epoxy/semi	N/A	epoxy/semi	semigl/satin	satin	eggsh/semi
Lecture & Classrooms	eggshell	eggshell/flat	stain or semi	epoxy/semi	semigl/satin	satin	eggsh/semi
Bathrooms (4)	epoxy/semi	epoxy/semi	N/A	epoxy/semi	semigl/satin	satin	semigl (4)

- (1) Consider oil base for painted exterior wood to increase durability
- (2) Recommend leaving brick and masonry in natural finish, unless there is an aesthetic concern or, for existing masonry, there is an excessive amount of soil, stain, or mismatched patching.
- (3) Use mildew-resistant primer and paint in bathrooms, especially bathrooms with showers
- (4) Smooth ceiling finishes only are to be used in bathrooms
- (5) Use Latex-based paint for areas with lab animals that might be affected by volatile paints
- (6) BSL2 and BSL3 laboratories may have special cleaning requirements such as steam that may require special wall and ceiling coatings

4.4-1 Allowable Substrate Usage

List of Acronyms Used

MDF	Medium Density Fiberboard
MR-MDF	Moisture Resistant Medium Density Fiberboard
SCRC	Solid Color Reinforced Composite

Countertop Material	Allowable Substrate Materials			
	MDF	MR-MDF	Plywood	Combination
Plastic Laminate	X	X	Rqd. @ sink	X
Wood Veneer			X	X
Stainless Steel	X	X	Rqd. @ sink	X
Solid Surface	No Substrate Required			
Millwork Finish Material				
(panel products)	Allowable Substrate Materials			
	MDF	MR-MDF	Plywood	Combination
Plastic Laminate / Melamine	X	X		X
Hardwood Veneer	X	X	X	X
Metal Panel	X	X		X
SCRC	No Substrate Required			
Millwork Finish Material				
(casework)	Allowable Substrate Materials			
	MDF	MR-MDF	Plywood	Combination
Plastic Laminate	Door and drwr. fronts	Door and drwr. fronts	Rqd. for cab. box	X
Plastic Laminate / Melamine	X	X		X
Hardwood Veneer			X	X
SCRC	No Substrate Required			

Notes:

1. "Combination" substrate material refers to MDF crossbands with veneer core.
2. MR-MDF to be used in damp areas, plywood to be used in wet areas.
3. Fire-resistant substrates may be used based on code requirements.

4.4-2 Carpentry Documentation Checklist

Documentation will include, at a minimum:

Documentation	SD	100% DD 35% CD	65% CD	95% CD
Floor Plans	X	X	X	X
Millwork – on plans		X	X	X
Millwork – details			X	X
Partition Types		X	X	X
Window Types		X	X	X
Window Details			X	X
Screen Details			X	X
Blocking & Framing Details			X	X
Wall / Floor Assemblies & Details			X	X
Finish Schedule			X	X
Color Selections				X
Outline Specifications		X		
Full-Length Specifications			X	X

Introduction

In 1988, as a means of resolving a common problem, four major trade associations concerned with the manufacture, erection, finish, and decoration of gypsum board wall and ceiling systems developed an industry-wide, Recommended Levels of Gypsum Board Finish.

The document was intended to assist specification writers, architects, contractors, and building owners to more precisely describe the finish of walls and ceilings prior to the application of paints and other finishes, to encourage competitive bidding of suitably finished surfaces, and to enhance the appearance of the final decorative treatment and thereby enlist a satisfied client.

The original document was updated and revised in 1996.

This document takes the section of the 1996 document that discusses the specific criteria required to achieve individual levels of finish and presents them in a non-text format. The information contained in the document is technically identical to the original; however, it is formatted, solely for appearance purposes, into a matrix or grid simply to improve its readability. The scope, terminology, comments and resources sections are reproduced in their entirety from the original document.

Scope

This document describes various levels of finish of gypsum board surfaces prior to the application of specific types of final decoration. The recommended level of finish of gypsum board wall and ceiling surfaces varies with the final decoration to be applied and can also be dependent on their location in a structure and the type of illumination striking the surface. Each recommended level of finish is described with typical applications.

Terminology

The following definitions are applicable to this document.

Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.

