



SOUTH DAKOTA  
STATE UNIVERSITY

# Facility Design and Construction Standards

South Dakota State University  
Facilities and Services: Planning, Design and Construction  
A Division of Finance  
Administration Bldg, RM 304  
Brookings, SD 57006

2012 Edition

## Introduction

In 2002 a vision was created for South Dakota State University through the Millennium Master Plan. In 2008 a review of that plan resulted in the 2025 Campus Master Plan. The update is built upon the 2002 framework to reflect new facilities that have been recently completed or are currently under construction and/or in the planning stages. These two planning documents set the guiding principles and recommendations for future development. Each new building and site improvement project should be consistent with the master plan, or carries the burden of showing how it improves upon the plans. This guide acts to further assist campus development and planning. These design and construction standards outline how new construction as well as renovated spaces should be created and maintained, considering neighboring structures, and how they should provide service to SDSU and the surrounding community.

The Universities vision will create an associated demand for new facilities, adaptation of existing facilities, and the on-going development of campus resources. These SDSU Design and Construction Standards form a Guideline and are intended to facilitate the growth and development in an intentional, yet dynamic manner.

## Purpose and Intent of Design and Construction Standards

This set of Design and Construction Standards is meant to be a tool to shape the future of SDSU. The intent of these Standards is to serve as a guide for designers and planners working at SDSU that will initiate creativity while respecting the boundaries of tradition and heritage. The defined land use districts, Academic Core, College Green, Jackrabbit Green, East Parkway, Agriculture and Life Sciences, Athletic and Housing should remain cohesive and unified districts. Overall, all SDSU facilities should demonstrate a common sense of place. Future buildings and renovations of existing buildings should reflect a commonality to campus users and visitors, and reflect a collegiate feel that is common for institutions of higher education. Specifically, entrances into campus must be well defined and also suggest a destination; a sense of “arrival”. Buildings and landscape need to flow from these entrances. Campus buildings will not be identical but will compliment and correspond to each other in size, shape, architectural elements and context, representing the collegiate feel. A campus’s identity is revealed from several perspectives: in its individual buildings, outside spaces, groups of buildings in districts or sections and as a sum of all the parts as a one place. New buildings, additions as well as built outdoor spaces, should be successful at all these levels, contributing to a sense of community and cohesive unity, but also demonstrate design excellence individually.

The Design Guidelines will be extended to all elements of the campus, built and natural, buildings and places. Reflecting the land grant ancestry, SDSU will be intentional about the design and execution of outdoor spaces as well.

## Major Principles

### Sustainability

After 2010 all new facilities at SDSU will be designed to achieve LEED silver certification. Alternatives should be developed that explore sustainable performance.

Extending the renewal cycles for building materials and reducing the consumption of energy and water have benefits for the natural environment, the quality of the campus built environment and the University’s finances. The intent is to develop buildings that require less maintenance and operational

investment over time while continuing to serve the needs of users and enhance the aesthetics of the campus.

These Design Guidelines support the achievement of fiscally sound and environmentally responsible development and the wise stewardship of all campus resources, including the development and management of campus green space. Examples of the type of activities are 1) Enhancing multimodal transportation opportunities for new physical development to encourage walking, bicycling, and future transit expansion. 2) Provide supportive information signage, maps. 3) When possible design facilities and building systems to save non-renewable resources through the use of substitutes, recycling, and better recovery and reuse. 4) Include consideration for maintainability over time through potential benefits from building life cycle cost analyses, alternative performance systems, and other strategies at time of design and construction. 5) Promote ongoing energy conservation practices, water conservation, and waste reduction.

SDSU buildings are designed for a 50-year life. Lifetime operating costs of these buildings most likely will exceed the original cost of construction. Therefore, sustainability needs to include designs that are durable and readily maintainable. This may translate into higher first time costs, as well as requiring proactive initial designs for repurposing space for future needs. Building design should maximize flexibility to satisfy the varied demands of the present and future. The guiding standard should be that the building envelope be designed for 50 years of service, with 15-20 year building interior life. A building should be able to accommodate some level of adaptation and reconfiguration without exorbitant expense or structural modification.

Buildings and spaces should be created with maintainability in mind. Creating and supporting facility and landscape designs that acknowledge the climate of South Dakota will result in the most success. Building entrances and walk ways should be considerate of safety, including snow and ice prevention and removal. Designs should be attractive and functional, both when first built and for the long term. The beauty of a design should be able to be sustained long into the future, in the context of long-term operations and maintenance.

### Quality

As the leader in higher education in South Dakota with regional and national recognition, the facilities at SDSU must reflect that prominence and prestige. A high standard of excellence must be set for campus planning and architecture, in appearance, life-safety and accessibility, construction durability and long-term flexibility, low energy and environmental impact, and technology and innovation.

Consistent excellence must be seen in all aspects of SDSU's physical presence. This includes the thoughtful integration of new buildings and spaces into the existing environment.

All new facilities and spaces should be designed to minimize accessibility challenges. SDSU must be a welcoming and open environment for all. In existing facilities where an accessible retrofit is not possible, SDSU will make individual programs accessible.

As a recognized research institution center, innovation should be instilled into building design and systems. When feasible, new technologies will be used.

Buildings and other facilities assets represent a significant investment to the University and the State of South Dakota. Each change or addition has a profound impact on the overall campus landscape for decades. Therefore, it is essential that construction be accomplished intentionally and with the highest standards of quality possible within the funds available. At times, square footage may need to be

adjusted in order to maintain the desired level of quality. Programmatic needs must be met. High standards of material selections, systems choices and design components will contribute a sense of permanence and excellence that impacts prospective students, faculty and staff.

From the very first impression at a SDSU gateway or boundary, the quality of SDSU should be seen in the entire campus environment, including consideration for safety. Campus elements in place to handle traffic, parking, landscaping, pedestrian access and lighting should convey a high standard. Inviting indoor and outdoor spaces will be coherent and provide opportunities for socializing and informal learning.

### Stewardship

It is the intent of these Guidelines to encourage responsible stewardship of all existing University buildings. Each renovation project, therefore, should include an investigation of all aspects, systems and features impacted by the specific intervention. Conditions discovered during project evaluation, design or construction that are in need of improvement cannot be ignored. Even in cases where budgetary or schedule constraints necessitate only a partial remediation, any building deficiencies brought to light are to be examined and documented so that they may be addressed at a future time. Additionally renovation projects must be estimated and funded to include remediation of critical code violations.

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.

Standardize building materials and systems wherever possible to promote and take advantage of uniformity with regard to material/system technical knowledge, replacement cycles, replacement techniques, tools required, materials required, materials availability, etc.

Include consideration for the available level of grounds maintenance and snow removal for all exterior features.

In order to maximize the plant assets, campus buildings must effectively meet the programmatic needs of users.

Exemplary planning, design and development is an obligation for SDSU in response to the resources provided. SDSU, one of the South Dakota Board of Regents institutions, is accountable to students, faculty, and staff as well as to the people of South Dakota, to make good decisions about campus facilities. Deliberate consideration must be given to design campus buildings and spaces considering life cycle costs, not only the first initial costs. Careful analysis and decision-making are required to insure that the University receives the greatest possible value for the funds expended.

## **Building Design Guidelines**

### Building Shape

The form of the building can greatly impact the texture of its area of campus. A consistent form used throughout a specified area provides a cohesive, identifiable appearance to that area. The roofline, proportion and visual mass of the building affect the overall form. By using similar building forms, a high degree of unity between buildings on the campus can emerge, even among buildings of differing architectural style.

## Building Size

Buildings should be in scale with the surrounding structures, and the streets and public ways that are adjacent to them. Proportion, massing and scale of all new construction shall respond sympathetically to nearby buildings and general campus character. To maintain human scale in public buildings, make them minimal, not more than 3 to 4 stories high.

## Façade Proportion (or Scale and Proportion)

The scale and proportion of a building impacts the “sense of place” within the campus. New buildings and additions should acknowledge surrounding context, but recognize and establish human scale. The design of the building should take into consideration how the design affects a person standing at the face of the structure, similarly the building’s materials can all influence how the building scale is read.

## Shape, Color and Texture (or Materials)

The materials from which structures or landscape elements are constructed can have a significant effect on the image the campus projects. Defining a palette of appropriate building materials, including their colors, can allow a designer freedom of expression, yet establish a unity among campus buildings. Alterations and additions to existing buildings must borrow from the original in color, texture and form. They shall be designed to be sensitive to the setting and remain in balance with the original architecture.

## Massing and Building Sites

Locations for new buildings, additions and open spaces should be compliant with SDSU master planning. Proximity to university infrastructure and utility systems should be considered.

Care should be taken to site the building in a way that creates a positive connection between the building, walkways and outdoor spaces. For easy foot traffic navigation, all building entrances need to be placed relative to walking access, regardless of “street” entrance access. All entrances should appear to be main entrances, welcoming and orientating the visitor. There should be no “back door” access. Accessibility factors should be considered.

The building should acknowledge the setback or alignment of adjacent buildings. Adjacent buildings should also be studied in regard to their entry locations, potential for shared plaza and/or entry arrangements, and for the development or enhancement of outdoor spaces and spaces between buildings. The location of building service entrances also deserves special consideration. The view from and to existing campus landmarks should also be analyzed and incorporated when siting a new building.

Where applicable, buildings should be designed to contribute to the buildings, streets, and pedestrian ways on each side. Building entrances are frequently meeting and gathering places and should be designed to encourage interaction. Gathering spaces should be designed inside the building, particularly at the entrance as well as outdoor gathering locations with inviting furnishings. The activities of the University should be visible to those passing by. Windows should be placed to light and provide views to internal spaces, but also to give walks and streets the security and interest that comes from the visibility of adjacent activity.

Each project should take responsibility for improving adjacent streets and pedestrian ways, by including funds in its budget to bring these up to campus standards. Every project should provide secure bicycle parking areas.

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.

Landscape design should receive the same level of attention and budget stability accorded to buildings and infrastructure. While a limited, consistent plant palette can provide unity in the landscape, thoughtful incorporation of a diversity of plant species can add interest and appeal to the landscape.

### **Outdoor Environment Design Guidelines**

SDSU buildings represent an individuality based on the design and year of construction. The landscape and public spaces are the elements that can integrate these individual pieces into a coherent whole. While the physical character and quality of a campus is defined by both its buildings and its open space, it is the open space which has the greatest potential for unifying and equalizing the shared space of the campus. It can promote the sense of community derived from actively shared space, and provide for the enriching experiences of both planned and chance encounter. Comprised of streets, walkways, greens, courtyards, plazas, and landscaped areas, open space has the potential to knit together the diverse elements of the campus in a unified way. Transitions to and from the campus should be enhanced through appropriate lighting levels, simple and functional signage, appropriately scaled plant material, and elimination of clutter. Recognize outdoor area uses by differing activity levels such as: major walks, quieter areas for reflection and study, centers of social gathering and larger event locations. Larger open green spaces should be created for a variety of recreational and social uses. Ideally, shaded edges would be provided for outdoor studying or viewing activities.

#### Service Areas

Areas devoted exclusively to building loading and services, to the removal of trash, or to mechanical equipment should be designed so that their visibility from public areas, including walkways, is minimized. Rooftop mechanical equipment should be enclosed in climate controlled structures that are integrated into the building design. Acoustic mitigation should be required to ensure the quality of the pedestrian environment.

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 setbacks from snow removal routes are required.

#### Plantings

Large-scale landscape designs including mass plantings and clear durable functional identification signage should be utilized. Campus edge landscaping, signage, site accessories, and material selections to create a break between adjacent uses while maintaining a sense of continuity, softening views of perimeter parking lots, and improving safety for all modes of movement along the campus interconnections with the community should be provided.

Plantings should provide continuity on campus. Special attention should be given to all building entries with plant materials selected for scale, texture, seasonal color and overall visual impact. Select building entries that face major thoroughfares should include plaza or patio areas with seating, planting beds, lights and benches providing opportunities for small, informal gatherings. Pedestrian pathways should be bordered with turf rather than planted material, for maintenance, snow removal purposes and safety. Views to campus landmarks should be preserved wherever possible. Trees and shrubs should be

used to buffer parking lots, building service areas, open storage areas and high volume streets. Use native landscape materials to the greatest extent feasible, including drought-tolerant plantings where appropriate, and the preservation of flora and fauna habitats.

Plant flower beds together in quantity at points of campus entry and places of greatest people density. Use more drought-resistant plantings, naturally grouped, in areas where close inspection is not likely. Place plant materials in massed groupings without using several competing species. Arrange trees and other plantings to enhance building architecture and details, especially entrances, which should be fully revealed. Limit small scale plantings, such as flower beds, to principal building entrances.

### Pavement

Maintain walkway widths appropriate for the anticipated volume of pedestrian traffic, but no less than seven feet for efficient snow removal. Consider other uses, such as wheelchairs, bicycles, and service vehicles. Provide generous corner radii or small plazas (nodes) where walkways intersect.

Create stopping places along walkways to observe and appreciate views, landscape, or activities along the way, incorporating seating where possible. Provide pull-off bays on joint use walks for service vehicles where needed.

Major pedestrian paths within the pedestrian precinct will be required to accommodate emergency vehicles and 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.

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. Lightly trafficked campus roads should include all of the other roads on campus. On these roads, there should be frequent vehicle stops to reduce traffic speeds and to facilitate pedestrian crossings. The design of these roads and the frequency of stops should make it very clear to drivers that pedestrians have the higher priority than vehicles. Heavily used campus roads should be at the next level. While vehicles will take precedence on the roads themselves, the roads should be glanced by broad sidewalks and crosswalks should be spaced close enough for convenient pedestrian crossing. Design speeds should be lower than on perimeter roads and special purpose turning lanes should be eliminated. Perimeter roads should be at the highest level of the hierarchy and should have the highest vehicular priority: pedestrian crossings will be permitted only at street intersections.

Circulation patterns on campus should be clearly defined and recognizable with minimal conflicts for public vehicle, service vehicle, bicycle and pedestrian users.

### Parking

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 should be available within parking lots to minimize damage to surrounding landscaping. Methods to provide routine annual surface maintenance and regular cleaning should be in place.

Provide visual relief from a wall of bumpers, license plates and headlights, and contribute to a planned campus fabric (which includes access, landscaping, lighting, etc.) as a responsibility of each individual parking or building project. Use green space consisting of grass and trees to soften impacts. Project size could influence the required setback distance.

### Lighting

Use campus standardized lighting fixtures for pedestrian areas and for streets and parking lots. Provide special lighting for building fronts, walls, trees, public art, and special landscaped areas to create emphasis on focal points of interest of the night-time campus.

### Signage

Provide consistent directional signage at campus entrances, parking garages, major buildings, key intersections, and nodes using campus standard signage details. Include maps, event locations, disabled routing, and bicycle routes. Clear standardization of information using minimal number of signs should be the goal. Provide uniform regulatory, identification, directional, and informational signing according to existing campus standards.

### Site Furnishings

Provide campus standardized site furniture, convenient trash and recycling containers, and other site accessories in pedestrian-friendly locations. Provide places for casual seating and benches with backs for longer term use.

### Topography

Avoid unsustainable slopes, minimize retaining walls, and utilize gradual sloping earthen berms only when necessary. Take advantage of existing campus irrigations systems and accompanying raw water consumption standards. Utilize the best water quality principles throughout. Slope sites to drain away from buildings, sidewalks, and plazas. Use landscaping to effectively control soil erosion. Design to control water runoff and storm drainage through retention/detention methods.

### Safety

Designs should provide well lighted public spaces and provide emergency notification devices. To promote safety, designs should encourage intended uses, and minimize unintended uses.

### Transportation

Vehicular areas address roadways and parking for cars, emergency vehicles, service vehicles, bicycles, and future public transit opportunities. Enhance existing streets throughout campus for safer multi-modal movement and improved appearance utilizing surfacing, lighting, signage, bicycle parking, and site accessories.

Place generously-sized bicycle parking areas along multi-modal streets and near campus activity centers and student residence halls and courts. Establish drop-off zones near major activity centers for convenient use. wide landscaping in and around parking lots to soften hardscape appearances from streets, break up extended rows of cars, and provide shade. Ensure adequate lighting for safe use and clear pathways from parking lots to adjacent building entrances. Design sufficient setbacks between parking lots and streets, which could include raised landscaping, berms, and/or walls to block views into the lot. Include loading and service vehicle parking spaces adjacent to major buildings. This design

strategy may not work for specific residential life parking facilities. Screen or buffer views to service areas where possible with a combination of screen walls, opaque enclosures, gates, and landscaping. Limit service parking to designated spaces only. Provide raised curbs selectively along campus walkways to discourage all modes of transportation from crossing or parking on lawns or adjacent landscaping.

A network of bicycle paths should be provided 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. Bicycle parking should be on a hard surface, adjacent to buildings and bicycle access routes. 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 areas themselves. Bicycle storage shelters should be considered on the periphery of the pedestrian precinct, and undercover bicycle racks should be located near building entrances.

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.

Connect all portions of our expanding campus by a hierarchy of pedestrian friendly walks and pathways.

### **Summary Statement**

Through a deliberate planning process the intention is to make SDSU a campus that is functional, attractive, and capable of invoking memories.. The campus environment must be flexible and able to create context spaces for learning, research, experimentation and public service. The physical setting of a campus plays an integral role in attracting and retaining the best students, faculty and staff available. It is a place that brings diverse people and ideas together creating potential for intellectual and social exchange. A campus of distinction such as SDSU is a place that facilitates learning and collaboration opportunities, and creates a sense of pride for its community of users. The campus also serves as a meeting place for people in South Dakota for various events, including but not limited to, athletics, music, arts, exhibits and various other attractions. If campus planning is successful, the resulting environment will reflect SDSU's mission that includes commitment to enduring excellence and a respected heritage. Successful campus planning will also affirm the leadership position that the University has in the Brookings community, the state of South Dakota and beyond.

Dean Kattelmann, PE

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South Dakota State University

# Section 00 INTRODUCTION

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# Sec 00 INTRODUCTION

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## 00.01 FACILITY DESIGN AND CONSTRUCTION STANDARDS

### A. ORIGIN AND PURPOSE

1. These Facilities Design and Construction Standards (FDCS) have been prepared by experienced Facilities and Services personnel who are responsible for the planning, construction and maintenance of facilities at South Dakota State University.
2. The standards in the FDCS are required to be incorporated (not copied) into the Project by the Design Professional and Professional Consultants to provide the Owner with quality systems, structures and landscapes that meet Facility Program Plan requirements and require minimal maintenance and operating expense.
3. The processes and standards in the FDCS apply to renovations, additions and new construction located at the following institutions governed by the Board of Regents, State of South Dakota.
  - a. South Dakota State University, Brookings, SD
  - b. South Dakota State University state wide facilities.
4. A thorough understanding of the content of the FDCS is required for Design Professionals involved in the selection process.

### B. ELECTRONIC FORMAT AND UPDATING

1. The FDCS is a set of linked PDF documents published and periodically updated on the SDSU Facilities & Services web site at <http://www.sdstate.edu/facserv/about/divisions/fac-engineering/index.cfm>.
2. For reading parts of the FDCS in printed form, ensure that relevant linked documents are also printed.
3. For a project in process, updates to the FDCS are effective immediately unless otherwise approved in writing by the Owner's Representative. Facilities & Services will ensure the A/E is fully aware of pending updates. Updates are anticipated to occur annually.

### C. FACILITIES DESIGN AND CONSTRUCTION MANUAL

1. The FDCS includes ten Sections and twenty four Divisions.
  - a. Sections 00-04 contain core information and Sections 05-09 describe phases of the Capital Improvement Process.
    - 1) Sec 00 Introduction (this section)
    - 2) Sec 01 Working Relationships
    - 3) Sec 02 Codes and Regulations
    - 4) Sec 03 Space and Site Design
    - 5) Sec 04 BOR Requirements
    - 6) Sec 05 Pre-Planning and Building Programming
    - 7) Sec 06 Schematic Design Phase
    - 8) Sec 07 Design Development Phase
    - 9) Sec 08 Construction Document Phase
    - 10) Sec 09 Bidding and Construction Phases
  - b. Divisions 01-14, 21-23, 26-28, and 31-33 contain design and construction standards.
    - 1) Div 01 General Requirements
    - 2) Div 02 Existing Conditions
    - 3) Div 03 Concrete
    - 4) Div 04 Masonry
    - 5) Div 05 Metals
    - 6) Div 06 Wood, Plastics And Composites
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- 1) [Cadd Standards](#)
  - 2) Campus Lighting Standard
  - 3) [Contractor Clean Standards](#)
  - 4) [General Class Room Standard](#)
  - 5) [Room Numbering Policy](#)
  - 6) [Service for New Floor Installations](#)
  - 7) Welding Inspection
  - 8) [Standard Pipe Schedule](#)
  - 9) [Grounds Management Plan](#)
  - 10) [SDSU Public Art Committee](#)
  - 11) [2025 Campus Master Plan](#)
  - 12) [Jack Rabbit Green Master Plan](#)
  - 13) [Signage and Wayfinding Program](#)
  - 14) [Residential Life Dining Services Master Plan](#)
  - 15) [2025 Athletics Plan for Master Facilities](#)
  - 16) [SDSU Parking Study](#)
  - 17) [Brookings Area Master Transportation Study](#)
  - 18) [McCrary Gardens Master Plan 2011](#)
  - 19) [SDSU Millennium Master Plan](#)

## **00.02 AGREEMENT BETWEEN OWNER AND DESIGN PROFESSIONAL**

### **A. SAMPLE A/E AGREEMENTS**

1. As used in the FDCS, "Sample A/E Agreement" refers to the form of Agreement Between Owner and Design Professional which has not been edited for a specific project.
  - a. Agreement Between Owner and Design Professional – [Non Delegated](#)
  - b. Agreement Between Owner and Design Professional – Delegated
  - c. Agreement Between Owner and Design Professional – Consultant Services
  - d. Agreement Between Owner and Design Professional – Letter of Agreement

- e. The requirements of the Capital Improvement Process, BOR Policy 6.4, discussed in FDCS Sections 04 – 09 are based on the Non Delegated version of the Sample A/E Agreement.

## **B. EXECUTED AGREEMENT**

1. As used in the FDCS, "executed Agreement" is the actual signed Agreement for the Project.
2. Consult the executed Agreement instead the Sample A/E Agreement whenever the Project is active.