Critical Lighting: Strong sidelighting from windows or surface-mounted light fixtures. Syn severe lighting. See "Comments" Section of this document.

Joint Photographing: The shadowing of the finished joint areas through the surface decoration. Syn telegraphing.

Drywall Primer: A paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings. See "comments" section of this document.

Skim Coat: A thin coat of joint compound, or a material manufactured especially for this purpose, applied over

the entire surface to fill imperfections in the joint work, smooth the paper texture, and provide a uniform surface for decorating. Excess compound is immediately sheared off, leaving a film of skim coating compound completely covering the paper.

Spotting: To cover fastener heads with joint compound.

Texture: A decorative treatment of gypsum board surfaces.

Texturing: regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer. See "comments" section of this document.

Comments

Critical (Severe) Lighting Areas. Wall and ceiling areas abutting window mullions or skylights, long hallways, or atriums with large surface areas flooded with artificial and/or natural lighting are a few examples of critical lighting areas. Strong sidelighting from windows or surface-mounted light fixtures may reveal even minor surface imperfections. Light striking the surface obliquely, at a very slight angle, greatly exaggerates surface irregularities. If critical lighting cannot be avoided, the effects can be minimized by skim coating the gypsum board surface, by decorating the surface with medium to heavy textures, or by the use of draperies and blinds which soften shadows. In general: gloss, semi-gloss, and enamel finishes highlighted surface defects; textures hide minor imperfections.

Manufacturer Recommendations:

The recommendations of individual manufacturers of gypsum board, joint tapes and compounds, accessories, drywall primers, wall coverings, adhesives, texture materials, and paints may vary from what is recommended herein and as such are not a part of this recommended specification.

Drywall Primer: Applied as a first coat to the entire prepared gypsum board surface with brush, roller, or spray prior to decoration. Where final appearance is critical, the application of high quality, high solids, and drywall primer will minimize most decorating problems.

For finish paints: A good quality, white latex drywall primer formulated with higher binder solids, applied undiluted, is typically specified for new gypsum board surfaces prior to the application of texture materials and gloss, semi-gloss, and flat latex wall paints.

An alkali and moisture-resistant primer and a tinted enamel undercoat may be required under enamel paints. Consult with the finish paint manufacturer for specific recommendations.

For wall coverings: White, self-sizing, water based, "universal" (all-purpose) wall covering primers have recently been introduced into the marketplace for use on new gypsum board surfaces. These products are claimed to minimize damage if wall coverings are subsequently removed, bind poor quality latex paint, allow hanging over glossy surfaces and existing vinyl, hide wall colors, and to be water washable.

Texturing: Texture material is applied by brush, roller, spray or trowel, or a combination of these tools, depending on the desired result. Textured wall surfaces are normally over painted with the desired finish; over painting of textured ceiling surfaces may not be deemed necessary where an adequate amount of material is applied to provide sufficient hiding properties. A drywall primer may not be required under certain proprietary texture materials; consult with the manufacturer of the texture materials for specific recommendations.

Tool Marks and Ridges: A smooth surface may be achieved by lightly sanding or wiping joint compound with a dampened sponge. Care shall be exercised to ensure that the nap of the gypsum board facing paper is not raised during sanding operations. For additional information on the finishing of gypsum board surfaces consult ASTM Standard C 840.

Resources

Designers and specifiers are encouraged to consult the following reference documents:

ASTM C 840, GA-216, GA-505, Master Painters Glossary

Contact one of the following associations for additional assistance with copies of this recommended specification:

The Association of the Wall and Ceiling Industries International

Ceilings & Interior Systems Construction Association Gypsum Association

Painting and Decorating Contractors of America

Notice

All of the statements, opinions, specifications, and recommendations on levels of gypsum board finish contained in this publication are for general information purposes only and are not intended to imply that these are the only materials, procedures, processes, or methods which are available or suitable.

By publishing this document, the co-sponsoring trade associations, and their member companies individually or collectively, make no express or implied warranty or other representation as the quality, characteristics, or suitability of the materials or techniques described herein, and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose which may arise by operation of law or otherwise.