## **00.03 BIDDING AND CONTRACTING REQUIREMENTS**

### **A. SAMPLE DOCUMENT**

1. As used in the FDCS, "[Sample Division 00 Document](#)" refers to the form of Division 00 Bidding and Contracting Requirements which has not been edited for a specific project.
2. The sample Division 00 Document contains the following sections provided by the Owner (abbreviations used for reference in the FDCS are shown in parentheses).
  - a. Index
  - b. Invitation to Bid
  - c. Bidders Check List
  - d. Asbestos containing Materials Statement
  - e. Instructions to Bidders (IB)
    - 1) Exhibit A; Bid Form and/or Explanation of Alternates
    - 2) Exhibit A-1; Facsimile Modification to Bid Form
    - 3) Exhibit B; Format for Sealed Envelope
    - 4) Exhibit C; Bid Bond
    - 5) Exhibit D; Performance and Payment Bond with Acknowledgement of Surety
    - 6) Exhibit E; Non Resident Bidder Affidavit
    - 7) Exhibit F; Contractors Statement of Skills and Capabilities
    - 8) Exhibit G; Resident Subcontractor Certification
  - f. Agreement for Construction
  - g. General Conditions of the Contract (GC)
    - 1) This section is common to all institutions governed by the Board of Regents, State of South Dakota.
  - h. Supplementary Conditions (SC)**
    - 1) This section adds to the General Conditions to meet administrative requirements of South Dakota State University.**
  - i. Special Conditions (SPC)
    - 1) This section edits the General Conditions and Supplementary Conditions to meet special project requirements.

### **B. EXECUTED CONTRACT**

1. As used in the FDCS, "executed Contract" is the actual signed Division 00 Document for the Project.
2. Consult the executed Contract instead of the sample Division 00 Document whenever the Project is active.

END OF SECTION 00 INTRODUCTION

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## Section 01 WORKING RELATIONSHIPS

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### 01.01 GENERAL

#### A. REFERENCE ABBREVIATIONS

1. BOR, South Dakota Board of Regents
2. OSE, Office of State Engineer
3. O-DP, Agreement Between Owner and Design Professional or executed Agreement
4. SDSU, South Dakota State University

### 01.02 PROJECT DESIGN TEAM

#### A. OWNER

1. The owner is the State of South Dakota acting through the legally appointed commissioner for the Bureau of Administration and his representative, the Office of the State Engineer and their delegate, South Dakota State University.
2. For all operational procedures the A/E is directed to work with South Dakota State University (SDSU) Facilities and Services or the entity designated in the executed Agreement.

#### B. OWNER'S REPRESENTATIVE

1. The Owner's Representative for Non-Delegated projects is the OSE.
  - a. Non-Delegated projects will be assigned an OSE representative and a SDSU Project Manager to handle the daily responsibilities required by the Project.
2. The Owner's Representative for Delegated projects is the SDSU Assistant Vice President for Facilities and Services.
  - a. Delegated projects are not assigned an OSE representative. SDSU Assistant Vice President for Facilities and Services will select a Project Manager to handle the daily responsibilities required by the Project.
3. Direct all communication to the Owner through the designated OSE representative or the SDSU Project manager.

#### C. DESIGN PROFESSIONAL

1. The Design Professional is an entity engaged by the Owner to provide professional design services for the Project.
2. The executed Agreement establishes the basic terms and conditions which exist between the Owner and the Design Professional.
3. The Design Professional is responsible for the entire project and for full coordination of services required under the executed Agreement, whether the work is performed by the Design Professional or by one or more Professional Consultants contracted by the Design Professional.

#### D. DESIGN PROFESSIONAL'S REPRESENTATIVE

1. The Design Professional's Representative is a principal or an authorized representative of the Design Professional's firm who is professionally licensed in the state of South Dakota.
2. Any change of the Design Professional's Representative during the life of the executed Agreement must be approved in writing by the Owner's Representative before the change takes place.

#### E. PROFESSIONAL CONSULTANT

1. A Professional Consultant is an Owner-approved entity contracted by the Design Professional to provide specified services for the Project.
2. Professional Consultants may be named in the executed Agreement or added subsequently by written approval of the Owner's Representative.
3. Any change of Professional Consultant must be approved in writing by the Owner's Representative

before the change takes place.

4. Require Professional Consultants to be active on the Project through all phases as appropriate, and to attend meetings when their work will be discussed.
5. Require the Professional Consultant to seal the portion(s) of the Contract Documents attributed to the work of the Professional Consultant, whether this work was done by the Design Professional's staff or by the Professional Consultant.

#### **F. PROFESSIONAL CONSULTANT'S REPRESENTATIVE**

1. The Professional Consultant's Representative is a principal or an authorized representative of the Professional Consultant's firm who is designated by the Professional Consultant to represent the firm at all applicable meetings with the Owner's Representative.
2. Any change of the Professional Consultant's Representative during the life of the executed Agreement must be approved in writing by the Owner's Representative before the change takes place.

#### **G. PLANNING COMMITTEE**

1. A Planning Committee is composed of representatives of the college, user departments, SDSU Foundation, Facilities and Services and other representatives as appropriate.
2. The Planning Committee provides information and feedback to the Owner's Representative and the Design Professional to establish the goals and requirements of the Project.
3. Expect to meet with the Planning Committee approximately every 2 weeks during the design phases of the Project to confirm the Project is complying with Owner requirements.
4. By virtue of funding sources for a project (Grants, Donors, Fees, etc.) colleges and departments participating in the planning committee may have an ownership or client roll in project.

### **01.03 GENERAL DESIGN PROFESSIONAL RESPONSIBILITIES – ADMINISTRATIVE**

#### **A. GENERAL**

1. For responsibilities of the Design Professional, consult the [Sample A/E Agreement](#) between Owner and Design Professional.
2. For phase-specific responsibilities, see FDCS Sections 05-09.

#### **B. FACILITIES DESIGN AND CONSTRUCTION STANDARDS**

1. Incorporate the standards in this Facilities Design and Construction Standards into the Project.
2. Deviation from these standards requires a written justification from the Design Professional and written approval from the Owner's Representative before completion of Design Development Documents.

#### **C. INTERNET BASED PROJECT COMMUNICATIONS**

1. Projects with estimated construction costs of fifty thousand or more are required to use an internet based document management system that will provide real time tracking and document transfer for the following functions for all design and construction phases of the project.
  - a. Viewing correspondence and information published by other project team members.
  - b. Publishing correspondence and information for viewing by other project team members.
  - c. Logging and/or responding to items such as Requests for Information and Project Submittals.
  - d. Project Schedules
  - e. Bid Documents including plans, specifications, and Addenda
  - f. Closeout documents
  - g. Warranty activity
2. An archive of the project information shall be provided to Owner's Representative at the end of the warranty period.
3. Projects with an estimated construction cost less than fifty thousand will use a project folder structure set up by SDSU on an SDSU internal ftp: site.

#### **D. DESIGN PROFESSIONAL'S SCHEDULE**

1. Develop with the Owner's Representative a detailed written time schedule of Design Professional services and maintain the mutually agreed schedule through all phases of the Project (O-DP I.C).
2. Any change of the mutually agreed Schedule of Design Professional Services must be approved in writing by the Owner's Representative before the change takes place (O-DP I.C).

#### **E. PROJECT CORRESPONDENCE AND DOCUMENTS**

1. Identify all Project correspondence and documents with the Owner's Official Project Title, OSE Project Number defined in the executed Agreement, and the SDSU Project Number.
2. When identifying South Dakota State University in documents (title blocks and cover sheets for drawings, reports, etc) use official SDSU Nameplates available for downloading at <http://www.sdstate.edu/facserv/about/divisions/fac-engineering/index.cfm>
3. Publish all Project correspondence and documents in Adobe Portable Document Format (PDF) to the project web site.
  - a. Use standard fonts that will view and print accurately when converted to Adobe PDF.
  - b. Refer to [SDSU Cadd Standards](#) for requirements of Cadd based deliverables.

#### **F. MONTHLY PROGRESS REPORTS**

1. Summarize the current status of the Project using the Design Professional Monthly Progress Report located in Supplemental Design Documents/ [Design Professional Monthly Progress Report](#)
  - a. Update the report before submitting the "Design Professional's Invoice for Compensation...".

#### **G. A/E INVOICES**

1. Submit statements for compensation earned under the terms of the executed Agreement using the appropriate Owner's "A/E Voucher Form" available at <http://www.state.sd.us/boa/ose/>
2. Invoices must include the following minimum information
  - a. Amount of Contract
  - b. Work completed
  - c. Previously invoiced work
  - d. Amount Due
3. Combine the invoice form and supporting documentation into a single file, scan and email, fax or mail to the Owners Representative for processing.

#### **H. MEETING MINUTES**

1. Attend meetings with the Owner's Representative, Owner's personnel, Contractor and other team members as may be necessary for the timely performance of all services (O-DP II.B.2).
2. Take notes of all meetings and document phone conversation between the Design Professional and the Owner's personnel for all phases of services covered in the executed Agreement (O-DP II.B.3)
3. Compose written minutes of meetings and document phone conversations and publish them in Adobe PDF to the Owner's project website no later than the third working day following the meeting or telephone conversation.

#### **I. PARKING/PERMIT**

1. Parking ID's are free only if you have a current contract with SDSU. This free service is a privilege not a right; therefore you must follow the rules and regulations on the back of the parking ID. When obtaining a parking ID, you will need your vehicle's identification information (make, model, license number) and company information. The parking ID should be registered to the primary vehicle in which it will be used but is transferable to other vehicles as needed.
2. Parking ID's MUST be coordinated through the Facilities and Services Project manager and will be made available from the Facilities and Services Front Desk, Administration Building room 304.

3. Contractors:
  - a. All company cars and pickups, as well as personal vehicles parking on campus will need to have a parking ID unless parked within construction boundaries.
  - b. Parking should be kept within the limits of the construction boundaries.
  - c. If parking is not available or sufficient within the construction boundaries then:
    - 1) Facilities and Services will direct you where to park as determined by job site location (commuter lots) or you may be asked to park in remote parking and shuttle your employees to the site.
  - d. Under no circumstances should you park in a reserved lot, visitor spaces, residence hall lots or motor cycle spaces for any amount of time.
  - e. The fine for parking in a reserved lot is \$50.00 and this fine will NOT be voided.
  - f. Vehicles parked in handicapped stalls without a state handicapped permit are subject to a \$200.00 fine.
4. Consultants:
  - a. Your valid parking ID will allow you to park in visitor parking, commuter, all class or remote lots. Visitor parking is located in lots 18 (Administration) and 22 (Student Union) and marked as such.
  - b. Under no circumstances should you park in a reserved lot, residence hall lots, or motor cycle spaces for any amount of time.
  - c. The fine for parking in a reserved Lot is \$50.00 and this fine will NOT be voided.
  - d. Vehicles parked in handicapped stalls without a state permit are subject to a \$200.00 fine.
5. If you are not currently under contract and need to meet with Facilities and Services, SDSU has both pay-per-hour visitor and free visitor parking available as shown in green on the linked map <http://sdstate.edu/parking/campus/images/CampusParkingMap2011.jpg>

## **01.04 GENERAL DESIGN PROFESSIONAL RESPONSIBILITIES – DESIGN PHASES**

### **A. GENERAL**

1. For responsibilities of the Design Professional, including those described under 01.03, consult the [Sample A/E Agreement for Non-Delegated](#) projects or, if the Project is active, the executed Agreement.
2. Engage all members of the design team in an integrated design process that addresses the programmatic, environmental, sustainable and energy conservation issues applicable to the Project.
3. For phase-specific responsibilities, see FDCS Sections 05 to 09.

### **B. CODES AND REGULATIONS**

1. Create Construction Documents that comply with state and federal laws and regulations applicable to the Project (O-DP II.D.3).
  - a. See FDCS Sec 02 Codes and Regulations.

### **C. EXISTING CONDITIONS AND CODES RESEARCH**

1. Analyze and document the location and capacities of existing site utilities and building systems and the resulting impact on the Project.
2. Review existing building and campus planning documents and document the impact on the Project.
3. Research codes and regulations applicable to the project and resolve any conflicting code interpretations with authorities having jurisdiction over the Project (O-DP II.D.3).
4. On behalf of the Owner, provide required documents for code reviews and obtain required approvals from authorities having jurisdiction over the project (O-DP II.D.4).

### **B. BUDGET**

1. Design the Project so that actual construction costs do not exceed the fixed limit of construction costs as defined in the executed Agreement (O-DP V.B).
2. Promptly notify the Owner's Representative in writing when the budgeted construction cost might be

exceeded.

### **C. SDSU PUBLIC ART COMMITTEE**

1. SDSU created the Public Art Sub-committee in 2012, which is charged with determining the acquisition, exhibition, storage, and conservation of works in the SDSU Public Art Collection.
2. The Campus Planning and Design committee created a Collections Management Policy to guide the Public Art Sub-committee's decisions regarding these works of art for the university community and public. The collection exists to enhance the educational mission of the university.
3. Link to SDSU Public Art Committee's [Collection Management Policy](#)

## **01.05 GENERAL OWNER RESPONSIBILITIES – ADMINISTRATIVE**

### **A. GENERAL**

1. For responsibilities of the Owner, including those described under 01.04, consult the following documents.
  - a. [Sample A/E Agreement for Non-Delegated](#) projects or, if the Project is active, the executed Agreement.
  - b. [Sample Division 00 Document](#) or, if the Project is active, the executed Contract.
2. For phase specific responsibilities, see FDCS Sections 05-09.

### **B. DESIGN AGREEMENT ADMINISTRATION**

1. The Owner will exercise the Owner's rights and administer the requirements defined in the executed Agreement as governed by the laws of the State of South Dakota (O-DP IV.A).
2. The Owner will furnish required information as expeditiously as necessary for the orderly progress of the Work (O-DP IV.B, IV.C).
3. The Owner will administer the process for payment to the Design Professional as described in the executed Agreement (O-DP XI).
4. The Owner will attend all meetings with the Design Professional and other institutional personnel.
5. The Owner will assist the Design Professional to develop the detailed written time schedule of Design Professional services and approve any modifications to the schedule (O-DP I.C).

### **C. CONSTRUCTION CONTRACT ADMINISTRATION**

1. See paragraphs under 09.03D in FDCS Sec 09 Bidding and Construction Phases.

## **01.06 PROJECT DOCUMENT OWNERSHIP**

### **D. A. GENERAL**

1. All hard copy documents, electronic files, finish sample boards and other deliverables required by the executed Agreement as instruments of service are the property of the Owner to reuse at the Owner's sole risk and without liability or legal exposure to the Design Professional (O-DP II.F.18, VI.A).
2. The Owner will allow the Design Professional to retain, without copyright, hard copies, reproducible hard copies and electronic files of Drawings, Specifications and other Project-related documents.

END OF SECTION 01 WORKING RELATIONSHIPS

# Section 02 CODES AND REGULATIONS

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## Section 02 CODES AND REGULATIONS

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### 02.01 GENERAL

#### A. GENERAL DESIGN PROFESSIONAL RESPONSIBILITIES – DESIGN PHASES

1. Design to comply with, but not be limited to, the codes, rules and standards referenced in this Section 02 applicable to the Project.
2. For projects with federal funding, comply with federal regulations applicable to the Project.
3. If required, secure written code approval of Construction Documents from appropriate authorities before bidding.
  - a. Submit approval letters in hard copy to the Owner's Representative.

#### B. BUILDING PERMIT

1. Specify the Contractor to obtain a building permit if needed.
  - a. A building permit is not required for construction on University property.
  - b. "University property" includes
    - 1) South Dakota State University, Brookings
    - 2) South Dakota State University research facilities, statewide
  - c. Construction in off-campus buildings (usually leased) may require a building permit and compliance with local building codes.
  - d. New construction in a flood plain may require a building permit or special clearance.

### 02.02 STATE BUILDING CODES

#### A. REQUIREMENTS

1. Develop the design and the Construction Documents in accord with applicable State laws and codes. Architectural, structural, general, mechanical, plumbing, and the electrical design shall conform to the following standards that are current as of the date of authorization to proceed with the design development documents. (O-DP II.B).
  - a. The latest edition of the International Code Council's International Building Code, International Fire Code, and International Mechanical Code and the associated appendix chapters for each code. (SDCL 34-29b-2)
  - b. The latest edition of The American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRE) standards for:
    - 1) Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings (90.1)
    - 2) Ventilation for Acceptable Indoor Air Quality (62.1)
  - c. The South Dakota State Plumbing Commission's rules and regulations governing the installation of plumbing, (SDCL 36-25)
  - d. The State Electrical Commission's rules and regulations governing the installation of electrical wiring, fixtures, and equipment. (SDCL 36-16)
  - e. The South Dakota State Glazing Law (SDCL 34-28-5), and
  - f. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (SDCL 5-14-12).
2. NOTE: Should there be a conflict between any of the above "Codes", Guides, or "Laws" the more stringent shall apply.

#### B. SUSTAINABLE DESIGN STANDARDS

1. State buildings to meet high-performance green building standard. Any state building projects as defined in SDCL 5-14-32, shall meet or exceed a high-performance green building standard (SDCL 5-14-33)
2. "High-performance green building standard," a building that is designed and constructed in a manner that achieves at least:

- a. A silver standard rating under the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system in effect as of July 1, 2009, or earlier if the building was registered or certified under a previous LEED rating system version;
3. "New construction," any new building constructed by any state agency, department, or institution which has a cost of five hundred thousand dollars or more or that includes five thousand square feet or more of space;
4. "Renovation" or "renovated," any alteration of a state building with a cost of five hundred thousand dollars or more or that includes five thousand square feet or more of the building;

### **C. STATE HISTORIC BUILDING CODE**

1. Comply with requirements in this chapter applicable to the Project (SDCL 1-19A, 1-19B)
2. For projects that involve a building that meets requirements for placement on the National Register of Historic Places, compliance with the International Existing Building Code, 2009 edition is encouraged.
3. Buildings at SDSU on the National Register of Historic Places:
  - a. Woodbine (Presidents Cottage)
  - b. Wakota Hall
  - c. Wanona Hall
  - d. Rammed Earth Wall at Woodbine
  - e. Rammed Earth Wall at old Dean of Ag Residence
  - f. Rammed Earth Building
  - g. Coughlin Campanile
  - h. Sylvan Theater
  - i. Stock Pavilion (Ag Museum)
  - j. Horticulture Building (Ag Communications)

### **02.03 FIRE MARSHAL'S RULES**

#### **A. GENERAL**

1. Comply with rules in South Dakota Codified Laws for Fire Prevention (SDCL 34-29B)

### **02.05 BOILER AND PRESSURE VESSEL RULES**

#### **A. GENERAL**

1. Comply with rules in South Dakota Codified Laws for Fire Prevention (SDCL 34-29A)

#### **B. GENERAL REQUIREMENTS FOR ALL OBJECTS**

1. Comply with the following codes applicable under various conditions listed in (SDCL 34-29A).
  - a. ASME Boiler and Pressure Vessel Code (2007 with 2008 addenda)
  - b. National Board Inspection Code (2007 with 2008 addenda)
  - c. National Electric Code (2008)
  - d. The Power Piping Code, ASME B31.1 (2007 with 2008 addenda)
  - e. Building Services Piping Code, ASME B31.9 (2008)
  - f. Controls and Safety Devices for Automatically Fired Boilers (CSD-1) (2009)
  - g. International Mechanical Code 2009 except Section 701.1 and Chapters 2 & 7
  - h. NFPA Standard for the Installation of Oil Burning Equipment, NFPA 31 (2006)
  - i. NFPA National Fuel Gas Code, NFPA 58 (2008)
  - j. NFPA Liquefied Petroleum Gas Code, NFPA 58 (2008)
  - k. NFPA Boiler and Combustion Systems Hazards Code, NFPA 85 (2007)
2. Boiler installations must pass inspection by the SDSU Boiler Insurance carrier prior to substantial completion.

## **02.07 OWNER STANDARDS**

### **A. DESIGN STANDARD**

1. Unless approved otherwise by the Owner's Representative, incorporate the standards in this Facilities Design and Construction Standard into the project.
2. This Facilities Design and Construction Standards are located at the SDSU Facilities and Services web site at <http://www.sdstate.edu/facserv/about/divisions/fac-engineering/index.cfm>

## **02.08 ENVIRONMENTAL AND SAFETY REGULATIONS**

### **A. DEPARTMENT OF ENVIRONMENTAL HEALTH AND SAFETY**

1. The Department of Environmental Health and Safety (EH&S) is the Owner's authority on environmental issues, occupational health and safety programs and associated state and federal regulations.
2. If discussion with EH&S personnel is required, contact the Owner's Representative to schedule a meeting.

### **B. NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM**

1. A National Pollution Discharge Elimination System (NPDES) permit is required to protect water quality from pollution sources when the area disturbed inside the construction limits is 1 acre or more.
2. The South Dakota Department of Natural Resources (DNR) will issue an NPDES permit after a Final Pollution Prevention Plan is submitted to, and approved by, the DNR before the project is bid.
  - a. See paragraphs under 06.03C6g in Sec 06 Schematic Design Phase, paragraphs under 07.02A5b in Sec 07 Design Development Phase and paragraphs under 08.02A8 in Sec 08 Construction Document Phase.

### **C. HAZARDOUS MATERIALS**

1. Materials containing asbestos, lead, polychlorinated biphenyl (PCB) and other substances in amounts deemed hazardous by the U. S. Environmental Protection Agency (EPA) and the U. S. Department of Labor's Occupational Safety and Health Administration (OSHA) are prohibited from the Project.

END OF SECTION 02 CODES AND REGULATIONS

# Section 03 SPACE AND SITE DESIGN

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## Section 03 SPACE AND SITE DESIGN

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### 03.01 DESIGN REQUIREMENTS

#### A. OVERALL CONSIDERATIONS

1. Achieve a thorough understanding of space relationships and user needs by a careful study of the Building Program and from subsequent discussions with the Planning Committee.
2. Develop a sound, functional plan that fulfills the Building Program.
3. Provide spaces that enhance user comfort and well-being in an effort to promote high productivity and task efficiency.
4. Because curricula and space needs change frequently, design to easily accommodate ongoing interior remodeling and building additions.
  - a. Provide easily changeable interior spaces to accommodate unanticipated as well as anticipated changes and future growth.
5. Because funds for maintenance and repair have historically been extremely inadequate, design using materials and systems that are exceptionally durable and need very little maintenance.
  - a. Unless stated otherwise in the Building Program, design buildings to provide useful accommodation to the Owner for at least 50 years.
6. Optimize design decisions based on a comprehensive life cycle analysis of the project and a collaborative design process involving all key stakeholders.
7. Specify building systems identified in the executed Agreement between Owner and Design Professional to be commissioned to ensure compliance with the requirements of the owner's Building Program.

#### B. EXISTING STANDARDS AND NEW TECHNOLOGY

1. The guidelines and requirements in this Manual are provided for the following reasons.
  - a. They are based upon the Owner's experience with materials, construction methods and details.
  - b. They have resulted in the fewest problems in operation and maintenance.
  - c. They have resulted in the best service and life of materials and equipment.
2. It is neither the policy nor the intent of the Owner to limit the creativity of the Design Professional in design or selection of materials, products or construction methods.
  - a. New materials, products, and construction methods, when evaluated using current knowledge of building science, may justify changes from these standards to meet the requirements of the Owner's Building Program.
    - 1) Consider using materials, products, and construction methods that are simple to detail and construct, replace a normally higher number of construction steps, encourage a quality installation, decrease construction time, and remain within the construction budget.

### 03.02 THE BUILDING PROGRAM

#### A. GENERAL

1. Develop a written Building Program based, in part, on the Owner's Project Requirements furnished by the Owner.
  - a. The Building Program may be furnished by the Owner if so stated in the executed Agreement between Owner and Design Professional.
2. The typical Building Program includes the following parts.
  - a. Program Approval and Planning Committee Members
  - b. Executive Summary
  - c. Project Goals
  - d. Space and Adjacency Requirements
  - e. Supporting Requirements

- f. Existing Site Studies
  - g. Existing Facilities Studies
  - h. Design Documents
  - i. Project Budget
  - j. Preliminary Project Schedule
  - k. Implementation Approach
3. For additional information, see Sec 05 Pre-Planning and Building Programming.
  4. The balance of the content of the Owner's Building Program is the standards contained in this Facilities Design Manual.

**B. PROJECT COST**

1. Be aware that the estimated amount identified as Construction Cost in the Building Program Project Budget includes all built-in and fixed equipment for the Project.
2. Immediately advise the Owner's Representative if the estimated Construction Cost is inadequate to allow meeting the requirements of the Building Program.

**C. PROJECT TIME**

1. Initial project planning shall be coordinated with and allow adequate time for the Owner to finish, flush and furnish the new or renovated facility according to the Owners required occupancy date(s), which normally are critical and relate to other planned programs and the University academic calendar.
  - a. As a general guide for a new facility, allow six to eight weeks for Owner required activity prior to occupancy.
  - b. The contractors schedule shall include Owner performed activity to occur prior to occupancy.

**D. SPACE AND ADJACENCY**

1. Unless previously approved by the Owner's Representative, significant deviation from Net Assignable Square Feet or from functional relationships in the Building Program could result in rejection of the design.
  - a. For definition of Net Assignable Square Feet and other space related terms, see Sec 05 Pre-Planning and Building Programming.

**03.03 BUILDING SERVICES AREA SPACE REQUIREMENTS (NONASSIGNABLE)**

**A. PUBLIC RESTROOMS**

See Division 10 2113 - TOILET COMPARTMENTS, 10 2800 TOILET ACCESSORIES

See Division 09 3000 - TILING

See Division 22 0000 - PLUMBING

**B. LACTATION ROOM**

1. Consideration of a lactation room should be discussed in the planning phase of the project.

**C. CUSTODIAL SERVICE ROOM**

1. Each floor of each building, including each wing of an addition (~30,000 sq. ft. or more) will have a custodial service closet. (100 sq. ft.) No unobstructed dimension of these rooms can be less than six feet. Any buildings with more than 30,000 sq. ft. per floor should have two custodial rooms per floor.
  - a. The custodial service room will not be dual purpose.
    - 1) Do not locate electrical panels, fire equipment, fire panels, condensate lines, mechanical equipment, telecom equipment or any other equipment in custodial service room.
    - 2) The space allocation must not include any space assigned to other departments for storage.
  - b. Access to custodial room or storage should not be through a restricted area, rooms assigned to others, or restrooms.
2. Multi-floor buildings without an elevator may have additional space requirements.

3. Provide an out-swinging 3'-0" wide door to accommodate equipment and supplies.
4. Provide a floor sink with 10 inch external sidewall with easy access for large floor machines.
5. Water Piping & Connections
  - a. Sink faucet to be installed between 3.5' and 4.5'.
  - b. Prior to wall penetration, add a single cold water line approximately 5 feet directly above sink area for chemical dispenser hook ups.
  - c. After penetration, install ball valve to allow for easy identification that the valve is open or closed.
  - d. The outlet piping should end in a male "garden hose" type connector.
6. Provide a backsplash on wall the width of the service sink that extends from the service sink to 6'-0" AFF
7. Provide a floor drain centered in the room.
8. Provide 2 GFCI protected duplex receptacle
  - a. on a wall separate from the floor sink
  - b. with adequate space for recharging automated equipment
9. Provide adjustable shelving tracks from the floor up 6'-0"
  - a. Shelves lengths should equal the wall width
  - b. Shelves should be 12 inches wide and support 50 psf using heavy duty brackets and double slotted standards
  - c. Top shelf no higher than 6'-0" AFF
10. Verify location of receptacle, shelves and brackets with the Owner's Representative.
11. Provide constant mechanical ventilation in accordance with ASHRAE Standard 62.1 and Division 23 with consideration for drying equipment and/or mops and eliminate buildup from battery recharging.

#### **D. AUXILIARY CUSTODIAL SPACE(S)**

1. Two auxiliary functions are needed: supply storage and team space.
  - a. If the supply storage is temperature controlled, secure and meets space requirements, it can also serve as team space
2. Do not locate electrical panels, fire equipment, fire panels, condensate lines, mechanical equipment, telecom equipment or other equipment in the custodial supply storage room.
3. Supply storage
  - a. Shall be a minimum of 200 sq. ft.
  - b. Consider adjacencies to loading dock and elevators when applicable
  - c. Review shelving/storage requirements based on building type/function and specialized equipment needs.
  - d. Provide an out-swinging 3'-0" wide door to accommodate easy access of supplies.
  - e. Provide a floor drain centered in the room with the floor sloped toward the drain.
4. Provide adjustable shelving tracks from the floor up 6'-0"
  - a. Shelves lengths should equal the wall width
  - b. Shelves should be 12 inches wide and support 50 psf using heavy duty brackets and double slotted standards
  - c. Top shelf no higher than 6'-0" AFF
  - d. Verify location of shelves with the Owner's Representative.
5. Provide (4) duplex receptacles on the wall opposite the shelving
6. Team Space
  - a. Provide 80 sq. ft. minimum for a supervisor work area and employee meeting space
  - b. Provide a network and phone connection
  - c. Provide appropriate electrical outlets for room use. Discuss potential time clock requirements
7. Provide constant mechanical ventilation in accordance with ASHRAE Standard 62.1 and Division 23.

## **E. BUILDING MAINTENANCE ROOMS**

1. The building maintenance rooms will not be dual purpose.
  - a. Do not locate electrical panels, fire equipment, fire panels, condensate lines, mechanical equipment, or telecom equipment in building maintenance rooms.
  - b. The space allocation must not include any space assigned to other departments for storage.
2. Shall be 150 sq. ft. minimum
3. Access to building maintenance rooms should not be through a restricted area, such as rooms assigned to others, or restrooms.
4. Consider adjacencies to loading dock and elevators when applicable
5. Room will be used to store items such as spare floor and ceiling tile, filters, and gas powered snow removal equipment
6. Provide constant mechanical ventilation in accordance with ASHRAE Standard 62.1 and Division 23.

## **03.04 CIRCULATION AREA SPACE REQUIREMENTS (NONASSIGNABLE)**

### **A. REFERENCE**

1. **DIVISION 09 FINISHES**

### **B. ENTRANCES AND VESTIBULES**

2. Except for exterior exit-only doors and exterior doors to individual rooms, provide vestibules between exterior entrance doors and the building interior circulation system.
3. Vestibules
  - a. Provide no less than 6 feet deep
4. Provide fully weather-stripped exterior doors and vestibule doors.

### **C. CORRIDORS**

5. Provide electrical duplex receptacles spaced not over 50 feet apart
6. Provide durable floor and wall surfaces. Reference Division 09 FINISHES

### **D. STAIRWELLS**

7. Provide an electrical duplex receptacle at each landing.
8. Reference Division 09 FINISHES

## **03.05 MECHANICAL AREA SPACE REQUIREMENTS (NONASSIGNABLE)**

### **A. MECHANICAL ROOMS**

1. Provide access at ground level to accommodate equipment storage and transport wherever possible. If not possible provide elevator access to the mechanical room level. Plan for an adequately sized elevator cab, elevator door, corridors and door sizes to allow for maintenance traffic.
2. Provide a 3 foot deep by 4 foot wide bench for review and storage of system drawings. Below bench surface, provide a shelf for flat storage of one full size set of as-built plans and base cabinet with adequate storage/shelving for one complete set of O&M manuals. For buildings with more than one mechanical room provide bench and shelving in the main mechanical room and signage in the other mechanical rooms to direct to the maintenance staff to the room with the plans and O&M manuals.
3. Provide a 3 foot by 7 foot work bench.
4. Provide a minimum of 6 lineal feet of adjustable shelves 16 inches deep that will support 50 psf for spare parts.
5. Verify design of work bench and location of shelves with the Owner's Representative.
6. Provide mechanical ventilation and or adequate and temperature control to keep the mechanical space below 85 degrees for protection of electronic equipment and to provide reasonable conditions for maintenance work within the space.

7. Specify door size based on largest piece of equipment within the room.
8. For mechanical rooms with water softeners, softener salt is delivered and stored on a standard pallet (roughly 48"x48"). Access must be provided for a fork lift or pallet jack to deliver and transport a full pallet of salt to the mechanical room. Provide a dedicated space within the mechanical room for the salt pallet and adequate clearance for a pallet fork to maneuver around.
9. Provide wall mount hangers for spare belts, clearly labeled for each piece of bent driven equipment within each mechanical room.
10. Provide ADEQUATE space between air handlers for future removal of coils.
11. Clearly show all mechanical and electrical service clearances around equipment on the plans and coordinate with all design trades.
12. Refer also to Division 23

#### **B. ROOF AREAS**

1. Locate roof access doors and hatches from public corridors, stairwells, or mechanical spaces, but not from custodial spaces.
2. If roof hatches are provided as the only means to access a roof, the only equipment allowed on the roof shall be small exhaust fans. For all other equipment, provide full sized stairs with standard tread and risers to a doghouse or mechanical penthouse with full sized doors as access to roof mounted equipment. Refer to Division 23 for further details on roof mounted equipment.
3. Safety Requirements
  - a. Locate no portion of roof access doors or hatches closer than 6 feet from a roof edge.
    - 1) At roof access hatches, install a permanent guard rail with swinging gate to the exterior sides of the hatch if required by code
  - b. Locate mechanical equipment no closer than 10 feet from a roof edge.

#### **C. ELECTRICAL ROOMS**

1. It is preferred to have a dedicated room for the main electrical service, fire alarm, and similar type systems. The building electrical rooms will not be dual purpose.
  - a. Do not locate fire sprinkler main equipment, steam lines, condensate lines, water lines, hydronic piping, mechanical equipment, or telecom equipment within the electrical room.
  - b. Discuss lighting control panel location with owner
  - c. The space allocation must not include any space assigned to other departments for storage.
  - d. Show code required or manufacture recommended service clearances on the plans.
2. Access to building maintenance rooms should not be through a restricted area, such as rooms assigned to others, or restrooms.
3. Provide constant mechanical ventilation in accordance with ASHRAE Standard 62.1 and Division 23.

### **03.06 MISCELLANEOUS SPACE REQUIREMENTS (ASSIGNABLE)**

#### **A. MAIL**

1. Facilities to accommodate the handling of mail are unique to each project.
2. In general, provide a locked room with locked compartments to store mail and counter space for departments to sort mail.
3. Provide compartments with clear inside dimensions of 15 inches wide, 19 inches deep and 15 inches high to accommodate a single mail tote.
  - a. Provide at least 1 compartment per department for incoming mail.
  - b. Provide at least 1 compartment for outgoing campus mail
  - c. Provide 1 compartment for US mail.
4. Compartments with locked doors front and rear are preferred for access on opposite sides
5. Verify mail handling requirements with the Owner's Representative.

## **B. TELECOMMUNICATION ROOM IT DEPT - COLIN**

1. Locate telecommunication outlets as approved by the Owner's Representative.
  - a. The typical outlet (voice-data jack) consists of an upper jack for voice (telephone), a lower jack for data (Information System Network – ISN) with a normal duplex outlet cover plate.
2. Request the Owner's Representative to arrange a meeting with Telecommunication personnel to determine locations and sizes of cable and equipment.
3. Locate telecommunication equipment rooms directly accessible from exit corridors.
4. For detailed room requirements, Refer to: Division 27 – **COMMUNICATIONS (Pending)**.

## **03.07 GENERAL USE SPACE REQUIREMENTS (ASSIGNABLE OR NONASSIGNABLE)**

### **A. GENERAL**

1. The following functions may be located in either assignable or non-assignable space.
  - a. If the function is located within a department space, it is assignable.
  - b. If the function is located within a circulation area, it is non-assignable.

### **B. INTERACTION SPACES**

1. Develop interaction spaces whenever possible throughout the building.

### **C. VENDING**

1. Vending locations are required in all buildings.
2. Discuss specific project requirements and required utilities with the Owner's Representative.
3. Locate vending machines within specifically designed coves, areas or rooms. Do not located vending machines in corridors.
4. Review locations of vending machines in relation to windows to avoid seeing them from the exterior of buildings.
5. Provide HVAC, power and data connections for vending machines.
  - a. Minimum number of machines is 2 soft drink machine and 1 candy machine.
  - b. Average number of machines is 3 soft drink machines and 1 candy machine.

### **D. PERIODICAL DISTRIBUTION**

1. Provide space for periodical distribution boxes within the vending area.
  - a. If space in vending area is not available, locate in a central meeting area
  - b. Do not locate in exit paths.
  - c. Locate at least 4'-0" minimum from any exterior doors
2. Distribution boxes will be furnished either by the Owner or by the publisher and paid for by the publisher.

### **E. POSTING**

1. Refer to: Division 10 - SPECIALTIES

### **F. RECYCLING**

1. Discuss specific project requirements and required utilities with the Owner's Representative.
2. Bins furnished and installed by the Owner.
  - a. Verify bin locations with the Owner's Representative

## **03.08 WASTE DISPOSAL**

### **A. GENERAL**

1. At the dock area, locate waste containers to permit easy, direct access by packer type trucks each day.
2. Provide building custodians convenient daily access to waste containers.

3. Verify waste disposal requirements with the Owner's Representative.
  - a. Give special consideration to biological wastes, chemical wastes and radioactive materials when their waste disposal requirements are included in the Building Program.
4. See Division 32 for trash enclosure requirements

### **03.09 CLASSROOMS**

#### **A. GENERAL DESIGN**

1. Discuss procurement and installation of furnishings and AV equipment with Facilities and Services project manager.
2. The following guidelines are for traditional general classrooms that are University controlled and scheduled. These guidelines do not completely apply to Active Learning Classrooms or to department controlled and scheduled rooms.

#### **B. WALLS**

1. If painted use light neutral color
2. Where walls are constructed of gypsum board, install corner guards and chair rail of a durable composite material
3. Coordinate the installation of the chair rail with the height of the stations
4. Typically use: InPro corner guards and series 500 chair rail

#### **C. DOORS**

1. Provide a window within the door or a side light next to the door
2. Door and frame shall be prepared future electronic accommodations
3. Refer to: Division 8 - OPENINGS and Division 28 – ELECTRONIC SAFETY & SECURITY

#### **D. FLOORS**

1. Hard surface, generally VCT
2. Terrazzo, ceramic, concrete, stone are also acceptable
3. Avoid carpet due higher maintenance and shorter life span
4. Rooms with capacities of 75 or less shall have flat floors
5. For rooms with capacities of 75 or more, consideration of floor slope or tiers to be reviewed by Facilities and Services
6. If a tiered floor is used, consideration shall be given to the number of tables per tier and the potential for student collaboration

#### **E. BASE**

1. 4" cove in rubber or vinyl

#### **F. CEILING**

1. If suspended grid ceilings with acoustical tiles are used see Division 09 FINISHES for specific types of tiles

#### **G. LIGHTING**

1. See Division 26 ELECTRICAL
2. Provide light level control through manual switching and or dimmable fixtures
3. Label switch covers
4. Lighting control panels shall not be used
5. Design lighting and light circuiting and switching to properly view media screens and white boards while maintaining appropriate light level at the student stations
6. Use of more than one type of fixture is optional

#### **H. ELECTRICAL**

1. Provide electrical outlets for 25% of the total station count

#### **I. ACOUSTICS**

1. Reverberation time shall be no less than 0.5 second and no more than 1.2 seconds
2. Walls surrounding general classrooms shall have STC classification of 53 or greater

#### **J. WINDOW TREATMENTS**

1. Provide backing in the walls for installation
2. Provide appropriate type of treatment to control light levels
3. If windows are operable assure the treatment does not interfere with the operation of the window

#### **K. WHITEBOARDS**

1. Provide backing in the walls for installation, review with project manager
2. Boards shall be porcelain with aluminum frame
3. Boards shall be 4'-0" high, width based on space available
4. Boards shall have a full length marker rail
5. If boards need to be seamed, use butt seams
6. Install at the front of the room, generally the full width of the room
7. Consider other technology and teaching tools within the room to assure the board is accessible to the instructor and visible by the students (i.e. take in to consideration the location of screens that pull down or smart boards)
8. Use of "whiteboard paint" is optional
9. Chalk boards are not allowed – chalk dust is damaging to and shortens the life of classroom technology equipment

#### **L. STUDENT STATIONS**

1. Standard Freestanding
  - a. Facilities and Services review of furniture layout is required
  - b. Square footage per station and sight lines to be reviewed by Facilities and Services
  - c. 4 leg stations – no sled base
  - d. Stainless steel glides - no nylon glides
  - e. Oversized tablets
  - f. Poly seat and poly back – no upholstery
  - g. Back to have a flex design
  - h. 90% of total station count shall have right tablets
  - i. 5% of total station count shall have left tablets
  - j. Typically use: KI Dorsal 1090 series
2. Accessible Freestanding Stations
  - a. 4 leg chairs
  - b. No arms on the chairs
  - c. Desk/table with cantilevered legs
  - d. 5% of total station count shall be accessible stations
  - e. Coordinate finishes with the standard station finishes as much as possible
  - f. Typically use: VIRCO Zuma series
3. Fixed Stations
  - a. Facilities and Services review of furniture layout is required
  - b. Accessible stations need to be noted on plans
  - c. Stations can be either upholstered or non-upholstered

- d. If tablets are used with the fixed seating, the tablet needs to flip as well as recess/drop between/beside seats
- e. Continuous tables can be used instead of tablets
- f. American Seating product shall not be specified or used

**M. INSTRUCTOR STATION**

- 1. 24" x 42" table size, laminate top
- 2. 4 legs or end panels
- 3. No drawers or shelves – they only accumulate trash/unwanted items
- 4. Provide a portable table top podium

**N. INSTRUCTOR CHAIR/STOOL**

- 1. Provide a desk height chair with 4 legs, stainless steel glides, poly seat & poly back – same style as student stations if possible
- 2. Provide a stool with poly seat & poly back, foot ring and casters– same style as student stations if possible

**O. CLASSROOM TECHNOLOGY**

- 1. Coordinate with Classroom Technologies regarding the podium, equipment, cabinets, data, power and locations
- 2. Coordinate with IT department regarding data connections or wireless access

**P. ACCESSORIES**

- 1. Custodial staff to provide a battery operated clock at the front of the room or adjacent to the front of the room
- 2. Custodial staff to provide a trash can at the entrance of the room

**03.10 OFFICES**

**A. GENERAL**

- 1. Discuss specific project requirements and required utilities with the Owner's Representative.
  - a. Access to utilities and equipment
  - b. Flooring finish
  - c. Visibility into office for safety and security - window in door, side light, partial glazing, blinds, etc.
  - d. Coordinate furniture layout with electrical outlets, data ports, thermostats, vents/return air, wall mounted heating,
- 2. Refer to Owner's Space Utilization Model for size and quantity requirements

**03.11 UNIVERSAL & ACCESSIBLE DESIGN**

**A. GENERAL**

- 1. Provide universal site and building access
- 2. Follow federal and state accessibility requirements and universal design and accessibility guidelines

**03.12 SDSU PUBLIC ART**

**A. GENERAL**

- 1. Refer to: Supplemental Design Guides/[SDSU Public Art Committee](#)

**03.13 SITE CONSIDERATIONS**

**A. GENERAL**

- 1. Because the university administration determined the Project site with full regard to the Master plan, provide careful attention to the design of the Project with respect to the surrounding buildings, landscaping and open space

2. Locate building entrances and walks to coordinate with existing pedestrian traffic patterns.
3. Locate bicycle parking areas to coordinate with existing bicycle traffic patterns.
4. Locate building docks and service drives to coordinate with existing vehicular traffic patterns.
5. Locate building mechanical spaces to coordinate with existing utility line locations.
6. Follow recommendations of City of Brookings Fire Department personnel with regard to the following issues.
  - a. Fire truck entry and truck turning radii
  - b. Water supply capability based on current test results
  - c. Location of post indicator valves and fire department hose connections

**B. SITE DESIGN CRITERIA**

1. Refer to: Division 33 - EXTERIOR IMPROVEMENTS
2. It is preferred to design using gradually sloped walks. If possible avoid ramps and stairs to facilitate access and eliminate snow removal by hand.
  - a. Where stairs cannot be avoided, design railings to facilitate snow removal.
3. Avoid surface drainage of storm water across walks.
4. Refer to: Division 12 7100 - OUTDOOR FURNISHINGS
5. Provide service drives with a minimum inside radius of 35 feet.
6. Consider the location of vegetation that requires maintenance.
7. Provide a mowing strip or equivalent around fixed objects in grass areas to eliminate hand trimming.
8. Avoid window wells and below grade open structures unless approved by the Owner's Representative.
9. Refer to Division 22 - PLUMBING for directing water from roof drains

END OF SECTION 03 SPACE AND SITE DESIGN

# Section 04 BOARD OF REGENTS SUBMITTALS

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## Section 04 BOARD OF REGENTS SUBMITTALS

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This section reviews the requirements of BOR Policy 6.4 for Capital Improvements and Policy 6.5 for Building Committees and provides direction to the A/E and Project Manager. The policy information contained in this section of the FDCS has been modified from its official format. [Current BOR Policies](#) for Facilities should be reviewed to ensure the most recent Policy changes are incorporated into the project.

BOR Policy 6.4, 6.5 and 6.6 are required on all projects that meet the financial limits described in the current version of the policy. Policy information described in this section of the FDCS is based on BOR policies in effect on April 31, 2012.

\* Items shown with an asterisk (\*) have been added to help describe the process and are not included in BOR policy.

### 04.00 General

#### A. CAPITAL IMPROVEMENTS INCLUDE:

1. The erection of a new facility;
2. The addition, expansion or extension of an existing facility that adds to the facility's overall external dimensions or adds to the total gross square footage of the facility;
3. Any major maintenance, repair, renovation or alteration project, as defined in Policy Number 6:6, whose cost exceeds \$1,500,000 whether done in phases or not.