Levels of Gypsum Board Finish

Southern Wall Products, Inc. offers the following information through the courtesy of AWCI

LEVEL*	JOINTS	INTERIOR ANGLES	ACCESSORIES	FASTENERS	SURFACE
<p>#0</p> <p><i>This level of finish may be useful in temporary construction or whenever the final decoration has not been determined.</i></p>	No taping, finishing or accessories required.				
<p>#1</p> <p><i>Frequently specified in plenum areas above ceilings, in attics, in areas where the assembly would generally be concealed or in building service corridors, and other areas not normally open to public view. Accessories optional at specifier discretion in corridors and other areas with pedestrian traffic. Some degree of sound and smoke control is provided; in some geographic areas this level is referred to as "fretaping." Where a fire-resistance rating is required for the gypsum board assembly, details of construction shall be in accordance with reports of fire tests of assemblies that have met the fire-rating requirement. Tape and fastener heads need not be covered with joint compound.</i></p>	Tape set in joint compound	Tape set in joint compound			Tool marks and ridges acceptable. Surface free of excess joint compound.
<p>#2</p> <p><i>Specified where water-resistant gypsum backing board (ASTM C 630) is used as a substrate for tile; may be specified in garages, warehouse storage, or other similar areas where surface appearance is not of primary concern.</i></p>	Tape embedded in joint compound and wiped with a joint knife, leaving a thin coat of compound over tape.	Tape embedded in joint compound and wiped with a joint knife, leaving a thin coat of compound over tape.	Shall be covered by one separate coat of joint compound.	Shall be covered by one separate coat of joint compound.	Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
<p>#3</p> <p><i>Typically specified in appearance areas which are to receive heavy- or medium-texture (spray or hand applied) finishes before final painting, or where heavy-grade wallcoverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces or light to medium wallcoverings are specified.</i></p>	Tape as in level #2, then covered with one separate coat of joint compound.	Tape as in level #2, then covered with one separate coat of joint compound.	Shall be covered by two separate coats of joint compound.	Shall be covered by two separate coats of joint compound.	Joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes. See painting/wallcovering specification in this regard.
<p>#4</p> <p><i>This level should be specified where flat paints, light textures, or wallcoverings are to be applied. In critical lighting areas, flat paints applied over light textures tend to reduce joint photographing. Gloss, semi-gloss, and enamel paints are not recommended over this level of finish. The weight, texture, and sheen level of wallcoverings applied over this level of finish should be carefully evaluated. Joints and fasteners must be adequately concealed if the wallcovering material is lightweight, contains limited pattern, has a gloss finish, or any combination of these finishes is present. Unbacked vinyl wallcoverings are not recommended over this level of finish.</i></p>	Tape as in level #2, then covered with two separate coats of joint compound.	Tape as in level #2, then covered with one separate coat of joint compound.	Shall be covered by three separate coats of joint compound.	Shall be covered by three separate coats of joint compound.	Joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes. See painting/wallcovering specification in this regard.
<p>#5</p> <p><i>This level of finish is highly recommended where gloss, semi-gloss, enamel, or nontextured flat paints are specified or where severe lighting conditions occur. This highest quality finish is the most effective method to provide a uniform surface and minimize the possibility of joint photographing and of fasteners showing through the final decoration.</i></p>	Tape as in level #2, then covered with two separate coats of joint compound.	Tape as in level #2, then covered with one separate coat of joint compound.	Shall be covered by three separate coats of joint compound.	Shall be covered by three separate coats of joint compound.	A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. See note in level 4.

*Minimum level of finish is described.

5.1-1 ITC Wiring Standards

The most current version of the MSU ITC wiring standards are found on the web at:

<http://www.montana.edu/itcenter/guidelines/telecomm/>

5.2-1 Audio/Visual Guidelines

The most current version of the MSU ITC Audio/Visual guidelines are incorporated into the MSU Classroom Design Guideline, which can be referenced within this document - see Appendix 6.2-1.

MSU Noise Criteria – Buildings and Equipment

1.0 Introduction

Montana State University recognizes the impacts that increasing levels of noise have on the campus and the surrounding community. In 2008, MSU contracted with Big Sky Acoustics, LLC to measure existing sound levels around the campus to form a baseline in developing noise level criteria to guide future campus development relative to noise produced by MSU facilities and operations. This document is the culmination of the resulting noise measurements, evaluation and study of noise criteria and the recommendations of the University Facilities Planning Board.