#### B. COST OBJECTS RECOGNIZABLE AS CAPITAL IMPROVEMENT EXPENDITURES INCLUDE:

1. Architectural and engineering services, site preparation, construction, furnishing, equipping such buildings and facilities or subsystems for use, including heating, plumbing, ventilation, water, sewer, and electrical facilities with necessary connections to existing systems, asbestos abatement where necessary, the construction of sidewalks, and the landscaping of grounds.
  - a. No costs associated with the acquisition of land may be charged against appropriations provided for new construction.

#### C. REQUESTS FOR CAPITAL IMPROVEMENTS MAY BE JUSTIFIED IN ONE OR MORE OF THE FOLLOWING CIRCUMSTANCES:

1. Where the new construction shall replace a facility or subsystem that has become inadequate through deterioration or obsolescence and that cannot be renovated at a cost below fifty percent of the facility replacement value;
2. Where new construction shall provide the most effective and economical means to meet current operational requirements;
3. Where new construction shall provide the most effective and economical means to meet new operational requirements, such as may arise from increased enrollments; and
4. Where the new construction shall upgrade existing facilities or subsystems to reasonable standards of safety set forth in safety codes or other suitably documented safety standards.

#### D. BOR MEETING SCHEDULE\*

1. Information/documents that go to BOR for approval are required to be routed for internally for SDSU administrative review and approval. The internal deadline for review is approximately five (5) weeks prior to the BOR meeting.

### 04.01 REVIEW AND APPROVAL OF CAPITAL IMPROVEMENT REQUESTS

- A. The review and approval of capital improvement projects involves four distinct phases. Board approval is required before a project may advance from one stage to another. All projects over \$1,500,000 should be submitted for approval as governed by Board Policy 6:6.
- B. A flow chart detailing the Board's internal procedure can be found at the end of this section. All non-revenue projects require legislative approval, which usually happens after the facility program plan although it may happen at different stages.

**1. Preliminary Facility Statement (PFS)**

- a. Requests to initiate the formal review of proposed capital improvement projects must be accompanied by a preliminary facility statement prepared by the institution that addresses the following:
  - 1) General programmatic needs to be addressed;
  - 2) Analysis of the student body or constituents to be served;
  - 3) Additional services to be offered;
  - 4) Compliance with master plan;
  - 5) Analysis of needs assessment based on the facilities utilization report;
  - 6) Location;
  - 7) Reallocation or demolition of old space, if any;
  - 8) Proposed funding source/sources; and
  - 9) Budget for development of a Facility Program Plan.
- b. The PFS is prepared by and submitted to the BOR office by Facilities & Services staff.
- c. \* An OSE Work Request for Planning may be required at this stage of the project.

**2. Facility Program Plan (FPP)**

- a. If the Board authorizes the Preliminary Facility Statement for a proposed capital improvement project, the institution shall prepare a Facility Program Plan.
- b. If an A/E firm will be involved in the development of the Program Plan, a Building Committee will need to be appointed to interview A/E firms for the purpose of developing the Facility Program Plan and for the Final Design stage (BOR Policy 6:5). Discussed in 04.02.
- c. The Facility Program Plan must be approved before a capital improvement project is authorized for submission to the Legislature unless the project received legislative authorization through a previous capital improvement planning process.
  - 1) The program plan shall address the following: (Section 05 Pre Planning and Building Programming):
    - (a) Programmatic justification for discrete spaces (classrooms, offices, etc.) (05.04.B);
    - (b) Gross square footage (FDCM 05.03.A);
    - (c) Site analysis (FDCM 05.04);
    - (d) Description of key building features (05.04);
    - (e) Illustrative floor plans (05.04);
    - (f) Initial cost estimates and funding sources (05.04);
    - (g) Identification of fund sources and impact to campus maintenance and repair. Budget and sources for ongoing operational costs including janitorial, utilities, and other costs. The operational cost projections should identify the estimates of utilities, custodial and maintenance services, supplies, materials, equipment, etc. The impact to utility budgets and WAPA electrical allocations must be provided. Options for mitigating this impact shall be included in the form of a facility life cycle cost analysis which includes utility, maintenance and operation costs.
    - (h) If the operational costs are to be covered by general funds, the FPP should identify how the costs shall be funded if no new funds for operational costs are appropriated as well as the resulting impact of the realignment to the overall campus budget.
  - 2) In conjunction with any approval to proceed, the Board shall also designate the source of funds--state, federal, revenue or private/foundation gifts--for the cost of (a) construction; (b) ongoing operations, and (c) M&R. The Board may elect to use different sources of funds, totally or partially, for any facility construction, operations or M&R cost components.
  - 3) If the Board requires capital improvement projects funded totally or partially from private donations or foundation funds to have on-going operational and annual M&R expenditures covered by private donation or foundation funds, a financing plan shall be required.

- (a) This plan may be financed through the establishment of an endowment, annuity, operational revenues, or other external funds.
- (i) If the financing plan includes the establishment of an endowment or annuity, the plan should identify
  - 1. the size of the endowment or annuity that shall be established to defray the operational and M&R expenditures over the projected life of the project, including reserves needed to fund demolition of the structure, and
  - 2. assumptions used to project sufficient funds to cover the estimated costs.
- (ii) If an endowment is used, the financing plan should address the disposition of endowment corpus in the event the building is taken out of service.

### **3. Facility Design Plan (FDP)**

- a. \*In special cases the Preliminary Facility Statement and Facility Program Plan or the Facility Program Plan and Facility Design Plan have been submitted together.
- b. \* The FDP requires approval of the Building Committee and BOR at a regularly scheduled BOR meeting.
  - 1) BOR meeting are generally scheduled around the following dates:
    - (a) Late March (Regular Meeting)
    - (b) Mid May (Regular Meeting)
    - (c) Mid June (Regular Only)
    - (d) Early August (Planning Only)
    - (e) Early October (Regular Meeting)
    - (f) Mid December (Regular Meeting)
    - (g) Mid January (Legislative Planning Meeting)
- c. The Facility Design Plan must be approved by the Building Committee prior to being submitted to the Board for approval. This phase of the project planning process shall address the following:
  - 1) Architectural, mechanical and electrical schematic design;
  - 2) Changes from facility program plan;
  - 3) Impact to existing building or campus-wide heating/cooling/ electrical systems;
  - 4) Total construction cost estimates (see 04.00.B above); and
  - 5) Changes from cost estimates for operational or M&R expenses.
- d. The facility design costs should be part of the project costs and funded out of the approved revenue sources for the project.
- e. If the facility is revenue Capital Improvement project, Board review of the project is required before it proceeds to the facility bid document stage.
- f. If the facility is a non-revenue Capital Improvement project, the Board may approve the submission of legislation to authorize and secure funding for the project.
- g. The Board may approve the expenditure of HEFF monies from an institution's Maintenance and Repair allocation for projects which fall into 04.00.BA.3 above.
- h. Final Board approval of the project is granted with approval of the Facility Design Plan.
- i. An Office of the State Engineer work request should be forwarded at the start of this phase.

### **4. Facility Bid Documents**

- a. After the Board's approval of the facility design plan in 04.01.B.3 above, the Building Committee will proceed with final bid documents.
  - 1) The final bid documents, including plans and specifications, must be reviewed and approved by the Building Committee prior to issuing the bid documents to contractors for bids. This review and approval may be concurrent with BOA/OSE and institutional final review and approval.
  - 2) If either the final cost estimates or the bids, including a reasonable contingency, exceed the approved level of funding, the Building Committee shall review and approve any changes

proposed.

- 3) Any changes proposed by the BOA/OSE, the A/E, and the institution that would alter the program defined in 04.01.B.1 Preliminary Facility Study and 04.00.B.2 Facility Program Plan must be reviewed and approved by both the Building Committee and the Board.

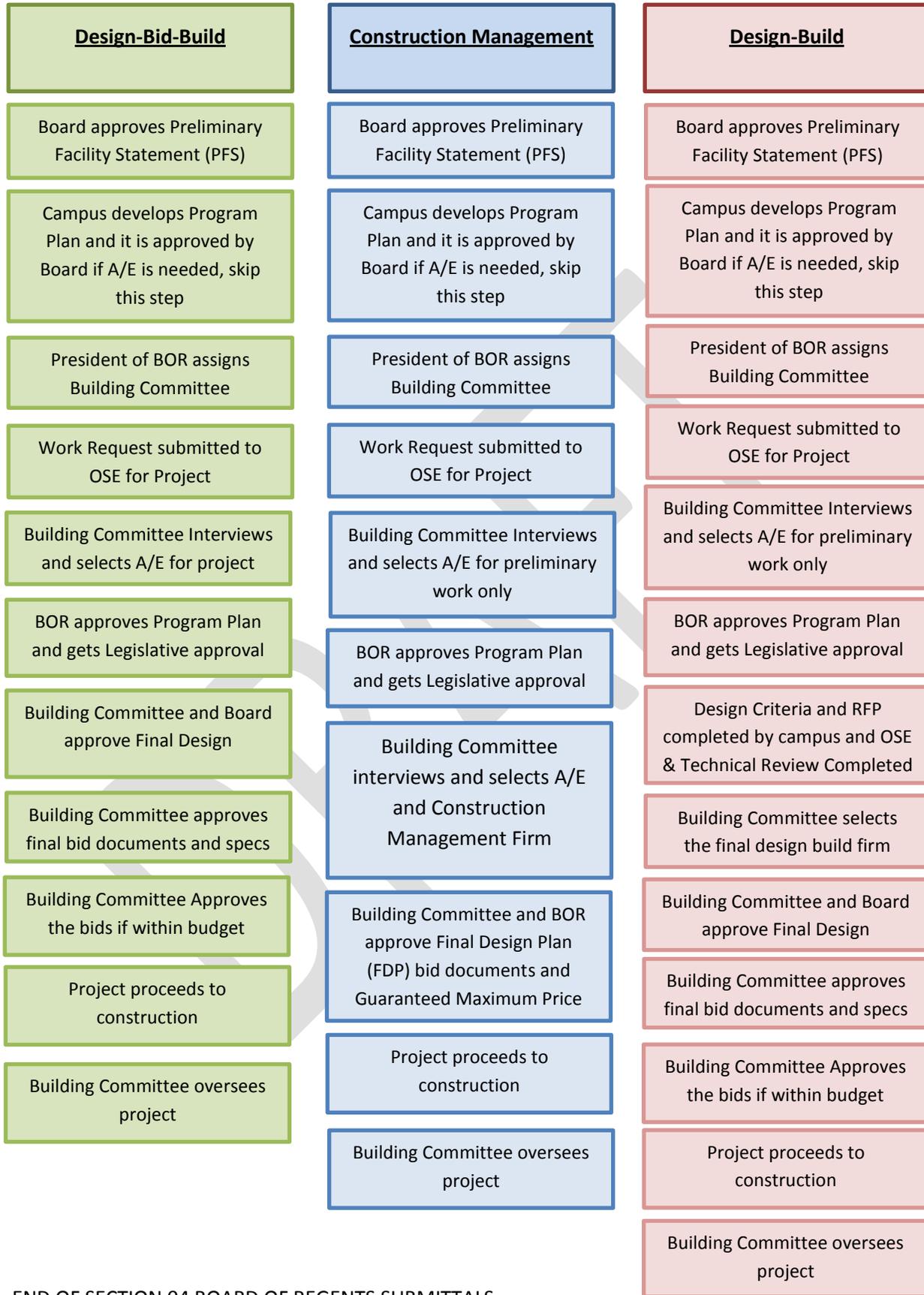
#### **C. CONSTRUCTION**

1. Once the bids are approved by the Building Committee and the financing plan is in place, the project proceeds to construction.

#### **04.02 BUILDING COMMITTEE (BOR POLICY 6.5)**

- A. The Board will appoint a Building Committee for each capital improvement project at the various schools and institutions in the System. The committee shall be appointed by the President of the Board and shall consist of the Executive Director who shall chair the committee, the president or superintendent of the institution or school, a Regent, and the State Engineer.
  1. The committee shall assume the following responsibilities:
    - a. The building committee shall interview and select architects for the purpose of developing and designing facilities. Architects may be contracted for two phases: 1) the program plan development, if a formal A/E engagement is deemed necessary for this phase, and 2) the final design of the project. All A/E engagements relative to capital improvements, whether done by the institution, their Foundation, or a related entity, must go through a Building Committee. Any A/E firm that works on a master plan which includes specific designs or floor plans for buildings, in which the A/E firm was not selected by a Building Committee, will not be considered for the final design and development of any project contained in the master plan or preliminary concept development.
    - b. The building committee shall review proposed designs to assure their compliance with the requirements of Regents Policy Manual § 6:4. The building committee shall review proposed project budgets to assure their compliance with the requirements of Regents Policy Manual § 6:4.
    - c. The building committee shall direct the state engineer to refer to it for additional review and approval all proposed design modifications that would affect the operating cost, utility or life expectancy of the capital improvement.
    - d. The building committee shall direct the state engineer to refer to it for additional review and approval of all proposed design modifications that would significantly affect the project budget.
    - e. The building committee shall direct the state engineer to advise it of all developments in the course of construction that might affect the legal rights or liabilities of the Board. Building Committees
    - f. The building committee shall report to the full Board any developments that might affect the operating cost, utility or life expectancy of the capital improvement, that might significantly affect the project budget or that might affect the legal rights or liabilities of the Board.

**04.03 Flow Chart for BOR Process**



END OF SECTION 04 BOARD OF REGENTS SUBMITTALS

Section 05 PRE-PLANNING AND BUILDING PROGRAMMING

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## Section 05 PRE-PLANNING AND BUILDING PROGRAMMING

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### 05.01 GENERAL

#### A. AGREEMENT BASIS

1. This phase of the Capital Project Process is based on the Sample A/E Agreement for Non-Delegated projects.

#### B. DESIGN PROFESSIONAL RESPONSIBILITIES

1. For responsibilities of the Design Professional, consult the for Non-Delegated projects or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.02 in FDCS Sec 01 Working Relationships.

#### C. OWNER RESPONSIBILITIES

1. For responsibilities of the Owner, consult the Sample A/E Agreement for Non-Delegated projects at or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.04 in FDCS Sec 01 Working Relationships.
2. Pre-Planning for capital improvements meeting the requirements of BOR Policy 6:4(2.A), will culminate in the Owner preparing a Preliminary Facility Statement (PFS) for BOR approval. Refer to 04.03 Flow Chart for BOR Policy 6.4.
3. Building Programming for capital improvements meeting the requirements of BOR Policy 6:4(2.A), will culminate in the Owner preparing a Facility Program Plan (FPP) for BOR approval. Refer to 04.03 Flow Chart for BOR Policy 6.4.

### 05.02 INTRODUCTION

#### A. PRE-PLANNING

1. Pre-planning by the Owner is the basis for establishing the scope, budget and schedule for a new capital project.
  - a. University-Wide Standards
2. Used to ensure that needs are adequately satisfied and all programs are treated equitably
3. Used when activity requirements are universal.
  - a. Department standards
    - 1) Developed to consider special needs of unique departmental activities

#### B. BUILDING PROGRAMMING

1. The process leading to a statement of an architectural problem and the requirements to be met in formulating a solution
2. Attempts to identify the issues and problems the design process must address and resolve
3. For a list of site issues that impact the building program, see FDCS Supplemental Design Guides/ [Site Programming Review-Development Discussion Guide.pdf](#)

#### C. BUILDING PROGRAM SPACE REQUIREMENT SUMMARY

1. Identifies the size and number of spaces to be included in the Project without significant deviation.

### 05.03 BUILDING AREAS

#### A. GENERAL

1. From the first concept of a building need to the final occupancy of the space, there is a continuing reference to the net assignable and gross areas involved.
2. These areas must be considered in the original program planning and are used in reference to unit costs in preliminary estimates, establishing budgets and final accounting.

3. The definitions and calculation methods used by the Owner are taken directly from the Postsecondary Education Facilities Inventory and Classification Manual (FICM), National Center for Education Statistics, 1992.
  - a. FICM is available on-line at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=92165XXXX>.
  - b. Building area definitions are located in FDCS Supplemental Design Guides/[FICM Partial Chapter 4.pdf](#).
  - c. Use FICM definitions for the following building areas.
    - 1) Gross Area
    - 2) Assignable Area (Net Assignable Square Feet – NASF)
      - (a) Break out spaces according to FICM
      - (b) Owner will assist in determining which FICM categories are required
  - d. Do not use Non-Assignable Area and Net Usable Area

## **05.04 BUILDING PROGRAMMING PROCESS AND FORMAT**

### **A. BUILDING PROGRAMMING**

1. The process leading to a statement of an architectural problem and the requirements to be met in formulating a solution.
  - a. A problem seeking process that attempts to identify the issues and problems the design process must address and resolve.
  - b. Generally operates at two interconnected levels.
    - 1) The pragmatic level where specific functional requirements are listed and interrelated
    - 2) The aspirational level which strives to capture the client's dreams and desires, preconceptions and biases, hopes and fears
2. Primary activities of building programming may be categorized as follows.
  - a. Data Collection
  - b. Data Analysis
  - c. Data Organization
  - d. Communication of Results

### **B. BUILDING PROGRAMMING PROCESS**

1. Identify the basic elements for collecting information and making decisions.
  - a. Set up the structure and techniques to obtain necessary information from clients, college/administrators, service providers, etc., anyone with necessary knowledge or significant influence.
  - b. Interview the key decision makers.
  - c. Prepare an outline of the program contents.
  - d. Key all information to the outline.
2. Carefully document and evaluate the present building conditions: how much space is used by each entity/employee, what works well and what does not.
  - a. Inventory all spaces in drawings and text.
  - b. Inventory all furnishings and equipment.
  - c. Have occupants and decision makers evaluate the present spaces, in words and by marked up floor plans.
  - d. For renovation projects, have occupants and decision makers participate in identifying areas and features to retain and to change.
3. Prepare a space requirements outline.
  - a. Use a standard content format for all building programs.
  - b. Include basic spatial criteria such as dimensions, proportions, and ceiling heights.

- c. Include services and storage requirements, access, flexibility, and utility requirements for each space.
  - d. Reference more detailed requirements.
4. Identify overall building requirements with respect to use, purpose, and general requirements.
  - a. List the range of users and uses, such as parking, access, service needs, security, degree of privacy, as well as symbolic and aesthetic requirements.
  - b. Revise the outline program as required.
5. Identify the role of the Project in the surrounding landscape.
  - a. Includes environmental impacts and campus context.
  - b. Include symbolic and aesthetic goals.
  - c. Consider pedestrian and vehicular access to the site.
  - d. Utility infrastructure needs.
  - e. Master plan context, land use, set backs, adjacencies, historical context.
6. Identify the fundamental functional, spatial, and visual relationships among components of the Project.
  - a. Include relationships between user components or departments.
  - b. Include relationships between the building components and the outside community or visitors.
  - c. Describe any grouping requirements, such as for security, public access, or super-cleanliness.
  - d. Use diagrams, models, or other methods that suggest scale or relevance to the way people behave.
7. Identify measures to allow for future growth and change.
  - a. Identify elements subject to change, both in the short and long term. Assess probabilities of change and indicate where expansion, contraction, or alteration should be provided for in design.
  - b. Note that technology as well as space needs may change.
8. Summarize key requirements of governing codes and regulations.
  - a. Identify and list probable codes and regulations.
9. Define energy, services, and environmental requirements.
  - a. Indicate energy conservation or environmental protection measures to be pursued in design.
  - b. Determine whether the design professional will be able to propose additions to the budget based on life cycle cost analysis.
  - c. Analyze long-term operating and maintenance costs and issues.
  - d. Identify the owner's decision criteria.
10. Formulate a detailed room or space requirements.
  - a. Brief description of function/activities
  - b. Area and configuration requirements
  - c. Physical access and adjacency requirements
  - d. Loading and special structural requirements
  - e. Luminous or acoustical environment requirements
  - f. Security and safety requirements
  - g. Mechanical, electrical and services requirements
  - h. Aesthetic requirements
  - i. Special requirements
11. Prepare illustrative floor plans
12. Identification of fund sources and impact to campus maintenance and repair (Internal Facilities & Services Requirement of Pre Planning and Programming).
  - a. Budget and sources for ongoing operational costs including janitorial, utilities, and other costs.
  - b. Operational cost projections should identify the estimates of utilities, custodial and maintenance services, supplies, materials, equipment, etc.

- c. Impact to utility budgets and WAPA electrical allocations must be provided.
    - 1) Options for mitigating this impact shall be included in the form of a facility life cycle cost analysis which includes utility, maintenance and operation costs.
  - d. If the operational costs are to be covered by general funds, the request should identify how the costs shall be funded if no new funds for operational costs are appropriated as well as the resulting impact of the realignment to the overall campus budget.
13. Document the entire program following the standard format

**C. BUILDING PROGRAM FORMAT AND CONTENT**

1. Typically the Design Professional will work with the Owner to develop a written Building Program.
2. The typical Building Program has the following format and content.
3. Sign-Offs
  - a. A statement of approval by academic and administrative personnel involved with the Project. All participants in the development of the building program will be acknowledged.
4. Executive Summary
  - a. Project Description and Scope
  - b. Evaluation Criteria
  - c. Project Budget
  - d. Project Schedule
5. Project Goals
  - a. University's Mission Statement and Objectives
  - b. Compliance with the University's Strategic Plan
  - c. Compliance with the University's Master Plan
  - d. Functional Programs and Curricula Descriptions and Projections
  - e. Project Need
  - f. Project Objectives
  - g. Compliance with the Space Model
6. Space and Adjacency Requirements
  - a. Related to the Entire Building
  - b. Room-By-Room Requirements
7. Supporting Requirements
  - a. Site development and landscaping requirements
  - b. Requirements for Support Services
  - c. Security Requirements
  - d. Sustainability and LEED certification requirements
8. Existing Site Studies
  - a. Study of Alternative Sites
  - b. Aerial photograph of the proposed site
  - c. Topographical Survey (general)
  - d. Geotechnical Survey (general)
  - e. Description of existing landscaping and impacts
  - f. Extraordinary drainage requirements and a plan to manage storm water runoff
  - g. Any existing construction or utilities on the site
  - h. Description of any known environmental issues that would limit use or result in additional Project costs such as hazardous waste cleanup
  - i. Plans to relocate any existing occupants or equipment off of the site

- j. Diagram showing the intended expansion during any future phases
- 9. Existing Facilities Studies
  - a. Existing drawings and specifications
  - b. Extent of the Remodeling
  - c. Code Compliance
  - d. Hazardous Materials
  - e. Temporary
  - f. Existing Utilities Studies
  - g. Site Implications
- 10. Design Documents
  - a. Codes and Regulations
  - b. Technical Standards
  - c. Institutional Design Standards
- 11. Illustrative Floor Plans
- 12. Project Budget
  - a. Identify Project costs using the university's budget worksheet for preliminary cost estimates.
- 13. Preliminary Project Schedule
  - a. Include a tentative schedule indicating when various phases of the work are expected to be completed.
  - b. The schedule should also include Project approval milestones.
- 14. Implementation Approach
  - a. Comprehensive Project Schedule - in addition to the Project Schedule, this section should address how the university plans to manage.
  - b. Design Plan – this section defines the resources and methods to be used to provide cost effective design for the Project.
  - c. Contracting Plan
  - d. Cost and Schedule Controls – this section contains the overall Project cost and schedule philosophy including.
  - e. University Staffing Plan
  - f. More information is available in the SDSU Building Program template located in FDCS Supplemental Design Guides/ [SDSU Building Program.doc](#).

END OF SECTION 05 PRE-PLANNING AND BUILDING PROGRAMMING

# Section 06 SCHEMATIC DESIGN

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## Section 06 SCHEMATIC DESIGN

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### 06.01 GENERAL

#### A. REFERENCE ABBREVIATIONS

1. O-DP Sample A/E Agreement Between Owner and Design Professional or executed Agreement

#### B. AGREEMENT BASIS

1. This phase of the Capital Planning Process is based on the Sample A/E Agreement for Non Delegated projects.

#### C. DESIGN PROFESSIONAL RESPONSIBILITIES

1. For responsibilities of the Design Professional, including those referenced under 06.01C, consult the Sample A/E Agreement for Non Delegated projects or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.03 in FDCS Sec 01 Working Relationships.
  - b. For general design phase responsibilities, see paragraphs under subsection 01.04 in FDCS Sec 01 Working Relationships.
2. Create Schematic Design Concepts based on the approved Building Program and publish in Adobe Portable document format (PDF) to the Owner's project web site for review by the Owner's Representative and the Planning Committee.
  - a. The number of Schematic Design Concepts will vary with project complexity and with the level of experience of the Design Professional with the project type.
  - b. Develop Schematic Design Concepts until Building Program requirements are met and a Schematic Design Concept is selected.
  - c. For requirements of each concept, see subsection 06.02.
3. Create a report describing the final selected Schematic Design Concept and publish in Adobe PDF to the Owner's project web site for university approval following requirements in subsection 06.03.
4. Create and submit a summary booklet in hard copy of the final selected Schematic Design Concept for use in developing the Facility Design Plan for approval by the Board of Regents, State of South Dakota, following requirements in subsection 06.04.
5. Publish interim documents in Adobe PDF to the project web site as needed or as requested by the Owner's Representative.
6. Communicate responses to review comments by the Owners Representatives using the Owner's Microsoft Excel template ([Review Comments.xls](#)). Rename the Excel Tab Sheet 1 to "Schematic"
  - a. In the XLS file(s), for each comment, enter a response in the yellow "Follow Up Comments" column that describes how the issue(s) will be addressed.
  - b. If there is not agreement by the Owner's Representative concerning how an issue will be addressed, work to attain a mutual resolution with the Owner's Representative.
    - 1) Record the revised follow up to the comment in the "Follow Up Comments" column.
  - c. Enter the follow up completion date in the yellow "Complete" column for each comment.

#### D. OWNER RESPONSIBILITIES

1. For responsibilities of the Owner, including those referenced under 07.01D, consult the Sample A/E Agreement for Non-Delegated projects or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.05 in Sec 01 Working Relationships.
2. Schematic Design for capital improvements meeting the requirements of BOR Policy 6:4(2.A), will culminate in the Owner preparing a Facility Design Plan (FDP) for BOR approval, see paragraphs under subsection 04.01.B.3.

### 06.02 SCHEMATIC DESIGN STUDIES (O-DP II.B.5)

#### A. DRAWINGS

1. Create simple electronic drawings, sketches and diagrams that show the Project's general form, scale, arrangement and relationship of functions and systems that appropriately respond to Building Program requirements.
  - a. Use of BIM software such as Autocad Revit is recommended, Google SketchUp or similar is acceptable.
2. Organize electronic drawings to print out on 8-1/2x11 and/or 11x17 sheet sizes.
3. Requirements for electronic sheets
  - a. Consistent drawing orientation and scale
    - 1) Normal minimum scale: 1/16" = 1' - 0"
    - 2) Site plan may be less than normal minimum scale.
  - b. Official Project Title (from the executed Agreement)
  - c. Submittal date
  - d. Design Professional's name
4. Required Drawing Types
  - a. 3D representation requirements
    - 1) Electronic model showing building character and relationship to site
    - 2) Perspective sketches in hard copy may be used to clarify design.
    - 3) Simple physical study models may be used to clarify design.
  - b. Site plan
    - 1) Show building orientation in context with programming requirements, climate factors, site conditions and surrounding area influences.
5. Show site setbacks, grade changes and other site restrictions.
6. Show access to bicycle and vehicular parking areas and to building entrances and service areas from existing vehicular and pedestrian routes.
7. Show approximate connection locations to existing utilities.
8. Show major landscape and hardscape elements.
9. Show storm water run-off patterns and water retaining areas.
  - a. Building plans of all levels, including existing conditions if the Project is a renovation
    - 1) General requirements
10. Show 1 plan per sheet unless approved otherwise by the Owner's Representative.
11. Identify spaces with Program Numbers and Names.
12. Identify required non-programmed circulation, public and service spaces.
13. Show major pieces of programmed furniture and other movable equipment.
14. Note Gross Square Feet (GSF) for the Project on each sheet.
  - a. Show exterior envelope and interior construction.
  - b. Show conveying equipment.
  - c. Show special construction.
  - d. Exterior Elevations
    - 1) Minimum number: 1 per building face
    - 2) Show exterior finish materials and colors.
  - e. Interior Elevations of Major Spaces
    - 1) Minimum number: 2
    - 2) Show interior finish materials and colors.
  - f. Building Sections
    - 1) Minimum number: 2
    - 2) Show interior finish materials and colors.

- 3) Show major level changes.
- 4) Show structural system materials.

**B. TABULATION OF AREAS**

1. Create a Microsoft Excel spreadsheet with the following information.
  - a. Spaces identified with Program Name, Number and programmed Net Assignable Square Feet (NASF)
  - b. Schematic Design NASF for each space and amount over or under programmed NASF
  - c. Gross Square Feet (GSF) per floor and total GSF for the Project
  - d. NASF-to-GSF ratio for the Project

**C. STATEMENT OF PROBABLE CONSTRUCTION COST**

1. Provide a Statement of Probable Construction Cost for each concept (O-DP II.B.6).
  - a. Show current total amounts and amounts for contingency.
  - b. Provide a multiplier that shows anticipated inflation to reflect conditions at time of bid.

**06.03 SELECTED CONCEPT DOCUMENT REQUIREMENTS FOR REVIEW (O-DP II.B.7)**

**A. GENERAL**

1. Create electronic documents for the Schematic Design Concept selected by the Campus Planning Committee.
2. Discuss with narratives and graphics the design process and the reasoning behind the selected design.
3. Organize electronic drawings to print out on 8-1/2x11 and/or 11x17 sheet sizes.
4. For required narratives 06.03.C7-17, discuss the considered and chosen systems and influencing factors.
  - a. When more than 1 system or material is being considered for an application, include a discussion of the criteria for selection within the narrative.

**B. INTRODUCTORY ORGANIZATION AND CONTENT**

1. Title Page
2. Table of Contents
3. List of Participants – a list of persons involved in the planning process, including members of the Planning Committee

**C. PROJECT DESIGN NARRATIVES**

1. Project Design Statement – a summary of the major intent of the Project
2. Project Systems Coordination Narrative – a discussion of how the Project's various systems coordinate to optimize solutions to Building Program requirements
3. Architectural Design Narrative – a discussion of the Design Professional's interpretation of the design criteria for the Project and steps that led to the final Schematic Design Concept
4. Existing Facility Narrative (if the Project is an addition or a remodel) – an assessment of the following existing building conditions that will impact the addition or remodel
  - a. Functional relationships
  - b. Accessibility
  - c. Structural and exterior envelope condition
  - d. Fire suppression and alarm systems
  - e. Environmental system performance
  - f. Utility availability and capacity
5. Project Demolition Narrative – a discussion of existing elements that will require demolition
6. Site Planning Narrative – a discussion of the site plan and influencing factors, including the following
  - a. [2025 University Master Plan](#)
  - b. [Campus Parking Study](#)
  - c. [Jack Rabbit Green Master Plan](#)

- d. [Signage and Wayfinding Program](#)
  - e. [Residential Life & Dining Services Master Plan](#)
  - f. [Brookings Area Master Transportation Plan](#)
  - g. [McCrory Gardens Master Plan](#)
  - h. Surrounding site context
  - i. Site historic ecosystem
  - j. Site surface and sub-surface features
  - k. Availability and location of utilities
  - l. Water control
  - m. If the Owner's Representative determines a National Pollutant Discharge Elimination System (NPDES) Construction Permit is required for the Project, include a discussion of pollution prevention solutions under consideration.
7. Foundation and Structure
- a. Compatibility with soil bearing conditions
  - b. Durability
  - c. Thermal, air barrier and moisture control systems
  - d. Vibration control (steel structural systems and vibration sensitive areas)
8. Exterior Wall
- a. Aesthetics
  - b. Durability
  - c. Thermal, air barrier and moisture control systems
  - d. Openings
  - e. Resistance to invasion from animals, insects and plants
9. Roofing
- a. Durability
  - b. Thermal, air barrier and moisture control systems
  - c. Color and appearance, if visible
  - d. Reflectivity Index
  - e. Parapets, scuppers and roof edges
  - f. Drainage locations
  - g. Openings
10. Interior Construction Narrative
- a. Partitions
  - b. Shafts
  - c. Finishes
  - d. Openings
11. Special Construction Narrative
12. Conveying Equipment Narrative
13. Mechanical and Plumbing Systems Narrative
- a. Heating, ventilation, air conditioning and refrigeration design criteria
  - b. Replacement, maintenance and clearance requirements
  - c. Indoor air quality criteria
  - d. Hydronic systems
  - e. Air handling and distribution systems
  - f. Supply and drain, waste & vent plumbing systems

- g. Lab plumbing and piping systems
- h. Roof drainage systems
- 14. Building Automation Systems Narrative
- 15. Electrical Systems Narrative
  - a. Power and emergency power requirements
  - b. Lighting fixture types
  - c. Location and maintenance issues
  - d. Integration with natural lighting
- 16. Life Safety and Security/Access Systems Narrative
- 17. Voice, Data and Audio/Video Systems Narrative

#### **D. DRAWINGS**

- 1. Include drawings required in subsection 06.02A.
- 2. Add the following systems to existing drawings or to new drawings that match existing drawing format.
  - a. Foundation and structural systems
  - b. Roofing systems
  - c. Diagrammed mechanical and plumbing systems
  - d. Diagrammed power and lighting systems
  - e. Diagrammed life-safety and security/access systems
  - f. Diagrammed voice, data and audio/video systems

#### **E. TABULATION OF AREAS**

- 1. Update the document required in subsection 06.02B.

#### **F. STATEMENT OF PROBABLE CONSTRUCTION COST**

- 1. Update the document required in subsection 06.02C.

#### **G. OTHER DOCUMENTS**

- 1. Project Schedule – a schedule that shows major milestones that meet Project phasing and completion requirements
- 2. State Building Code Narrative – a summary that shows compliance with major building code requirements
  - a. Use as a tool to guide decisions on site design, construction type and exiting issues.
- 3. Life Cycle Cost Narrative – a summary that shows approximate costs for the anticipated life of the Project
  - a. Consider this narrative the beginning of the Life Cycle Cost Analysis required in the Design Development Phase.
    - 1) Include a matrix of initial choices for analysis that include the following.
      - (a) alternatives for domestic hot water systems
      - (b) alternatives for lighting systems
      - (c) alternatives for HVAC systems in combination with 3 alternatives for building envelopes.
  - b. Use as a tool to guide design decisions on coordinating and optimizing building systems.
- 4. Leadership in Energy and Environmental Design (LEED) Narrative – a summary that includes strategies intended to comply with current requirements for LEED New Construction (LEED-NC) Certification level or higher.
  - a. Consider this narrative the beginning of the LEED-NC Analysis required in the Design Development Phase.
  - b. Use as a tool to guide design decisions to provide the Owner with high performance building systems and reduced negative impact on the environment.
  - c. For a check list of LEED points required by the Owner, see FDCS Supplemental Design Guides/ [SDSU LEED Checklist](#) for capital improvement projects.

## **06.04 REVIEW AND APPROVAL PROCESS FOR SELECTED CONCEPT**

### **A. UNIVERSITY REVIEW**

1. Publish the selected Schematic Design Documents in Adobe PDF to the project web site.
2. If published documents are considered by the Owner's Representative to be insufficiently complete for Owner review, revise and republish documents by a mutually agreed date and time at no additional cost to the Owner.
3. After acceptance by the Owner's Representative, submit to the Owner's Representative one hard copy and one PDF copy of the following documents.
  - a. Drawings as required under 06.03D
4. Documents will be reviewed by one or more of the following groups:
  - a. Planning Committee
  - b. Department representatives not on the Planning Committee
  - c. Department of Environmental Health and Safety
  - d. Facilities and Services
  - e. Other administrative and academic personnel
5. During review, comments will be published in 1 or more Microsoft Excel (XLS) files to the project web site by the Owner's Representative.
  - a. Respond to comments using the process described in paragraphs under 06.01.C7.

### **B. REVIEWS AND APPROVAL**

1. If the Project budget is \$1,500,000 or more, prepare an 8-1/2x11 Schematic Design Booklet in hard copy for review and approval by the Campus Project Committee.
  - a. Submit a draft booklet to the Owner's Representative for review and approval.
  - b. Comply with current requirements of South Dakota State University Schematic Design Booklet located in FDCS Supplemental Design Guides/[SDSU Schematic Design Booklet](#).
2. Facilities and Services will prepare a Facility Design Plan based on the approved concept. The FDP will be submitted to the Building Committee and the BOR for approval.
3. The Architect/Engineer shall receive written authority from the Owners Representative prior to proceeding beyond this phase of the project.

END OF SECTION 06 SCHEMATIC DESIGN PHASE

# Section 07 DESIGN DEVELOPMENT

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## Section 07 DESIGN DEVELOPMENT

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### 07.01 GENERAL

#### A. REFERENCE ABBREVIATIONS

1. O-DP - Sample A/E Agreement Between Owner and Design Professional or executed Agreement
2. D/D – Design Development

#### B. AGREEMENT BASIS

1. This phase of the Capital Planning Process is based on the Sample A/E Agreement for Non Delegated projects.
2. For Engineering projects, this phase is referred to as the Preliminary Design Phase.

#### C. DESIGN PROFESSIONAL RESPONSIBILITIES

1. For responsibilities of the Design Professional, including those referenced under 07.01C, consult the Sample A/E Agreement [http://www.state.sd.us/boa/ose/documents/OSE\\_AEContract.pdf](http://www.state.sd.us/boa/ose/documents/OSE_AEContract.pdf) or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.03 in FDCS Sec 01 Working Relationships.
  - b. For general design phase responsibilities, see paragraphs under subsection 01.04 in FDCS Sec 01 Working Relationships.
2. Prepare Design Development Documents from the Schematic Design Concept approved by the Owner's Representative that substantially define the Project in all aspects including structure, enclosure, building systems and items of equipment (O-DP II.C).
  - a. Create text documents using (or converted to) DOC files from the latest version of Microsoft Word and convert to Adobe Portable Document Format (PDF) for publishing to the Owner's project web site.
  - b. Create drawings using (or converted to) DWG files from the latest version of Autodesk AutoCAD, Architectural Desktop or RVT files from the latest version of Autodesk Revit and convert to Adobe PDF for publishing to the Owner's project web site.
3. Determine design solutions to all Project requirements.
  - a. Discuss with the Planning Committee, and appropriate personnel in Environmental Health and Safety and in Facilities Planning and Management.
  - b. Discuss with using departments through arrangements made by the Owner's Representative.
  - c. For consideration of a concept, method or product that deviates from the design standards stated in the Facilities Design and Construction Manual, initiate a comprehensive review by the Owner's Representative as early as possible during the Design Development Phase.
    - 1) Review will not normally be done after the Design Development Phase.
    - 2) Incorporate into the Project only after providing written justification and receiving written approval by the Owner's Representative.
  - d. Develop the design to the point of being completely ready for final documentation.
4. Continue the Building Automation System specification development process defined in Division 23 - HVAC.
5. Publish interim documents in Adobe PDF to the Owner's project web site as needed or as requested by the Owner's Representative.
6. Communicate responses to review comments by the Owner using the Owner's Microsoft Excel template (Supplemental Design Guides Docs/[Review Comments](#)) published on the Owner's project web site.
  - a. In the XLS file(s), for each comment, enter a response in the yellow "Follow Up Comments" column that describes how the issue(s) will be addressed.
  - b. If there is not agreement by the Owner's Representative concerning how an issue will be addressed,

work to attain a mutual resolution with the Owner's Representative.

- 1) Record the revised follow up to the comment in the "Follow Up Comments" column.
- c. Enter the follow up completion date in the yellow "Complete" column for each comment.

#### **D. OWNER RESPONSIBILITIES**

1. For responsibilities of the Owner, including those referenced under 07.01D, consult the Sample A/E Agreement for Non Delegated projects at [http://www.state.sd.us/boa/ose/documents/OSE\\_AEContract.pdf](http://www.state.sd.us/boa/ose/documents/OSE_AEContract.pdf) or, if the Project is active, the executed Agreement.
  - a. For general administrative Owner responsibilities, see paragraphs under subsection 01.05 in FDCC Sec 01 Working Relationships.
2. The Owner will furnish the services of a geotechnical engineer or other Professional Consultant when deemed necessary by the Design Professional and approved by the Owner (O-DP IV.C).
3. The Owner will assist the Design Professional to develop a design that fits contextually, and properly correlates with existing buildings, topography, site features and utility systems.
4. The Owner will define final room numbers and door numbers for the Design Professional and will provide follow-up renumbering if room configurations and/or door locations are subsequently revised.
  - a. See the Owner's room numbering and door numbering standards at Supplemental Design Guides/[Room Numbering Standards.pdf](#).

### **07.02 REQUIRED DESIGN DEVELOPMENT DOCUMENTS FOR UNIVERSITY REVIEW**

#### **A. NUMBER OF SUBMITTALS**

1. Most projects will only require a single D/D submittal at one hundred percent of the design development phase.
2. Large or technically complex projects may benefit from a fifty percent Design/Development submittal. If a fifty percent submittal is requested by the Owner, the Design Professional and the Owner will document at the beginning of the D/D phase the requirements for the 50% D/D.
  - a. Generally a 50% D/D submittal will include all the items discussed in 07.02c with the only exception being 07.02c2 (dimensions).
  - b. All design elements included in the 50% D/D submittal shall be shown to scale if they are not dimensioned.

#### **B. DRAWING FORMAT**

1. Provide drawings and diagrams that clearly show the Project's major details, materials, surface characteristics, constructability and the coordination and integration of system components.
2. Use Autodesk Revit, Autodesk Architectural Desktop or Autocad Civil 3D with objects and following [SDSU Cadd Standards](#) in conjunction with:
  - a. The U.S. National CAD Standard layering and organization (<http://www.nationalcadstandard.org/>) guide for additional guidance.
3. Provide Adobe PDF files that print to standard sheet sizes.
  - a. Sheet sizes 30x42 is preferred for Architectural projects.
  - b. Sheet sizes 22x34 is preferred for Civil projects.
  - c. Sheet sizes larger than 30x42 require approval by the Owner's Representative.
4. Requirements for All Sheets
  - a. Consistent drawing orientation and scale
    - 1) Use the scale that will be used for Construction Documents, normally not less than 1/8" = 1' - 0".
    - 2) Use the same scale for plans, elevations and building sections.
  - b. Official Project Title
  - c. Submittal date
  - d. Design Professional's name

## C. DRAWINGS

### 1. Required Drawing Types

- a. Site plan (Supplemental Design Guides/[Landscape And Site Design Development Checklist](#))
  - 1) Show required demolition of physical and natural elements.
  - 2) Show building and site in context with surrounding area.
  - 3) Show utilities locations and connections.
  - 4) Show hardscape and circulation elements.
- b. Dimensions
  - 1) All design elements listed below or shown in the plans shall be dimensioned in the D/D set submitted for review.
- c. Building plans of all levels
  - 1) General requirements.
    - (a) Show names and NASF of non-programmed circulation, public and service spaces.
    - (b) Show final room numbers and door numbers provided by the Owner's Representative.
    - (c) Show major control dimensions and dimensions needed to determine room sizes.
  - 2) Show required demolition if the Project is a renovation.
  - 3) Show foundation and structural systems.
  - 4) Show exterior walls.
  - 5) Show roofing systems.
  - 6) Show continuity of thermal, air barrier and moisture control systems.
    - (a) Show detail sketches at roof/wall/opening/floor/foundation intersections.
  - 7) Show interior construction.
  - 8) Show fixed equipment to be furnished and installed by the Contractor.
    - (a) Examples are built-in items such as, but not limited to, laboratory casework, fume hoods, benches, wall cabinets, shelves, counters, white boards, tack boards, projection screens and coat racks.
  - 9) Show fixed equipment to be furnished by the Owner and installed by the Contractor.
    - (a) Examples are items such as, but not limited to, media cabinets, teaching stations, carpet, drapes and blinds, that are identified in the Building Program or during the Design Development Phase.
  - 10) Show major pieces of programmed furniture and other movable equipment.
    - (a) Movable equipment typically designed or selected, furnished and installed by the Owner are non-built-in items such as, but not limited to, office furniture, file and storage cabinets, free-standing bookcases, scientific equipment and office equipment.
    - (b) The cost of movable equipment furnished and installed by the Owner is not included in the total construction cost of the Project.
    - (c) Show movable equipment furnished and installed by the Owner to verify adequate space and utilities are provided by the Project.
  - 11) Show conveying equipment.
  - 12) Show special construction.
  - 13) Show mechanical and plumbing systems.
  - 14) Show electrical systems.
  - 15) Show life safety and security/access systems.
  - 16) Show voice, data and audio/video systems.
- d. Exterior Elevations
  - 1) Show initial drawings that will be included in the Construction Documents.