The noise level limits listed in the following sections shall be determined using one-minute, L₉₀ sound pressure levels.

2.0 Exterior Noise

Noise generated by campus facilities, equipment and activities shall be limited to L₉₀ 55 dBA from 7:00 a.m. to 10:00 p.m., and L₉₀ 50 dBA from 10:00 p.m. to 7:00 a.m., or for new installations up to 5 dBA above the existing ambient (L₉₀) noise level at the listener location, whichever is *less*, measured at the campus perimeter/property line.

Noise generated by campus facilities, equipment and activities shall be limited to L₉₀ 55 dBA or up to 5 dBA above the existing ambient (L₉₀) noise level at the listener location, whichever is *less*, measured at the following locations:

- a. The façade of individual buildings not served by, but in proximity to nearby exterior building equipment;
- b. The effective boundary of frequently-used outdoor campus common areas, such as the Centennial mall, the Duck Pond, etc.

For new buildings, major renovations and/or equipment installations, designs shall be reviewed and evaluated and noise mitigation measures prescribed/employed as necessary to assure conformance to the above noise criteria.

3.0 Interior Noise

Noise generated by equipment and systems serving a building shall be limited at the rooms served not to exceed the following:

- a. Classrooms, Seminar Rooms, Conference Rooms 35 dBA
- b. Private Offices, Libraries 40 dBA
- c. Shared/Open Office Areas 50 dBA
- d. Labs, Lobbies, Gyms 60 dBA
- e. Rooms designed for web-casting/distance-learning 35 dBA

If audible, discrete, single or narrow frequency range tonal noise is anticipated or identified, noise mitigation measures shall be taken to reduce the overall noise of the tone to 5 dBA less than the limits noted above.

4.0 Exemptions

Necessary activities of reasonable, limited duration, related to the maintenance and construction of campus buildings, infrastructure and grounds are exempt from these noise criteria.

APPENDIX 6.1-1 LABORATORY DESIGN

Overview

Academic laboratory buildings are living laboratories that advertise, enable, excite and inform everyone within range. They include both research and teaching labs. Academic research labs can be very similar to those of the private and government sectors while teaching labs are unique to the academic sector.

A. Types of Spaces

An academic laboratory incorporates a number of space types to meet the needs of the students, teachers, faculty, staff, and visitors. These may include:

Laboratory: Dry

The Dry Laboratory space type is a laboratory space that is specific to work with dry stored materials, electronics, and/or large instruments with few piped services. The laboratories defined by this space type are analytical laboratories that may require accurate temperature and humidity control, dust control, and clean power.

Dry laboratory space types are designed to accommodate project-specific work patterns and scientific equipment. As such, they tend to include design features that provide reliable working conditions in a somewhat mobile environment. Typical features of dry laboratory space types include the list of applicable design objectives elements as outlined below. Below is a list and definitions of the design objectives.

Constant and Reliable Temperature and Humidity: As some equipment and experiments are temperature- and humidity-sensitive, constant conditions are required in Dry Laboratory spaces to ensure that equipment can perform properly and that experiments produce accurate results. Laboratories are usually supplied with variable volume terminal reheat system with pre-filters and after-filters for 90% efficiency. In general, laboratory spaces have positive pressure relative to other spaces with no return air from the laboratory to the other spaces.

Durable/Flexible/Mobile Casework: As working conditions will often change due to new projects and equipment, dry laboratories are usually fitted with mobile casework to allow for flexibility in the floor plan. This casework is generally a pre-manufactured laboratory metal casework system with cantilever support off of central service chase system. Counters are typically a plastic laminate with integral splash. The chase system has metal channel support with a horizontal distribution of wiring.

Reliable, Easy to Access, Systems: Due to the flexible nature of the Dry Laboratory, the distribution of critical wiring (power, voice data, and HVAC) should be clearly laid out, and easy to access and redirect. Thus, a system of exposed and reconfigurable infrastructure is the recommended system of distribution of critical services for this space type.

Fire and Life Safety: All Laboratory spaces typically will contain a hand-held chemical emergency fire extinguisher in an emergency equipment cabinet. There is generally one fire alarm pull station by each egress point and an audible and visible (strobe) alarm in each occupiable space (not including closets, storage rooms, or coat racks).

Laboratory: Wet

Wet Laboratory space types are defined as laboratories where chemicals, drugs, or other material or biological matter are tested and analyzed requiring water, direct ventilation, and specialized piped utilities. Wet Laboratory space types do not include biohazards in Levels BL-2, BL-3, and BL-4. The Wet Laboratory space types are typically located within a building specifically designed to house them.

Wet Laboratory space types are unique in that they must accommodate simultaneous and separate ventilation and utility connections at individual lab modules to ensure both the reliability and accuracy of results as well as occupant safety throughout the space. Typical features of wet laboratory space types include the list of applicable design objectives elements as outlined below.

Surfaces: Resilient surfaces are an integral part of the Wet Laboratory space type design. Use epoxy paint for lab walls and monolithic, seamless, chemical-resistant vinyl flooring with integral coved base and mylar finish. Cabinets should have either metal or high pressure plastic laminate exteriors or interiors. If the lab will utilize acids the countertops should be acid resistant.

Separate Laboratory Modules: A Wet Lab space is typically divided into separate laboratory modules that contain individually controlled connections to HVAC, utilities and safety devices. Modules are defined spatially by floor-to-ceiling structural slab with under-floor plenum divider.

Constant and Reliable HVAC: As some equipment and experiments are temperature- and humidity-sensitive, constant conditions are required in Wet Laboratory spaces to ensure that equipment can perform properly and that experiments produce accurate results. Laboratories are usually supplied with variable volume, terminal reheat system with pre-filters and after-filters for 90% efficiency. In general, laboratory spaces have positive pressure relative to other spaces with no return air from the laboratory to the other spaces.

Dust Control: Just as experiments and equipment may be sensitive to changes in temperature and humidity, so might they be to dust and other foreign particulates.

Gas/Utility Services: Utility connections in Wet Laboratory space types can include vacuum, pneumatic supply, natural gas, O₂ and CO₂, and distilled water. Other gases and liquids may be required on a case by case basis. The fittings and connections for each module are connected to the building distribution system for six nominal piping systems.

Fume Hoods: Design Wet Laboratory space types to accommodate one 6'-0" chemical fume hood for each laboratory module, and provide direct 100% exhaust. It is also typical of this space type to include an acid and corrosives vented storage cabinet located under the fume hood, as well storage for emergency equipment.

Laboratory Occupancy: Occupancy Group Classification for Wet Laboratory is B2, Sprinkler protected construction, as per IBC, with a GSA Acoustical Class C1 for enclosed spaces and Class C2 for open spaces.

Fire and Life Safety: All Laboratory spaces should contain a hand-held chemical emergency fire extinguisher in an emergency equipment cabinet. There is generally one fire alarm pull station by each egress point and an audible and visible (strobe) alarm in each occupiable space (not including closets, storage rooms, or coat racks). Also include toxic gas monitors in each lab module and a gas storage area with audio and visual (strobe) alarms both inside and outside the lab. Eyewash and deluge shower should be located at each module quad.

Conference / Classroom: For academic labs, the passive, front-facing lecture/ discussion room is becoming obsolete, yielding to the team-based interactive learning theatre where everyone can see the faces and hear the words of all in the room and those connected by the web. In state of the art examples there is no fixed furniture and the space can serve formal presentations, dynamic team based activities and support virtual interactions. Rooms like this are designed to allow small teams to work together in addition to dynamic full room discussions.

B. Teaching Laboratories

Today's teaching laboratory acts as a flexible framework, holding dynamic student work groups, research zones, and support equipment in unlimited arrangements. As such, new design strategies must be put in place to address the needs of academic laboratory facilities:

- Plan for the unexpected. Too many buildings are designed for current needs and technologies. Buildings must have extra power, data, cooling, and space over and above the minimum current requirements to serve the future.
- Special visualization and virtual reality labs are becoming common elements of new science buildings, with a dramatic impact on the way space will be used.
- Personal digital devices that merge all computing, communication, and locating technologies will soon be common. These devices will need to connect with networks embedded in buildings or furniture to create a seamless net of information access and sharing.
- Sustainable design is a basic responsibility and should serve as a research, teaching, and policy-changing tool. Buildings will more intentionally express the impact of day-lighting strategies, the use of local and recyclable materials, will show off and on-site wastewater and storm water systems strategies, and will be more thoughtfully and actively integrated into their sites.
- Building planners and owners must clearly understand where they are on the technology continuum and design to embrace the most current technology while creating a framework for the best technologies that will come.