- 2) Show exterior finish materials
- e. Interior Elevations
  - 1) Show initial drawings that will be included in the Construction Documents.
  - 2) Show interior finish materials
- f. Building Sections
  - 1) Show initial drawings that will be included in the Construction Documents.
  - 2) Show interior finish materials.
  - 3) Show major level changes.
  - 4) Show structural system materials.
- g. Schedules
  - 1) Show initial schedules that will be included in the Construction Documents.
  - 2) Show room numbers (provided by the Owner's Representative) in the Room Finish Schedule.
    - (a) When labeling subdivided rooms in the schedule, use the room number plus a text modifier.
  - 3) Show door numbers (provided by the Owner's Representative) in the Door Finish Schedule.
- h. Plumbing, Mechanical and Electrical System Schematic Diagrams
- 2. Outline Specification
  - a. Show all specification sections that will be included in the Construction Documents.
  - b. Follow recommendations of Construction Specifications Institute's MasterFormat 2004 or newer.
  - c. Provide manufacturer's illustrations of specified products that include the following.
    - 1) Products that will be assembled, fabricated or manufactured
    - 2) Products that will be visible when construction is completed
    - 3) Products that comprise the thermal, air barrier and moisture control systems within the exterior envelope.
  - d. For products that deviate from standards stated in this Facilities Design Manual, include a copy of the Design Professional's justification and written approval by the Owner's Representative.
- 3. Schedules
  - a. Provide schedules for all expected equipment, ie. mechanical, electrical, architectural, civil, etc. Populate data fields in the schedule only after the unit size, capacity, etc. has been determined for this particular job. Partially populated schedules are acceptable.
    - 1) Realize that the Owner is likely to review and comment on the content of the schedule and if it includes information cut and pasted from other jobs, or from preliminary equipment selections that are no longer valid it is a waste of review time and energy. All schedules shall clearly identify the units of measure in the column headings.
- 4. Design Data/Basis of Design
  - a. Calculations and assumptions used in the design of HVAC and structural systems, examples:
    - 1) Energy Models
    - 2) Structural loading and factors of safety,
    - 3) Complete set of structural calculations, including the check set.
- 5. Tabulation Of Areas
  - a. Add columns to the Tabulation of Areas created during Schematic Design with the following updated information based on Design Development Document.
    - 1) Final room number for each space
    - 2) Net Assignable Square Feet (NASF) for each space and amount over or under programmed NASF
    - 3) Gross Square Feet (GSF) per floor and total GSF for the Project
    - 4) NASF-to-GSF ratio for the Project

6. Statement Of Probable Construction Cost
  - a. Provide an updated Statement of Probable Construction Cost based on Design Development Documents (O-DP II.C.4).
    - 1) Show current total amounts and amounts for contingency.
    - 2) Provide a multiplier that shows anticipated inflation to reflect conditions at time of bid.
    - 3) If the Owner employs an independent cost consultant or construction manager, review and, if applicable, provide a written exception to any part of the report produced by the independent cost consultant or construction manager.
7. Preliminary Storm Water Pollution Prevention Plan (SWPPP)
  - a. A Pollution Prevention Plan is a prerequisite to obtaining a National Pollutant Discharge Elimination System (NPDES) Construction Permit when any of the following conditions exists.
    - 1) The area disturbed inside the construction limits is 1 acre or more.
    - 2) The Project is a part of a "larger plan of development" being constructed in stages that will disturb 1 acre or more.
  - b. Where a permit is not required, incorporate best NPDES practices into the site plans.
  - c. When required, consider the Preliminary Pollution Prevention Plan the beginning of the Final Pollution Prevention Plan required midway in the Construction Documents Phase.
8. Other Documents
  - a. Project Design Narratives
    - 1) Based on Design Development Documents, update and clearly indicate deletions and additions to the Project Design Narratives created in the Schematic Design Phase.
  - b. SDSU Public Art - a discussion of how fine arts may be incorporated into the Project
  - c. Design Standards Exception Narrative
    - 1) Provide an updated narrative of concepts, methods or products that deviate from standards stated in this Facilities Design and Construction Manual based on Design Development Documents.
  - d. Project Schedule
    - 1) Provide an updated schedule based on Design Development Documents that shows major milestones that meet Project phasing and completion requirements.
  - e. State Building Code Analysis
    - 1) Provide drawings that show design compliance with State Building Code requirements, including type of construction, fire separations, exiting and site layout.
  - f. Leadership in Energy and Environmental Design (LEED) Analysis
    - 1) Based on Design Development Documents, describe strategies to be used which comply with current requirements for the LEED-NC target level of the Project.
    - 2) The Owner's check list of LEED points may be used as a support document for the analysis.
      - (a) Supplemental Design Guides/[LEED Checklist](#) for capital improvement projects. Refer to Div. 01 – GENERAL REQUIREMENTS for additional information on LEED and sustainability.

### **07.03 FINISH SAMPLES**

#### **A. EXTERIOR**

1. Create a board that displays samples of exterior finish material showing color and texture.

#### **B. INTERIOR**

1. Create a board that displays samples of interior finish material showing color and texture.

### **07.04 REVIEW AND APPROVAL PROCESS**

#### **A. UNIVERSITY REVIEW**

1. Publish the Design Development Documents in Adobe PDF to the Owner's project web site.

2. If published documents are considered by the Owner's Representative to be insufficiently complete for Owner review, revise and republish documents by a mutually agreed date and time at no additional cost to the Owner.
3. After acceptance by the Owner's Representative, submit to the Owner's Representative two (2) copies of the following documents.
  - a. Drawings as required under 07.02A
  - b. Outline Specifications as required under 07.02B
4. Submit 2 each of material finish sample boards required under 07.03A & B to the Owner's Representative.
5. The documents and boards will be critically reviewed in detail by the following groups.
  - a. Planning Committee
  - b. Department representatives not on the Planning Committee
  - c. Department of Environmental Health and Safety
  - d. Facilities and Services: Planning, Design and Construction group
  - e. Other administrative and academic personnel
6. During review, comments will be published in 1 or more Microsoft Excel (XLS) files to the project web site by the Owner's Representative.
  - a. Respond to comments using the process described in paragraphs under 07.01C6.

**B. UNIVERSITY APPROVAL**

1. After all required documents have been received and review issues have been resolved to the satisfaction of the Owner's Representative, the Owner's Representative will provide written approval to proceed to Construction Document Phase.
2. After approval, publish updated Design Development Documents in Adobe PDF to the following locations on project web site.

END OF SECTION 07 DESIGN DEVELOPMENT

# Section 08 CONSTRUCTION DOCUMENTS

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## Section 08 CONSTRUCTION DOCUMENTS

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### 08.01 GENERAL

#### A. REFERENCE ABBREVIATIONS

1. O-DP Sample A/E Agreement Between Owner and Design Professional or executed Agreement

#### B. AGREEMENT BASIS

1. This phase of the Capital Planning Process is based on the Sample A/E Agreement for Non-Delegated projects.
2. An Engineering project requires slightly different services and deliverables.
3. This phase is normally not included in an Agreement for Consulting Services projects.

#### C. DESIGN PROFESSIONAL RESPONSIBILITIES

1. For responsibilities of the Design Professional, including those referenced under 08.01C, consult the Sample A/E Agreement for [Non-Delegated](#) projects or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.03 in FDCS Sec 01 Working Relationships.
  - b. For general design phase responsibilities, see paragraphs under subsection 01.04 in FDCS Sec 01 Working Relationships.
2. Prepare Construction Documents from the Design Development Documents approved by the Owner's Representative to facilitate competent bidding and construction of the Project (O-DP II.D.1).
  - a. Create DOC text files using the latest version of Microsoft Word or other 100% compatible software and convert to Adobe Portable Document Format (PDF) for publishing to the project web site.
  - b. Create DWG drawing files using the latest version of Autodesk AutoCAD, Architectural Desktop, Revit or other 100% compatible software and convert to Adobe PDF for publishing to the project web site.
  - c. Continue to follow recommendations of the SDSU Cadd Standard and the current U. S. National CAD Standard (<http://www.nationalcadstandard.org/>) [SDSU Cadd Standards](#) and the current Project Resource Manual – CSI Manual of Practice (<http://www.csinet.org/Main-Menu-Category/CSI-Store/6>).
  - d. Complete Drawings and update other documents begun in Design Development Phase.
    - 1) Include the location of the following items on the Drawings.
      - (a) Site limits
      - (b) Gate(s)
      - (c) Off-site storage area(s)
      - (d) Haul route(s)
      - (e) Fence-protected trees
      - (f) Protected pedestrian routes
    - e. Where temporary structures are required to protect pedestrians from construction operations, include drawings and specifications for protective structures in the Construction Documents.
    - f. Complete Division 01-49 specifications applicable to the Project.
      - 1) Verify entire Division 01 content with the Owner's Representative.
  3. Initiate meetings with university personnel at appropriate milestones in the development of the Drawings and Specifications through arrangements made by the Owner's Representative.
  4. Publish monthly progress review documents and interim documents in Adobe PDF to the project web site as needed or as requested by the Owner's Representative.
  5. Communicate responses to review comments by the Owner using the Owner's Microsoft Excel template (see FDCS Supplementary Design Guides Docs/[Review Comments.xls](#)) published to the Owners project website.

- a. In the XLS file(s), for each comment, enter a response in the yellow "Follow Up Comments" column that describes how the issue(s) will be addressed.
  - b. If there is not agreement by the Owner's Representative concerning how an issue will be addressed, work to attain a mutual resolution with the Owner's Representative.
    - 1) Record the revised follow up to the comment in the "Follow Up Comments" column.
  - c. Enter the follow up completion date in the yellow "Complete" column for each comment.
6. Provide to the Owner a letter that contains a list of all special inspections required for the Project.
  7. Certify that no asbestos containing material (ACM), polychlorinated biphenyls (PCB) or other hazardous material identified by the Owner were specified for the Project by signing the No Hazardous Material Certification Form available from the Owner's Representative.
    - a. ACM is defined at [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9995](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9995) under 29CFR1910.1001(b) as material containing more than 1% asbestos.

#### **D. OWNER RESPONSIBILITIES**

1. For responsibilities of the Owner, consult the Sample A/E Agreement for [Non-Delegated](#) projects at or, if the Project is active, the executed Agreement.
  - a. For general administrative Owner responsibilities, see paragraphs under subsection 01.05 in FDCS Sec 01 Working Relationships.
2. The Owner will pay for special inspection services required for the Project.
3. The Owner will assist the Design Professional to determine appropriate security access, lock functions and keyways before the Specifications are completed.

### **08.02 REQUIRED CONSTRUCTION DOCUMENTS FOR UNIVERSITY REVIEW**

#### **A. SUBMITTALS**

1. Fifty Percent (50%) Construction Document Submittal
  - a. All drawings, standard details, special details, and note sheets expected to be included in the 95% submittal shall be included
  - b. All details shall be fully developed and dimensioned
  - c. All layouts and details shall be dimensioned
  - d. Standard notes shall be incorporated and referenced to the SDSU project
  - e. Required Supplemental Conditions and Special Conditions should be identified
  - f. Final Storm Water Pollution Prevention Plan shall be submitted for review
  - g. Updated estimate of probable construction cost
  - h. Updated project schedule
2. Ninety Five Percent (95%) Construction Document submittal (Final Review)
  - a. All plan notes fully developed
  - b. Project Manual including Owners Division 00, Specifications, Supplemental Conditions, and Special Conditions are fully developed and incorporated into the construction drawings.
  - c. All required material specifications shall be fully developed to the specific project
  - d. All tables and quantities are fully developed
  - e. Storm Water Pollution Prevention Plan if required shall be submitted with the required Notice of Intent and Notice of Storm Water Discharge.
  - f. Updated estimate of probable construction cost
  - g. Updated project schedule

#### **B. DRAWING REQUIREMENTS**

1. Complete Drawings begun during the Design Development Phase to completely describe the following.

- a. Show location and generic identification of each material.
  - b. Show dimensions of construction and site-fabricated assemblies.
  - c. Show large scale details of material interfaces.
  - d. Show diagrams as needed to clarify building systems.
2. Ensure completed Drawings are clear, concise, correct and complete.
    - a. Coordinate Drawings to prevent gaps and duplication of information.
    - b. Ensure text is correctly spelled, reads with proper grammar and uses the same terms as used in the Specifications.
    - c. Ensure Drawings are readable when printed half size.
  3. Coordinate Drawings to ensure all building systems are accurately sized and located to allowed sufficient space to function properly and be easily serviced by the Owner's maintenance personnel.
  4. Schedule and provide design and operating parameters for each item of equipment, including the following.
    - a. Mechanical and plumbing
    - b. Building automation
    - c. Electrical
    - d. Life safety and security/access
    - e. Voice, data and audio/video
    - f. All fixed and movable
  5. Incorporate requirements of the State Building Code and other regulations applicable to the Project into the Drawings.
    - a. Provide a code analysis sheet that includes plans that clearly show wall and partition fire ratings.
    - b. Provide a structural analysis sheet that includes plans that clearly show design dead and live floor loads.
  6. Provide a cover sheet approved by the Owner's Representative for each drawing set that shows the following information.
    - a. The official title of the Project
    - b. Maps that identify the location of the Project
    - c. A legend that identifies abbreviations and symbols used in the Drawings
    - d. An index of Drawings that identifies the content of each sheet
    - e. Space for the Design Professional's and Professional Consultant's certification, seal, signature and registration number
  7. Assist the Owner's Representative with coordinating the Division 00 Bidding and Contracting Documents with the Drawings to eliminate conflicting and redundant requirements.
  8. If an NPDES Construction Permit is required, complete the final Pollution Prevention Plan
    - a. Discuss BMP's with Facilities and Services
    - b. Midway through Construction Document Phase, submit the final Pollution Prevention Plan to the Owner's Representative for review.
    - c. Prepare a Notice of Intent Form and a Public Notice of Storm Water Discharge and submit both to the Owner's Representative.

### **C. SPECIFICATION REQUIREMENTS**

1. Complete the Specifications begun during the Design Development Phase to completely describe the following.
  - a. Product protection and site handling requirements
  - b. Physical, chemical and performance requirements of products
  - c. Product field-assembly and installation requirements

2. Ensure completed Specifications are clear, concise, correct and complete.
  - a. Coordinate Specifications to prevent gaps and duplication of information.
  - b. Ensure Specifications contain only Project-related information.
  - c. Ensure products are currently available and Specifications reference current standards.
  - d. Ensure text is correctly spelled and reads with proper grammar.
  - e. Use of streamlining and imperative mood sentence structure directed to the Contractor is recommended.
3. For referenced standards, clearly state what portions of the standards are applicable to the Project.
  - a. If abbreviations are used, provide a list that identifies the full name of the standard organization in Section 01 42 00 References or in General within each section.
4. Except for specific products required by this Facilities Design and Construction Standards, write Specifications to be nonrestrictive as follows.
  - a. Show performance requirements that establish attributes of the desired product, such as type, function, dimension, appearance and quality.
  - b. Where possible, list products from at least 3 different manufacturers that meet the performance requirements.
  - c. Below the product list state "Approved Equivalent".
5. Number pages within each respective section.
6. Obtain approval from the Owner's Representative before including other documents such as schedules and detail drawings.
7. Assist the Owner's Representative with coordinating Division 00 Bidding and Contracting Documents with the Specifications to eliminate conflicting and redundant requirements.
8. Where abatement procedures will not be completed before construction begins, include a description of how abatement procedures will be scheduled during the construction process.
9. Clearly specify requirements for the unloading, uncrating, installation, connection with utilities and clean-up of all fixed and movable equipment installed by the Contractor.
10. Specify special inspections required by IBC Section 1704 applicable to the Project.

#### **D. TABULATION OF AREAS**

1. Add columns to the Tabulation of Areas created during Schematic Design and Design Development with the following updated information based on Construction Documents.
  - a. Final room name and number for each space
  - b. Construction Document Net Assignable Square Feet (NASF) for each space and amount over or under programmed NASF
  - c. Gross Square Feet (GSF) per floor and total GSF for the Project
  - d. NASF-to-GSF ratio for the Project

#### **E. STATEMENT OF PROBABLE CONSTRUCTION COST**

1. Provide an updated Statement of Probable Construction Cost based on the Construction Documents (O-DP II.D.8).
  - a. Show current total amounts and amounts for contingency.
  - b. Provide a multiplier that shows anticipated inflation to reflect conditions at time of bid.

#### **F. OTHER DOCUMENTS**

1. Project Schedule
  - a. Provide an updated schedule based on Construction Documents that shows major milestones that meet Project phasing and completion requirements.
2. Leadership in Energy and Environmental Design (LEED) Analysis
  - a. Provide an updated analysis based on specific LEED requirements in the Construction Documents.

## **08.03 REVIEW AND APPROVAL PROCESS**

### **A. MONTHLY PROGRESS REVIEWS**

1. Publish Construction Documents each month to the Owner's project web site for the Owner's Representative to review to verify progress.
  - a. Payment to the Design Professional will be adjusted commensurate with the progress of the documents as determined by the Owner's Representative.
  - b. Respond to review comments from the Owner's Representative as described in paragraphs under 08.01C6.

### **B. UNIVERSITY REVIEW**

1. Publish the Construction Documents (Drawings, Specifications and Additional Documents) in Adobe PDF to the project web site.
  - a. Add "Final Construction Documents" to cover sheets of documents.
2. If the published documents are considered by the Owner's Representative to be insufficiently complete for Owner review, revise and republish documents by a mutually agreed date and time at no additional cost to the Owner.
3. After acceptance by the Owner's Representative, submit the following Construction Documents to the Owner's Representative for distribution.
  - a. Drawings and Specifications as required in paragraphs under 08.02A & 08.02B respectively
    - 1) Quantity will be determined by the Owner's Representative.
    - 2) Provide the Owner's Representative with the number of sets required by the Design Professional and Professional Consultants.
4. The documents will be critically reviewed in detail by the following groups.
  - a. Planning Committee
  - b. Department representatives not on the Planning Committee
  - c. Department of Environmental Health and Safety
  - d. Facilities Planning and Management
  - e. Other administrative and academic personnel
5. During review, comments will be published in 1 or more Microsoft Excel (XLS) files to the project web site by the Owner's Representative.
  - a. Respond to comments using the process described in paragraphs under 08.01C6.

### **C. BUILDING COMMITTEE APPROVAL**

1. After all required documents have been received and review issues have been resolved to the satisfaction of the Owner's Representative, the Owner's Representative will provide written approval to proceed to the Bidding Phase.
2. After approval, publish updated Construction Documents in Adobe PDF to the Owner's project web site.
3. Submit to the Owner's Representative the Approval Letter, both in hard copy, and publish both in Adobe PDF to the project web site.

END OF SECTION 08 CONSTRUCTION DOCUMENTS PHASE

# Section 09 BIDDING AND CONSTRUCTION

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## Section 09 BIDDING AND CONSTRUCTION

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### 09.01 GENERAL

#### A. REFERENCE ABBREVIATIONS

1. O-DP Sample A/E Agreement Between Owner and Design Professional or executed Agreement
2. Sample Division 00 Document or executed Contract
  - a. IB - Instructions to Bidders
  - b. GC - General Conditions of the Contract
  - c. SC - Supplementary Conditions
  - d. SPC - Special Conditions

### 09.02 BIDDING PHASE

#### A. AGREEMENT BASIS

1. This phase of the Capital Project Process is based on the Sample A/E Agreement for Non-Delegated projects.
2. This phase is normally not included in Consultant Services projects.

#### B. DESIGN PROFESSIONAL RESPONSIBILITIES

1. For responsibilities of the Design Professional, including those referenced under 09.02B, consult the Sample A/E Agreement for [Non-Delegated](#) projects or, if the Project is active, the executed Agreement.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.03 in FDCS Sec 01 Working Relationships.
  - b. For general design phase responsibilities, see paragraphs under subsection 01.04 in FDCS Sec 01 Working Relationships.
2. Consult with the Owner's Representative to identify bidding strategies, including alternates that protect the integrity of the budgeted construction cost.
3. Non-Delegated Projects
  - a. Submit 1 set of bid documents to OSE.
  - b. Submit 2 sets of bid documents to SDSU including one half size set.
  - c. Publish Bidding Documents that include Drawings, Specifications, Project Manual Cover Sheet, Table of Contents and all Addenda, in Adobe Portable Document Format (PDF) to the Owner's project web site.
  - d. OSE will advertise the project, open bids, and award the project.
  - e. Submit bid documents to plan houses, and maintain a list of plan holders.
  - f. Prepare and issue any required Addenda.
4. Delegated Projects
  - a. Submit 1 set of bid documents to OSE.
  - b. Submit 2 sets of bid documents to SDSU including one half size set.
  - c. Publish Bidding Documents that include Drawings, Specifications, Project Manual Cover Sheet, Table of Contents and all Addenda, in Adobe Portable Document Format (PDF) to the Owner's project web site.
  - d. SDSU will advertise the project, open bids, and award the project.
  - e. Submit bid documents to plan houses, and maintain a list of plan holders.
  - f. Prepare and issue any required Addenda.
  - g. Coordinate the printing and distribution of Bidding Documents and all Addenda.
5. If a pre-bid conference is held, participate in the conference with the Owner.

6. Obtain and forward letters of approval from applicable State agencies to the Owner's Representative prior to the bid date of the Project.
7. Assist the Owner in evaluation of the bids by writing a letter of recommendation to the Owner's Representative.

### **C. OWNER RESPONSIBILITIES**

1. For responsibilities of the Owner, including those referenced under 09.02C, consult the Sample A/E [Non-Delegated](#) for Non Delegated projects and the [Sample Division 00](#) document or, if the Project is active, the executed Agreement and the executed Contract.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.05 in FDM Part 1/ Sec 01 Working Relationships.
2. The Owner's Representative will schedule pre-bid meeting(s) and tours.
3. The Owner's Representative will designate parking for persons attending the bid opening.
4. Receive and evaluate bids, investigate the ability of bidders to perform the Work, and reject bids or recommend award of contract(s).
5. Send a Notice of Award letter and Notice to Proceed letter to the successful bidder.
6. For Delegated projects, prior to awarding a contract, OSE requests the information listed below. The Owner's Representative should consult the signed OSE Work Request. and cover letter for any changes to this list.
  - a. A summary of bids or quotes received for the work
  - b. If the bidding was informal, a listing of contractors who declined to bid the work if less than three bids are received.
  - c. If the contract amount is over \$50,000 for public building improvement projects and \$25,000 for supplies and Non Professional services, a copy of the advertisement as documentation that SDSU complied with the public notification requirements SDCL 5-18A-14.
  - d. If the contract amount is over \$50,000 for any professional service, a copy of the Request for Proposals and Supporting Selection documentation as required in SDCL 5-18D-17 thru 5-18D-22.