Teaching laboratories differ from research labs in a number of ways. They require space for teaching equipment, such as a lectern and marker boards; they require storage space for student microscopes, book bags, and coats; and they have less instrumentation than in research labs. Also, teaching labs must support a wide range of dynamic activity from standard lectures to active team-based inquiry with all the tools and technology necessary to enable any teaching and learning task easily. Interaction of learners and teachers occupying the same room has become more intentional, flexible and transparent to eliminate barriers and energize immediate and seamless collaboration. Classrooms must provide a greater level of visual and

auditory contact between those sharing the room, and those beyond, to meet a higher standard of service to collaboration. Virtual reality and computer simulation technologies require more flexible space to serve these rapidly growing fields. Spaces must respond by becoming more flexible, changeable, and attuned to the senses.

Lighting and acoustic control must be more sophisticated and flexible in every room, to allow the varied technologies to perform at their best. Powerful image capture and audio technology is becoming more pervasive in rooms, including offices, where people share information. Acoustic control and the design of the HVAC systems must be more sophisticated and flexible in every room, to allow the varied technologies to perform at their best. The sound level in laboratories—including those with fume hoods—must be as low as the classrooms' to allow normal conversations and collaboration. Lighting systems are more energy efficient and typically include daylight sensors and occupancy sensors. In all spaces, the control of the lighting is more adjustable to serve the varied presentation technologies and changes in scientific events that occur in each space.

Some disciplines will require fixed casework, benches, and utilities, but many teaching labs have mobile casework (equipped with locks) installed in a way that allows for different teaching environments and for multiple classes to be taught in the same space. Some teaching labs even use casework that a student can easily change in height to accommodate sit-down (30 in.) or stand-up (36 in.) work. The flexibility of the furniture encourages a variety of teaching and learning scenarios. In fact, properties of traditional, fixed lab furniture (stability and vibration resistance) are merging with properties of rolling/adjustable computer furniture (infinite mobility, plug and play capability, changeability) to create a new type of furniture for most scientific pursuits. This new breed blends the need for computer connections to everything with the ability to change the individual and team work environment immediately, or move it to another space. The additional cost of flexible furniture is offset by the amount of space saved by eliminating the requirement for separate sit-down and stand-up workstations.

Depending on the discipline and number of students, shared bench space can range from 15 to 30 linear feet per teaching laboratory; is usually configured as perimeter wall bench or center island bench; and is used for benchtop instruments, exhibiting displays, or distributing glass materials. Ten to 20 linear feet of wall space per lab should be left available for storage cabinets, as well as for built-in and movable equipment such as refrigerators and incubators. A typical student workstation is 3 to 4 feet wide with a file cabinet and data and electrical hookups for computers. Fume hoods shared by two students should be at least 6 ft. wide. The distance between student workbenches and fume hoods should be minimized to lessen the possibility of chemical spills.

For undergraduate courses, write-up areas are usually provided inside the lab. (Write-up areas for graduate students are generally located outside the lab, in offices.) A teaching lab must accommodate more people (i.e., students) and stools than does a typical research lab. Prep rooms, which allow faculty to set up supplies before classes, may be located between two teaching labs. The number of students typically enrolled in a course usually determines the size of the teaching lab used for that course. A typical lab module of 10 ft. 6 in. x 30 ft. (320 net square feet [nsf]) may support four to six students. An organic chemistry lab for 24 students would be approximately 1,600 nsf. Usually there is very little, if any, overhead shelving in the center of a lab. Overhead storage is at the perimeter walls, and the center of the lab has only base cabinets so as to maintain better sight lines for teaching and learning.

As budgets tighten and continuing education and distance learning continue to grow in popularity evening and Saturday classes may become more common in many colleges and universities. Moreover, some teaching labs being designed today will also be used for research. Because of these reasons, mechanical systems should be designed to be able to run at full capacity 24 hours a day, seven days a week. Also, a flexible design is recommended to accommodate enrollment fluctuations. A separate discussion room shared by several teaching labs may be an alternative to accommodating lectures in the lab. Teaching labs may be located adjacent to research labs in order to share resources. For example, if adjacent, advanced organic and inorganic chemistry labs and introductory chemistry labs can share some equipment.

C. Integrating Teaching and Research Labs

As the need for flexibility has grown and as science instruction, even at the undergraduate level, focuses more and more on hands-on experience, the traditional distinction between teaching and research labs becomes less important. An increasing number of institutions are integrating these areas to enhance undergraduate curricula and to facilitate communication between faculty and students at all levels. The greatest variances between teaching and research labs are space allocation and equipment needs. To compensate for those differences, some new facilities are designed with greater flexibility to allow lab space to be more adaptable and productive. There are several reasons for creating "homogenous" lab facilities:

- Students at all levels are introduced to current techniques.
- Such facilities encourage interaction between faculty, graduate students, and undergraduates.
- A standard laboratory module with basic services accommodates change quickly and economically.
- Common and specialized equipment may be shared.
- Common facilities can share support spaces, such as instrument rooms, prep rooms, and specialty rooms.
- Greater utilization of space and equipment enhances project cost justification.
- Teaching labs can be used for faculty research during semester breaks.

D. Sustainable Laboratory Design

A typical laboratory currently uses five times as much energy and water per square foot as a typical office building. Research facilities are so energy demanding for a variety of reasons:

- They contain large numbers of containment and exhaust devices;
- They house a great deal of heat-generating equipment;
- Scientists require 24-hour access; and
- Irreplaceable experiments require fail-safe redundant backup systems and uninterrupted power supply (UPS) or emergency power.

In addition, research facilities have intensive ventilation requirements—including "once through" air—and must meet other health and safety codes, which add to energy use. Examining energy and water requirements from a holistic perspective, however, can identify significant opportunities for improving efficiencies while meeting or exceeding health and safety standards. Sustainable design of lab environments should also improve comfort and worker productivity.

The key aspects of sustainable laboratory design include:

- Increased energy and water conservation and efficiency
- Reduction or elimination of harmful substances and waste
- Improvements to the interior and exterior environments, leading to increased productivity
- Efficient use of materials and resources
- Recycling and increased use of products with recycled content

Appendix 6.2-1 Classroom Design Guidelines

The most current version of the MSU Classroom Design Guidelines is found on the web at:

<http://www.montana.edu/us/pdc/planning/files/MSUClassroomDesignGuidelines.pdf>

**RECOMMENDED MONTANA STATE UNIVERSITY
TARGET SPACE GUIDELINES
2006**

AREA	NATIONAL STANDARD (SQ. FT.)	MSU PRACTICAL OFFICE (SQ. FT.)
College Dean.....	300-375	200-250
Chairman / Director	190-230	170-190
Associate Dean or Equivalent Position.....	170-200	170-190
Department Head	170-200	170-190
Other Administrative Officers, Associate / Assistant Directors, Etc.	120	120
Executive Administration Professional and Reception Space.....	180	160
One Admin Professional - Chairman, Director, Department Head Office	150	120
Two Admin Professionals - Department Head Office	200	180
Three or more Admin Professionals in one area.....	80 each	75 each
Faculty Office, Single	110-120	110-120
Faculty Office, Double.....	170-200	150-170
Graduate Teaching Assistant (Cubical Space).....	60-75	36-40



Heritage Building and Sites Policy

Subject: Physical Plant
Policy: Heritage Buildings and Sites Policy
Revised: May 15, 2010
Origin Date: May 15, 2010
Review Date: Five (5) years from Revised Date above
Sponsor: University Facilities Planning Board (UFPB)

Introduction and Purpose:

All MSU facilities are owned by the State of Montana and MSU. The facilities operations departments; Facilities Planning, Design & Construction (FPDC) and Facilities Services (FS) are charged with operating, maintaining and preserving the value of MSU's physical facilities for the benefit of the State and MSU, which includes preservation and adaptive reuse of historically significant properties. MSU acknowledges that historically significant properties of the MSU campus are recognizable icons of the campus and living connections to the state's heritage. The historically significant properties contribute to the embodiment of the ideas, values and vision of those who shaped the University. They help define a sense of place and are essential to alumni development, student recruitment, and the University's public image. MSU is committed to sensible adaptive re-use and renovation in order to preserve heritage value and ensure their continued contribution to the campus aesthetics, founding principles and ongoing mission.