## **09.03 CONSTRUCTION PHASE**

### **A. AGREEMENT BASIS**

1. This phase of the Capital Planning Process is based on the Sample A/E Agreement for Non-Delegated projects.

### **B. DESIGN PROFESSIONAL RESPONSIBILITIES**

1. The Design Professional provides services as described below, and in accordance with the conditions of the construction contract provided under Part II.D.2 of the Sample A/E Agreement, during the construction phase. The executed agreement shall govern the Design Professional.
  - a. Services under this phase shall commence upon award of contracts for construction.
2. Duties, responsibilities and limitations of authority of the Design Professional shall not be restricted, modified, or extended without written agreement of the Design Professional and the State Engineer.
3. The Design Professional is the representative of the State during the construction phase of the Project, and advises and consults with the State Engineer and the State Building Committee.
  - a. Instructions to the contractor shall be forwarded through the Design Professional.
  - b. The Architect shall have the authority to act on behalf of the State only to the extent provided herein and in the contract documents, unless otherwise specifically agreed in writing.
4. The Design Professional will visit the construction site at intervals appropriate to the stage of construction, but averaging every two weeks, to keep generally familiar with the progress and quality of the work completed and to determine in general if the Project is being constructed in a manner such that

when completed it would be in conformance with the plans and specifications and other contract documents.

- a. On the basis of such observations or inspections, the Design Professional keeps the State Engineer and the State Engineer's representative informed of the progress and quality of the work on the Project and endeavor to guard the State against defects and deficiencies in the work of the contractor.
  - b. Every two weeks, the Design Professional provides a written report to the State Engineer and the State Engineer's representative as to the progress of the Project, items noted for correction, and remedial actions, if any, required.
  - c. The State Engineer or an authorized representative of the State Engineer may attend such site visits or inspections, and other inspections or observance activities conducted by the Design Professional, or may on their own observe or inspect the progress of the Project at other times, but the responsibility for performing any inspections or observance of the construction work in accordance with this paragraph remains with the Design Professional.
  - d. Any services provided pursuant to Part III.B of the A/E Agreement shall be an additional service over and above the services to be provided under this paragraph.
5. The Design Professional shall endeavor at all times to guard the State against defects and deficiencies in the Project as executed by the Contractors, however, the Design Professional is not be required to guarantee the performance of the Contractors.
6. Prompt written notice is given by the Design Professional to the State Engineer if the Design Professional becomes aware of any fault or defect in the Project or non-conformance with the contract documents.
7. The Design Professional does not have control over or charge of and is not responsible for the following since these are solely the Contractor's responsibilities under the Contract for Construction.
- a. Construction means, methods, techniques, sequences or procedures
  - b. Safety precautions and programs in connection with the Project
  - c. The Design Professional shall not be responsible for the Contractor's schedules or failure to carry out the Project in accordance with the Contract Documents.
  - d. The Design Professional does not have control over or charge of acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Project
    - 1) Except to the extent that the Design Professional may formally notify the Contractor of the unacceptability of various portions of the Project or failure to carry out the work on the Project in accordance with the contract documents.
  - e. The Design Professional will inform the Contractor on behalf of, and in consultation with, the State Engineer to cease work on the Project or portions thereof affected by those items that are unacceptable and remain uncorrected until such time as corrections are made.
  - f. Nothing above is intended to relieve the Design Professional of its responsibility as set forth in the A/E Agreement to observe that the Project is completed in accordance with the plans, specifications, and contract documents.
8. The Design Professional must at all times have access to the Project wherever it is in preparation or progress.
9. Except as may otherwise be provided in the Contract Documents or when direct communications have been approved by the Design Professional, the Owner and their Representatives and the Contractor must communicate through the Design Professional.
- a. Communications by and with the Design Professional's consultants are through the Design Professional.
10. The Design Professional will determine the amounts owing to the Contractor based on inspections and observations at the site, and on evaluations of the Contractor's Monthly Applications for Payment, and

shall issue Certificates of Payment for amounts due on forms provided by the State Engineer.

- a. A Certificate of Payment constitutes a representation by the Design Professional to the State, based upon the inspections and the information provided by the Contractor in the Application,
  - 1) That the Project has progressed to the point indicated;
  - 2) That to the best of the Design Professional's knowledge, information, and belief, the quality of the work on the Project is in accordance with the Contract Documents;
  - 3) That the Contractor is entitled to payment in the amount certified.
11. The Design Professional has authority to reject work on the Project, which does not conform to the Contract Documents.
  - a. Whenever the Design Professional considers it necessary or advisable for implementation of the intent of the Contract Documents, the Design Professional has authority to require additional inspection or testing of the work in accordance with the provisions of the Contract Documents,
    - 1) Whether or not such work is fabricated, installed, or completed.
    - 2) Neither this authority of the Design Professional nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Design Professional to any Construction Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the work on the Project.
12. The Design Professional reviews and approves or takes other appropriate action on Shop Drawings, Product Data and Samples submitted by Construction Contractors to determine if they conform with the design concept for the Project and with the information provided in the Contract Documents
  - a. The A/E will submit these documents or information to the State Engineer indicating the Design Professional's approval or comments with reasonable promptness so as to cause no delay to the prosecution of the Project.
  - b. Approval or acceptance of a specific item shall not necessarily indicate the Design Professional's approval of an assembly of which the item is a component.
  - c. When professional certification of equipment is required by the Contract Documents, the Design Professional will be entitled to rely upon that certification to determine that the materials, systems, or equipment will meet the performance criteria required in the Contract Documents.
13. Design Professional consults with and advises the State Building Committee and the State Engineer during construction on any items which concern interpretation of design.
  - a. The Design Professional makes recommendations to the State Building Committee on any adjustments that may be proposed by the Contractor or the State agencies involved in the Project.
  - b. The Design Professional makes such necessary drawings or prepares descriptive information for change order proposals as required and shall review the proposals for accuracy and recommend approval to the State Engineer;
    - 1) After proposals are accepted by the State Engineer, the Design Professional shall prepare the necessary change order documents on forms provided by the State Engineer.
14. Design Professional conducts, at the time and place approved by the State Engineer, with representatives of the State agencies involved in the Project and the Contractor, inspections to establish dates of Project acceptance and completion.
  - a. The Design Professional shall have other Architects, Structural, Mechanical, or Electrical Engineers, or other consultants in their employ in attendance at this and at various progress inspections as may be necessary to evaluate whether the work completed on the Project is in conformance with the Contract Documents.
  - b. Design Professional will receive and forward to the State Engineer, with comments on completeness or acceptability, those warranties, operation manuals, and other documents required by the Contract Documents and assembled by the Contractor.

15. Design Professional will review the final estimate for final payment to the Contractor and provide a Certificate of Final Payment to the State Engineer.
16. Design Professional will provide to the State Engineer, State Building Committee, or the Contractor, upon written request, interpretations and decisions in writing, or in the form of drawings, on matters concerning performance under the Contract Documents, and execution or performance of the work on the Project.
  - a. Response to such requests shall be made with reasonable promptness and within any time limits agreed upon. The final decision on all such questions shall be made by the State Engineer on behalf of the State Building Committee.
17. Design Professional will maintain a log of all Request for Proposals and Change Orders.
18. Design Professional shall attend monthly construction progress meetings and take minutes of said meetings. Design Professional shall publish minutes of said meetings to the Owner, State Engineer, and Contractor.
19. When the Project is completed, the Design Professional will furnish Record Documents to the State Engineer for the State's permanent files.
  - a. Record Documents shall include all construction changes duly noted together with a summary of all final program requirements and design criteria and data.
    - 1) Two sets of reproducible reproductions of the drawings, on mylar or other medium acceptable to the State Engineer
    - 2) One set of the drawings and project technical specifications for computer access in PDF and DWG on CD-ROM or approved alternate
  - b. Final payment to the Design Professional will not be made until the Owner's Representative has verified the following to be true.
    - 1) The Record Documents accurately reflect the record documents provided by the contractor and include approved changes to the contract documents.
    - 2) Autocad objects, if used, have been retained in the files.
    - 3) DWG files printed by the Owner look identical to the PDF files published by the Design
20. Submittal Requirements
  - b. All submittal documentation forwarded to Facilities and Services shall be submitted in a timely fashion, coinciding with the needs of the project and Facilities and Services staff. The delivery of submittal documentation during various project stages shall be timed appropriately to ensure that Facilities and Services ultimately receives the most accurate information available.
  - c. Ensure that the Facilities and Services Project Number and OSE Number are located on all drawing sheets (including the cover sheet) and all other submitted documentation, i.e. Specifications and Operations and Maintenance Manuals. The Facilities and Services project number should be located in the title block of all drawings, and in the header or footer of Specifications and Operations and Maintenance Manuals, and any other submitted items.
  - d. The following documentation shall be delivered to Facilities and Services at the following project milestones:
    - 1) Review sets (SD, DD, 1-100%):
      - (a) Facilities and Services requires a complete set of documents as specified in the standard Architect/Engineer Contract including:
        - (i) If request, AutoCAD drawings in electronic format (.DWG and .PDF)
        - (ii) If requested, Architectural Floor plans, site/civil drawings and irrigation plans in DWG format.
        - (iii) Complete review set of drawings merged into a single PDF set
        - (iv) Building Information Models (BIM) in Revit format (.rvt) (projects with a construction

**budget over \$1.5 million)**

- (v) Specifications - submit electronically in PDF format as one document, OCR searchable, bookmarked according to CSI standards
- 2) Completion of Civil Utilities Installation:
  - (a) Site Development Drawings (Survey) shall be set up using SDSPC coordinates and the drawing units set to decimal feet. The survey shall be tied to the SDSU control network provided by Facilities and Services. All GPS surveys shall include a minimum of three of the campus control points.
  - (b) Facilities and Services requires a complete set of Site Development Drawings (Survey) as specified in the standard Architect/Engineer Contract including:
    - (i) AutoCAD Record Site Development Drawings (Survey) in electronic format (.DWG and .PDF and hardcopy – 1 set)
    - (ii) Contractor Redlined Site Development Drawings (Survey) - Full size hard copy format (1 set)
- 3) 100% Construction Documents (final CDs not for review) i.e. Bid Set
  - (a) Facilities and Services requires a complete set of documents as specified in the standard Architect/Engineer Contract including:
    - (i) AutoCAD drawings in electronic format (.DWG and .PDF)
    - (ii) Full size hard copy format (1 set) – Stamped
    - (iii) Half size set hard copy (2 sets) - Stamped
    - (iv) Building Information Models (BIM) in Revit format (.rvt) (projects with a construction budget over \$1.5 million)**
    - (v) Specifications - submit electronically in PDF format as one document, OCR searchable, bookmarked according to CSI standards
    - (vi) Specifications - hard copy format (1 set) – Stamped
- 4) Record Documents:
  - (a) When the project has been completed, the Consultant shall submit a complete set of record construction documents as specified in the standard Architect/Engineer Contract including:
    - (i) AutoCAD Record drawings in electronic format (.DWG and .PDF)
    - (ii) Record drawings
      - 1. Full size hardcopy: two (2) sets Mylar and one (1) set bond
    - (iii) Revit produced projects shall include the Revit model reflecting the changes outlined in the redlined drawings.
    - (iv) Redlined construction drawings (hard copy)
    - (v) Fire Systems shop drawings
    - (vi) Fire Suppression (sprinkler/standpipe) system (hardcopy - 1 set, .DWG and PDF)
    - (vii) Fire Detection/Alarm system (hardcopy - 1 set, .DWG and PDF)
    - (viii) Specifications - submit electronically in PDF format as one document, OCR searchable, bookmarked according to CSI standards
    - (ix) Operations and Maintenance Manuals – all disciplines - submit electronically in PDF format as one document, OCR searchable, bookmarked according to CSI standards and two hard copy sets.

### C. OWNER RESPONSIBILITIES

- 1. For responsibilities of the Owner, including those referenced under 09.03D, consult the Sample A/E Agreement for Non-Delegated projects and the sample Division 00 Document at or, if the Project is active, the executed Agreement and the executed Contract.
  - a. For general administrative responsibilities, see paragraphs under subsection 01.05 in FDM Part 1/ Sec 01 Working Relationships.

2. The Owner will award, and provide administration of, the Construction Contract.
3. The Owner will furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project.
4. The Owner will furnish special construction/testing services deemed necessary by the Owner or by the Design Professional with appropriate professional reports or recommendations.
5. The Owner will designate and approve the Contractor's use of off-site storage areas.
6. With the Design Professional, the Owner will review the Construction Schedule submitted by the Contractor
7. With the Design Professional, the Owner will approve the site staging plan submitted by the Contractor.
8. The Owner will Identify and evaluate materials and products with hazardous substances and furnish a list of known hazardous chemicals within the project site and suggestions for appropriate protective measures to the Contractor.
9. The Owner will provide information and services under the Owner's control with reasonable promptness to avoid delay in the orderly progress of the Work.
10. The Owner will prepare a Certificate of Substantial Completion.
11. The Owner will notify the Contractor to do work covered by the project warranty.
12. With the Design Professional, the Owner will schedule and perform a post-occupancy and warranty reviews.

END OF SECTION 09 BIDDING AND CONSTRUCTION PHASES

# Division 01 GENERAL REQUIREMENTS

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## Division 01 GENERAL REQUIREMENTS

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*This design standard is directed to the Design Professional to be incorporated into the Project.*

*The Owner encourages improved concept, method and products by the Design Professional; however, project compatibility with existing campus systems, processes and procedures is most desirable.*

### **01 1000 GENERAL**

#### **A. GENERAL**

1. Develop a complete Division 00 specification for the Project.
  - a. Owner will provide Division 00 Documents.
2. Verify Division 01 content with the Owner's Representative.

### **01 1400 WORK RESTRICTIONS**

#### **A. ACCESS TO SITE**

1. To minimize tracking of construction dirt into occupied areas, specify the Contractor's personnel are not to enter or use adjacent facilities or adjacent areas in use by the Owner.
  - a. Where construction dirt is tracked into occupied areas, specify the Contractor shall clean the area within twenty-four hours of the incident.
  - b. Follow the cleaning requirements in Supplemental Design Guide /[Contractor Cleaning Standard](#)

#### **B. COORDINATION WITH OCCUPANTS**

1. Where a remodeling is adjacent to occupied area, specify the Contractor to do the following actions.
  - a. Furnish the Owner's Representative with notice of construction activity at least 72 hours in advance.
  - b. Maintain exits and passageways in a continually usable condition and inform the Owner's Representative of potential conflict.
  - c. Specify negative air pressure dust control systems to control dust.

### **01 3300 SUBMITTAL PROCEDURES**

#### **A. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

1. In addition to requirements described under Article 4 of the General Conditions, verify current requirements with the Owner's Representative and specify accordingly.

### **01 5100 TEMPORARY UTILITIES**

#### **A. TEMPORARY ELECTRICITY**

1. Specify the Owner will provide a source point of connection within the site limits.
  - a. Specify 208 volt or 460 volt service as verified by the Owner's Representative.
2. Specify the Contractor furnish and install a fused disconnect sized for the service.
3. Specify the Contractor furnish and install all required equipment on the load side of the fused disconnect.

#### **B. TEMPORARY HEATING, COOLING AND VENTILATING**

1. Renovations
  - a. Specify the Contractor is allowed to utilize campus heating and ventilating systems for temporary heat to the extent those facilities are not impacted by the Project. Use of campus heating and ventilation is not a guarantee and should be verified by the A/E prior to inclusion as owner provided.
2. New Construction
  - a. Specify the Contractor shall furnish temporary heat and ventilation as need by the project at the contractor's expense.

3. Connecting to a campus natural gas source is generally not allowed for construction. If a natural gas source is used by the contractor, a meter shall be installed and the contractor will be billed for the quantity of fuel metered.

#### **C. TEMPORARY WATER**

1. Specify a connection point to potable water determined by the Owner within the site. All costs for connecting to the source are the responsibility of the contractor.
2. Specify the Contractor to furnish and install an approved backflow prevention device at all construction site water connections.

### **01 5200 CONSTRUCTION FACILITIES**

#### **A. FIELD OFFICES AND SHEDS**

1. Specify the Contractor shall coordinate the location of field office, staging, and contractor parking with the Owner.

#### **B. SANITARY FACILITIES**

1. Specify the Contractor to furnish portable toilet facilities for use by Contractor personnel.
2. Specify Contractor personnel to not use the Owner's toilet facilities.

### **01 5600 TEMPORARY BARRIERS AND ENCLOSURES**

#### **A. TEMPORARY AIR BARRIERS**

1. Specify the Contractor to furnish and install temporary enclosures as required to protect the work, materials and equipment against damage from wind, moisture and temperature extremes.

#### **B. TEMPORARY FENCING**

1. When specified, fencing must enclose all areas of the site such that no area of the construction is accessible to pedestrians or unauthorized personnel or vehicles. Access points must be clearly defined and include a means to limit access to the site and prevent inadvertent entry. Fencing must be continuously maintained in a neat and orderly condition.
2. Security and safety should be considered in determining the fence type. Where security of site installations is required, chain link fence should always be used regardless of the duration or level of hazard. Additional adjustments to the standard (fence height, etc.) should be considered as appropriate to the security risk.
3. Chain Link fence:
  - a. Six feet (6.0') high with galvanized steel pipe posts.
  - b. Gates shall be provided to control all access points. Hinged and lockable.
  - c. Installations must use a top and bottom tension wire or a top rail may be used in place of the top tension wire.
4. Fencing installed on paved areas may be self-supported or posts may be driven thru the pavement.
  - a. Self-supported fence must include a stable support system that discourages movement or topping of the fence.
  - b. Pavement penetrations will require a concrete hole patch when the posts are removed.
5. Warning signs shall be installed on fencing spaced no more than 50 feet apart with at least one on each side of the site that read "Danger – Construction Area – No Entry – Authorized Personnel Only". Signs must be professionally prepared and sign material must be suitable to withstand outdoor weather conditions for the duration of construction. Signs must be easily readable from a distance of 20 feet.
6. Where fencing is installed across existing walkways or roadways, retro reflective or lighted visual barriers and appropriate "Sidewalk Closed" or "Road Closed" signage shall be provided. All signage for closures of public streets and roadways must comply with the Manual on Uniform Traffic Control Devices for Streets and Highways.
7. Where fencing is located adjacent to a roadway or walkway that is to remain in use, fencing shall be set

back a minimum of 3 feet where possible to allow for snow removal activities.

## **01 6400 OWNER-FURNISHED PRODUCTS**

### **A. EQUIPMENT**

1. The following list of products is furnished to the project by SDSU. The project will be billed internally for the products. These products are included in the soft costs for the project and are not included in the construction cost.
  - a. Outdoor furnishings. Refer to Division 12 - FURNISHINGS.
  - b. Exterior facilities. Refer to Division 32 - EXTERIOR IMPROVEMENTS.
  - c. Parking & Traffic signage. Refer to Division 10 - SPECIALTIES.
  - d. Exterior building signage. Refer to Division 10 - SPECIALTIES.
  - e. Interior signage. Refer to Division 10 - SPECIALTIES.
  - f. Various toilet accessories. Refer to Division 10 - SPECIALTIES.
  - g. Lockset cores and keys. Refer to Division 8 - OPENINGS.

## **01 7300 PROJECT EXECUTION**

### **A. APPLICATION**

1. Where new construction joins existing construction, specify new construction is installed with minimal damage to existing surfaces wherever possible.

### **B. INACCESSIBLE EQUIPMENT**

1. If after meetings, reviews, comments, etc., there are documented changes not incorporated into the construction documents and installed equipment is not accessible for operation and maintenance, equipment shall be removed and reinstalled to facilitate maintenance access at no additional cost to the project.

## **01 7400 CLEANING AND WASTE MANAGEMENT**

### **A. GENERAL SITE**

1. Contractor shall keep the site clean and free of trash and debris.
2. Grass and weeds are to be managed and not allowed to grow into temporary fencing.
3. Campus and City streets used to access a construction site shall be maintained free of construction debris.
  - a. Mud, dirt, gravel and other construction materials shall not be allowed to gather on streets or in the curb and gutter. Projects with more than two acres of disturbed soil must follow the Storm Water Pollution prevention Plan. Projects with less than 2 acres of disturbed soil shall follow Best Management Practices and be in compliance with this Division.

### **B. FINAL CLEANING**

1. In addition to requirements for site clean-up described in 6.13 of the General Conditions, include references to required final facility cleaning specified in separate Divisions.
2. Refer to Supplement Design Guide /[Contractor Cleaning Standard](#)

## **01 7600 SUSTAINABILITY/LEED CERTIFICATION**

### **A. PHILOSOPHY**

1. After 2010 all new facilities at SDSU will be designed to achieve LEED silver certification. Alternatives should be developed that explore sustainable performance.
2. Extending the renewal cycles for building materials and reducing the consumption of energy and water have benefits for the natural environment, the quality of the campus built environment and the University's finances. The intent is to develop buildings that require less maintenance and operational

investment over time while continuing to serve the needs of users and enhance the aesthetics of the campus.

3. These Design Guidelines support the achievement of fiscally sound and environmentally responsible development and the stewardship of campus resources, including the development and management of campus green space. Examples of the type of activities are:
  - a. Enhancing multimodal transportation opportunities to encourage walking, bicycling, and future needs which could include connection to community transit.
  - b. Providing supportive information such as signage, and maps.
  - c. When possible designing facilities and building systems to save non-renewable resources through the use of substitutes, recycling, and better recovery and reuse.
  - d. Include consideration for maintainability over time through potential benefits from building life cycle cost analyses, alternative performance systems, and other strategies at time of design and construction.
  - e. Promote ongoing energy conservation practices, water conservation, and waste reduction.
4. SDSU buildings are designed for a 50-year life. Lifetime operating costs of these buildings most likely will exceed the original cost of construction. Therefore, sustainability needs to include designs that are durable and readily maintainable. This may translate into higher first time costs, as well as requiring proactive initial designs for repurposing space for future needs.
  - a. Building design should maximize flexibility to satisfy the varied demands of the present and future. The guiding standard should be that the building envelope be designed for 50 years of service, with 15-20 year building interior life.
  - b. A building should be able to accommodate some level of adaptation and reconfiguration without exorbitant expense or structural modification.
5. Buildings and spaces should be created with maintainability in mind. Creating and supporting facility and landscape designs that acknowledge the climate of South Dakota will result in the most success.
  - a. Building entrances and walk ways should be considerate of safety, including snow and ice prevention and removal.
  - b. Designs should be attractive and functional, both when first built and for the long term.
  - c. The beauty of a design should be able to be sustained long into the future, in the context of long-term operations and maintenance.

## **B. BACKGROUND AND REQUIREMENTS**

1. South Dakota Senate Bill 188, signed into law in 2008, established high performance building design and construction standards for newly constructed or renovated state-owned buildings.
  - a. This bill covers any new building constructed or renovated by any state agency, department, or institution which has a cost of \$500,000 or more or that includes 5,000 square feet or more.
  - b. The new construction or renovation must be designed and constructed to achieve at least:
    - 1) A silver standard rating under the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system as of January 1, 2008;
    - 2) A two globe rating under the Green Building Initiative's Green Globes rating system as of January 1, 2008; or
    - 3) A comparable numeric rating under a sustainable building certification program recognized by the American National Standards Institute as an accredited standards developer;
  - c. A waiver may only be granted by the Office of the State Engineer if:
    - 1) "The building will have minimal human occupancy;
    - 2) The increased costs of achieving a high-performance green building standard cannot be recouped from decreased operational costs within fifteen years;
    - 3) A building is on the national register of historic places and achieving a high-performance green building standard would result in noncompliance with standards for historic preservation as set

forth in the secretary of the interior's Standards for the Treatment of Historic Properties in effect as of January 1, 2008;

- 4) The square footage of the renovation project is less than fifty percent of the total square footage of the building being renovated. If the renovation project is being done in phases, the total square footage of all intended phases combined shall be used in making this calculation; or
- 5) The Bureau of Administration determines that extenuating circumstances exist to make impractical high-performance green building standard certification.”