Definitions:

Historically Significant Properties refers to any district, building, structure, landscape, sites, or object designated as such by the University Facilities Planning Board to be of significant in the history, architecture, archaeology, or culture of the University.

Heritage Property refers to a designation bestowed on said property in accordance with State and/or Board of Regents (BOR) policy.

Registered Property refers to registration of said property on the National Register of Historic Places.

National Register refers to properties registered and/or designated by the Secretary of Interior or State Historic Preservation Office as worthy of preservation because of national, state or local significance.

Adaptive re-use refers to a rehabilitative process of returning a property (building, structure, landscape, or site) to a state of utility through repair or alteration, which makes possible an efficient contemporary (institutional) use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values.

Preservation refers not only to the preservation in place of a property or other cultural resources, but also to the preservation of information about that resource

Montana Antiquities Act (as amended) refers to the responsibilities of the State Historic Preservation Office (SHPO) and other state agencies regarding historic and prehistoric sites including buildings, structures and paleontological or archeological sites on state owned lands.

State Historic Preservation Office (SHPO) is the state office designated by the Governor to administer the State historic preservation program pursuant to state legislation.

Policy:

The MSU Heritage Plan expresses the University's commitment of stewardship regarding the preservation of historically significant properties and promotes the development of standards to adaptively re-use, preserve, and protect such properties and facilitate restoration and rehabilitation to serve the University mission. Prior to the removal, demolition, or substantial alteration of any historically significant property owned by Montana State University and MAES, the entity planning such removal, demolition, or substantial alteration shall comply with the provisions of this policy.

Montana State University shall comply with the provisions of the Montana Antiquities Act as amended (MCA 22-3-421 through 22-3-442) and the Board of Regents Heritage Properties policy (1003.5 and 1003.6).

MSU's Historically significant properties will be continuously preserved and maintained to present a positive appearance to alumni, visitors, students, and the public, and to protect the enduring value of the properties. Removal of or major alteration to any historically significant properties designated or determined to be of historic significance, designated as a Heritage Property or listed on the National Register must be recommended by the University Facilities Planning Board and approved by the University President and/or appropriate governing agency when applicable.

Procedures:

The University will document historic or potentially historic properties consistent with the Montana Antiquities Act and BOR policies in a professionally competent and responsible manner and in consultation with the SHPO prior to implementing significant modifications or alterations.

Nomination of potential historic, archaeological, cultural and architectural properties and resources owned or controlled by MSU for Federal designation (National Register of Historic Places) and/or State designation (Heritage Property), shall be recommended by the UFPB to the President of Montana State University for approval. Nominations of historically significant property shall comply with BOR policy 1003.5 and other applicable state and federal statutes. The President, in making the determination, may consult with the University Staff, Faculty, and other resources as needed.

The University will consider national and state recognized historic preservation principles and guidelines (i.e. Secretary of Interior's Standards for Preservation) when implementing adaptive re-use or reuse of historically significant properties, Heritage Properties, or Registered

Properties under ownership and control of the University in the planning and implementation of projects when possible and feasible.

The Facilities Planning Design and Construction is responsible for coordinating University activities and projects with the SHPO and the state Architecture & Engineering Division as necessary or appropriate, and will be supported in these efforts by Facilities Services staff and UFPB.

The University Facilities Planning Board is responsible for overseeing compliance with the above policy guidelines and all applicable regulations of the BOR and State.

Internal Control:

Facilities Planning Design and Construction in conjunction with the UFPB will be responsible for the identification and inventory of the University's historically significant properties.

UFPB shall make recommendations to the MSU President with respect to monitoring historically significant properties and resources for rehabilitation, adaptive re-use, conservation, restoration, maintenance, interpretation, energy and operational efficiency, sustainability, and related ADA (Americans with Disabilities Act) compliance.

UFBP shall act as the advising body for the appropriate administrator(s) on matters concerning University buildings listed on the State Register of Cultural Properties and the National Register of Historic Places.