### **C. LEADERSHIP IN ENVIRONMENTAL DESIGN**

1. Currently, of the options listed above, SDSU uses USGBC’s LEED for New Construction (NC) and Major Renovation, latest edition. New buildings and major renovations shall incorporate LEED-NC sustainable design strategies as an integral part of all design decisions.
2. Architect/Engineering firm shall
  - a. Register the Project with the U. S. Green Building Council.
  - b. Identify the Owner as South Dakota State University.
  - c. Identify the Project Name as the Official Project Title.
  - d. Furnish the web site access code to the project manager.
  - e. As a minimum, attain LEED NC, latest edition, silver certification.
  - f. Generally, it’s preferred to submit certification documentation in two phases, design and after construction, as the LEED certification process allows.
3. Certain LEED credits are not obtainable by SDSU or shall not be pursued for operational, maintenance or other reasons. A check list for likely obtainable points has been developed as a starting for the Design Professional; [SDSU LEED Checklist](#). All projects are different and as such the applicable credits vary. SDSU encourages detailed discussions about each credit and the pros and cons of achieving each.
4. The Design professional shall provide the Owner copies of all calculations or other documentation used to support LEED certification. Documentation shall include the complete Energy Model in hard copy and electronic files.
5. Near end of project, designer shall summarize approximate cost differential to project, solely attributed to obtaining LEED certification.

## **01 7800 CLOSEOUT SUBMITTALS**

### **A. OPERATION AND MAINTENANCE DATA**

1. Include O&M requirements within the individual divisions.
2. Provide three hard copies and one electronic copy of all O&M information.

### **B. PROJECT RECORD DOCUMENTS**

1. In addition to requirements described under sub-article 6.9 of the General Conditions, verify current requirements with the Owner's Representative and specify accordingly.

## **01 7900 DEMONSTRATION AND TRAINING**

### **A. GENERAL**

1. Include demonstration and training requirements within the individual divisions.

END OF DIVISION 01 GENERAL REQUIREMENTS

# Division 02 EXISTING CONDITIONS

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## Division 02 EXISTING CONDITIONS

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

*The Owner encourages improved concept, method and products by the Design Professional; however, project compatibility with existing campus systems, processes and procedures is most desirable.*

### **02 0000 GENERAL**

#### **A. RELATED SECTIONS**

1. Division 01 8000 - SUSTAINABLE DESIGN REQUIREMENTS
2. Division 33 – UTILITIES

#### **B. DEFINITIONS**

1. SDSU – South Dakota State University
2. kmz – A zipped Keyhole Markup Language (KML) file used by Google Earth

#### **C. VARIATIONS**

1. It is recognized that project conditions and requirements may vary and all items identified herein may not apply in all cases.

### **02 2000 ASSESSMENT**

#### **A. SURVEYS**

1. Coordinate site surveys with Facilities and Services.
  - a. Refer to SDSU [Cadd Drafting Standards](#).
  - b. Survey services may be part of an A/E contract or contracted separately by Facilities and Services.
2. Confirm reference points (i.e., local benchmarks, State coordinates grid system, U.S. Geological Survey, etc.) with Facilities and Services.
3. SDSU has established a Campus Survey Control system. Three of these points must be included in all GPS based surveys.

#### **B. ENVIRONMENTAL**

1. Coordinate Environmental Assessment requirements with Facilities and Services.
2. Coordinate Hazardous Material Assessment requirements with the Facilities and Services.
  - a. SDSU has conducted asbestos and lead paint studies which are available for review.

### **02 3000 SUBSURFACE INVESTIGATION**

#### **A. GEOTECHNICAL INVESTIGATIONS**

1. General
  - a. All geotechnical work and recommendations must be supervised by a professional engineer registered in the state of South Dakota.
  - b. Geotechnical services are contracted directly by Facilities and Services or Office of State Engineer.
  - c. Facilities and Services will communicate with campus entities that might be affected by investigation work.
2. Geotechnical Engineering Cost Proposal and Report
  - a. Minimum requirements:
    - 1) Background information, project information, and any assumptions used.
    - 2) Preliminary design information specific to the project including, but not limited to, layout, loading types and conditions, etc.
    - 3) Standards used to perform any analysis or work.
    - 4) Comprehensive review and discussion of existing information from past explorations, past

- projects, and/or other information from adjacent or area work.
- 5) Expected subsurface conditions based on historical, local, and regional review.
  - 6) Justification for any proposed explorations or investigation work.
  - 7) Justification and discussion of any proposed laboratory testing.
  - 8) Justification for any proposed monitoring or other work.
  - 9) Detailed cost breakdown of proposed work, including at a minimum a breakout of labor and direct costs by task.
  - 10) Generalized subsurface profiles, indicating stratigraphic and structural relationships.
  - 11) Foundation support recommendations including types, elevations, calculated allowable bearing capacity, calculated settlements including total and differential, floor slab support recommendations, site seismic classification, drainage system, and general foundation construction requirements, including construction limitations.
  - 12) Pavement section recommendations for various traffic types with information on what methods/calculations/procedures were used to determine this.
  - 13) Groundwater conditions and anticipated effects on construction.
  - 14) 25, 100 and 500 year floodplains.
  - 15) Recommendations for earthwork, subgrade preparation, and back fill placement and compaction.
  - 16) Acceptability of on-site materials for construction.
  - 17) Excavation procedures.
  - 18) Any other items that could affect construction or the long-term performance of the foundation.
  - 19) As applicable to the specific project, provide information regarding lateral earth pressures, temporary construction procedures, dewatering procedures, subgrade drainage, trench safety, subgrade stabilization and piling, drilled shafts and sheet piling.
  - 20) Recommendations and justification for construction observations, quality control, and testing.

## **02 4000 DEMOLITION**

### **A. REQUIREMENTS**

1. Specify a demolition plan be prepared and submitted
  - a. In occupied spaces consider negative air pressure dust control
2. The Owner reserves first salvage rights; coordinate with Project Manager
3. Specify requirements for maintaining air quality in adjacent occupied spaces.
4. Demolition and disassembly will not be allowed until it is coordinated with Facility & Services.
5. Cease operations and notify the Facilities and Services Project Manager and A/E immediately if safety of structure appears to be endangered.
  - a. Take precautions to properly support structure.
  - b. Do not resume operations until safety is restored.
6. All active utility mains traversing the project site shall be maintained.
7. When removing a structure or building, establish a safety perimeter or corridor that restricts public access during the demolition operation.
  - a. Provide, erect and maintain barricades, lighting and guard rails as required to protect the public.

### **B. COORDINATION**

- a) Cooperate with Facilities and Services and local utility companies whose work affects or will be affected by the demolition operations.
- b) The professional consultant or contractor shall comply fully with all provisions of the local codes, laws and ordinances applicable to work of this Section, and other Facilities and Services plans and documents that relate to campus planning and development.

**C. SUBMITTALS**

- c) Schedule indicating proposed methods and sequence of operations for demolition work.

**02 5000 SITE REMEDIATION**

- 1. Coordinate requirements with the Facilities and Services Project Manager.

**02 6000 CONTAMINATED SITE MATERIAL REMOVAL**

- 1. Coordinate requirements with the Facilities and Services Project Manager.

END OF DIVISION 02 EXISTING CONDITIONS

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Cast in Place Concrete -----

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## Division 03 CONCRETE

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### **03 3000 CAST IN PLACE CONCRETE**

#### **A. ABBREVIATIONS**

1. A/E – Architect/Engineer
2. ADA – Americans with Disabilities Act

#### **B. GENERAL**

3. Show design stresses, floor live loads and soil bearing values on drawings
4. Specify procedures to be followed in both hot and cold weather operations.
5. Exterior concrete flatwork shall use 100% quartzite aggregate. Aggregate containing local shale shall not be used in this application.
6. Where concrete will be exposed to view, specify aggregate that contains no iron or other staining elements.
7. At cold joints, a keyway or tie bars shall be used.
8. For structural concrete elements, quality control and inspection shall be completed by an independent consultant and hired by owner. Design Professional shall notify the owner if additional requirements beyond standard tests are necessary. Contractor shall be responsible for coordinating testing.
9. ADA detectable warning panels shall be of plastic insert design and color approved by owner. [Detail 32-070](#)

#### **C. CONCRETE REINFORCING**

1. The design professional shall specify epoxy coated reinforcing in exterior stairs and utility tunnels with surface exposed lids.
2. Poly-fibrous reinforcing may only be considered in interior slabs.
3. Pre-pour inspections shall be required and documented.

#### **D. FINISHES**

1. For exterior stair treads and ramps, specify non-slip finish. Steel nosing's are not to be used.
2. Specify finish tolerance for floors, walls, etc.
3. Floors shall be sloped to drain to the nearest floor drain. Demonstrate proper sloping prior to floor finish installation.

#### **E. ADMIXTURES**

1. Specify air-entrained concrete in concrete which will be exposed to freeze-thaw conditions.
2. Do not specify calcium chloride or other salts as anti-freeze or accelerated-set additives.
3. See owner for standard concrete colors, accent colors and where they are applicable.

#### **F. PRECAST CONCRETE**

1. Specify required attachments and connecting inserts shall be clearly shown on submittals.
2. Specify the fabricator is fully responsible for the design of reinforcing to accommodate transit and lifting loads as well as for the design of structural reinforcing loads after final placement.
3. Specify tolerance of acceptable damage during shipping.
  - a. Repair of shipping damage shall be by supplier.

END OF DIVISION 03 CONCRETE

# Division 04 MASONRY

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## Division 04 MASONRY

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### **04 1000 GENERAL**

#### **A. DEFINITIONS**

1. A/E – Architect/Engineer

### **04 2000 UNIT MASONRY**

#### **A. GENERAL**

1. Limits and conditions for laying or erecting masonry in both hot and cold weather shall be specified. Specifications shall not be reference standards, but shall include the detailed requirements.
2. Chemical cleaning of masonry is not preferred.
3. Provide control joints as required for thermal expansion/contraction and building movement. Joints shall be raked back  $\frac{1}{2}$  -  $\frac{3}{4}$  inch and sealed with calk to prevent water infiltration.
4. At exterior masonry cavity walls, specify weeps at sixteen (16) inches on center and a minimum of 3 inches above finished grade. Weeps may be slotted or rope type. Slotted or open holed weeps shall be screened to prevent intrusion of insects.
5. Masonry joints shall be completely filled with mortar. All exterior masonry joints shall be tooled to concave shape. Raked joints are not allowed. Beaded joints shall be used only for historic pointing efforts on masonry that already has beaded joints.
6. Specify construction of a sample panel not less than six (6) feet wide and four (4) feet tall for approval by the Design Professional and the Owner's Representative prior to ordering brick. Panel shall remain on the job site for duration of masonry work.
7. Use of colored mortar shall be approved by the Owner's Representative prior to specifying.
8. Architectural detailing shall limit or eliminate potential for effluorescence.
  - a. Provide through wall flashing between foundation and above grade masonry.
  - b. All masonry walls (garden walls, retaining walls, etc.) where back of wall is exposed to soil and/or fill materials shall be surfaced with damp proofing or water proofing membrane that extends from the through wall flashing to just above grade level.
9. Masonry used in constructing additions to and renovations of existing buildings shall match or respect the context and textural design of the existing architecture.

### **04 2100 BRICK MASONRY**

#### **A. BRICK SHALL NOT BE USED BELOW GRADE.**

#### **B. NEW CONSTRUCTION**

1. Specify brick by type, size and manufacturer.
2. Do not specify by cash allowance.

#### **C. MATCHING EXISTING**

1. Recognizing that specifying brick to match is not a simple statement to execute, the A/E shall begin investigating potential match sources during Design Development.
  - a. Design team shall discuss benefits of constructing sample panels during design phase.
2. Where brick is required to match color and texture of existing brick masonry, color, blend, and texture shall be specified prior to bidding.

## **04 2200 CONCRETE UNIT MASONRY**

### **A. GENERAL**

1. Light weight aggregate units may only be specified where approved by the Owner's Representative.
2. Provide solid units where needed.
3. Specify bull nosed units for outside corners of interior finished work and outside corners at building entrances.

## **04 2300 GLASS MASONRY**

### **A. GENERAL**

1. Do not specify for exterior use without approval by the Owner's representative.

## **04 2400 STONE MASONRY**

### **A. GENERAL**

1. Detail stone and precast concrete to provide washes and drip lines to ensure water shed.

## **04 2500 POINTING**

### **A. GENERAL**

1. Use of mechanical routing tools for removal of soft or deteriorated mortar is allowed. Specifications shall be written, so a minimal or no brick is removed in the routing process.
2. Efforts shall be made with historic structures that receive pointing to discover original mortar color, and pointed mortar shall match the historic color.
3. Where soft or deteriorated mortar is removed, it shall be removed to a minimum depth of  $\frac{3}{4}$ " or to such depth as required to find solid mortar.
4. Design and specify necessary protection for outside HVAC equipment, electrical generators, and electrical equipment from dust generated by the mortar removal process.

END OF DIVISION 04 MASONRY

# Division 05 METALS

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## Division 05 METALS

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### **05 1000 GENERAL**

#### **A. DEFINITIONS**

1. OSHA – Occupational Safety and Health Administration

### **05 2000 METAL FABRICATIONS**

#### **B. STAIRS**

1. Where treads are steel or pan-type treads are used specify non slip surface.
2. Stairs shall be used to gain roof access, access to different levels, and equipment platform access. Ladders shall not be used and offset step stairs shall not be used.
3. Handrail and guardrail diameters, returns, and extensions shall be included within the contract documents.

#### **C. EQUIPMENT PLATFORMS**

1. Shall comply with OSHA safety requirements.

END OF DIVISION 05 METALS

# Division 06 WOOD, PLASTICS, AND COMPOSITS

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## Division 6 WOOD, PLASTICS, AND COMPOSITES

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### **06 1000 GENERAL**

#### **A. REFERENCE**

1. Division 10 – SPECIALTIES

#### **B. DEFINITIONS**

1. AWI – Architectural Woodwork Institute

### **06 2000 ROUGH CARPENTRY**

#### **C. WOOD FRAMING**

1. Specify species and grades of lumber to be used on the Project.
2. Specify required blocking, grounds, furring strips, and framing members.
3. Provide a minimum of two (2) rows of six (6) inch wide blocking in all classrooms, offices, class labs, conference rooms, corridors and laboratories. During design review, discuss vertical placement of blocking with the Project Manager.
4. Unexposed blocking shall be fire retardant treated wood or plywood for Type 1 and Type 2 construction.
  - a. Specify pressurized preservative treatment for wood in contact with concrete, roof blocking and curbs, and in moist locations.
  - b. Floor sheathing shall be tongue and groove material that is screwed and glued.

### **06 2013 EXTERIOR FINISH CARPENTRY**

#### **A. GENERAL**

1. Avoid use of wood products in non-historic buildings.
2. Stainless steel or exterior coated fasteners shall be used for exterior application.

### **06 4000 ARCHITECTURAL WOODWORK**

#### **A. GENERAL**

1. Casework and custom woodwork shall be manufactured and fabricated to meet a minimum of AWI Custom Grade.
2. As an alternative to using particle board bonded with urea formaldehyde resin, specify plywood or other board product that produces far less or no carcinogenic out gassing.
3. All countertops adjacent to wall surfaces shall be designed with backsplashes and end splashes.
4. Wood and plastic laminate products shall not be used for window sill finishes without approval by the project manager. More durable solid surface materials are preferred.
5. Minimize seams in countertops. Counter surface shall be planar without ridges.
6. Particular attention shall be made when using products with high recycled content or renewable content. Expansion/contraction from humidity, fastener holding ability, serviceability, and maintenance characteristics shall be compared with typically used materials to ensure service life, appearance, and durability are comparable.
7. Do not use post-formed edges and backsplashes.
8. Plastic laminate finished casework shall not be used in laboratories.
9. Plastic laminate shall not be used as a finish for the exposed edges of a countertop, casework doors, and casework drawers.
10. See also Division 10 - SPECIALTIES

## **06 1700 TRUSSES**

### **A. GENERAL**

1. Trusses may not be altered without written permission of the truss manufacturer or the project structural engineer.
2. Trusses shall be certified by a structural engineer licensed in the State of South Dakota.

## **06640 PLASTIC PANELING**

### **A. GENERAL**

1. All uses of this material shall be approved by the Owner prior to inclusion in a project.

END OF DIVISION 06 WOOD, PLASTICS, AND COMPOSITS

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# Division 07 THERMAL AND MOISTURE PROTECTION

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## Division 07 THERMAL AND MOISTURE PROTECTION

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### 07 1000 GENERAL

#### A. RELATED DIVISIONS

1. Division 01 – BUILDING DESIGN REQUIREMENTS
2. Division 23 – MECHANICAL SYSTEMS

#### B. DEFINITIONS

1. EPDM - Ethylene Propylene Diene Monomer
2. HVAC – Heating Ventilation and Air Conditioning

### 07 1050 DAMP PROOFING AND WATERPROOFING

#### A. BASEMENT WALL, UTILITY TUNNEL, AND SHALLOW TRENCH WATERPROOFING

1. Specify a membrane type water barrier system for all basement walls and all utility tunnel and shallow trench ceilings and walls.
2. Shower pan membrane.
  - a. Specify a waterproof membrane below showers and other consistently wet areas.
3. Waterproofing membrane.
  - a. Evaluate occupied spaces below mechanical room(s) for installation of membrane within mechanical floor system.

### 07 2000 VAPOR RETARDERS

#### A. GENERAL

1. Provide vapor retarders on built-in cold rooms on the warm side of walls, ceiling, and floor.
2. Provide vapor retarder on roofing system when interior HVAC conditions include humidity conditions consistently >45% and temperatures 68 degrees Fahrenheit or greater.
3. Specify owner inspection of vapor barrier prior to concealment.
4. Provide vapor retarders surrounding elevator pits that are tied to vapor retarders of basement floor slabs.

#### B. INTERIOR CONCRETE SLAB ON GRADE

1. Provide minimum of 6 mil poly vapor retarder under all basement slabs. Vapor retarder shall be located immediately below the floor slab.
2. Where an existing floor slab needs to be partially demolished or removed, the vapor retarder shall be spliced and patched to remain continuous.
3. Provide ground water drainage and sump system on interior or exterior of basement foundation wall below floor level. *[The water table of the soils in the University can be relatively close to the ground surface, especially when rainfall is above normal frequency]*
  - a. Specify a grid pattern for ground water drainage under a concrete basement slab.
  - b. Sump shall be alarmed to the campus central control system for high water or loss of power.
  - c. Drainage and sump system shall be discharged to the storm water drainage system.
  - d. Ground water drainage shall not be discharged into the sanitary sewer system.
4. Storm drainage that discharges on the ground surface shall be designed to minimize creation of a pedestrian slipping hazard.

### 07 5100 MEMBRANE ROOFING

## **A. DESIGN**

1. Do not specify ballasted single ply roofing systems. Fully adhered or mechanically fastened systems are preferred.
2. Method of attachment shall be reviewed with Project Manager based on installation schedule. Fully adhered single ply roofing systems shall not be installed when temperatures are expected to be below 40 degrees Fahrenheit within 24 hours.
3. Roof system shall have a positive slope of a minimum of ¼ inch per foot throughout the entire roof.
4. Extend the roof membrane up the inside of the parapet wall and terminate on the outside of the top of the parapet wall.
5. Roofing design or submittals shall include details required for all types of roofing penetrations.
6. Do not locate duct work, utility piping or electrical wiring on the roof.
7. New roofing systems shall include a full manufacturer's warranty.
  - a. Weather tight 15 year warranty for EPDM roofs.
8. Single ply roofing membrane systems shall have a minimum thickness of 60 mils.
9. Roofing systems shall include traffic pads between roofing access point(s) and all mechanical equipment that requires maintenance. Pads shall surround all mechanical equipment.
10. Reference building design and/or mechanical sections for roof access design.
11. Where allowed, roof hatches shall be provided with safety grab posts that extend above the hatch when the hatch is open.

## **07 5200 SHINGLE ROOFS**

### **A. GENERAL**

1. Asphalt or other shingle materials shall have a minimum manufacturer's warranty of 30 years.
2. Specify a Contractor's 5 year warranty on materials and installation of all shingle roofs.
3. Asphalt, fiberglass, or similar shingle materials shall not be installed when temperatures are expected to be below 40 degrees Fahrenheit within 24 hours.
4. Ice dam underlayment shall be used from the gutter edge to a minimum of 6 feet with a minimum 24" overlap of the interior up the slope of the roof. Ice dam material shall be used under all valleys.
5. Asphalt or other shingle materials shall be continuous through all valleys.

## **07 6000 FLASHING AND SHEET METAL**

### **A. GENERAL**

1. Cap flashing, through wall flashing, and metal coping material shall be a minimum of 24 gauge thickness.

## **07 9000 JOINT PROTECTION**

### **A. GENERAL**

1. For new sealant applications, specify a minimum 10 year manufacturer's sealant warranty and a 5-year contractor's warranty.

END OF DIVISION 07 THERMAL & MOISTURE PROTECTION

# Division 08 OPENINGS

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## Division 08 OPENINGS

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### **08 1000 GENERAL**

#### **A. RELATED DIVISIONS**

1. Division 06 - WOOD, PLASTICS, AND COMPOSITES
2. Division 26 - ELECTRICAL
3. Division 28 - ELECTRONIC SAFETY AND SECURITY

#### **B. GENERAL**

1. When possible specify products that contribute to LEED qualification
2. Specify inspection of frame installation accuracy prior to drywall installation. Contractor shall submit inspection report to the Design Professional.
3. Prior to substantial completion the Design Professional shall verify all frames, windows, doors and hardware are installed and operating as specified.
4. Early in design development ensure the following topics are fully addressed.
  - a. Card access
  - b. Surveillance
  - c. Type of hardware and lock function
5. In design phase include Facilities and Services in review of value engineering of openings.
6. Specify that detail drawings are required when utilizing an interface between electrified door hardware and fire alarm, access control, security and building control system.
7. All lockable personnel entrances and padlocks must have 7 pin small format interchangeable cores. Discuss other project specific requirements.

### **08 1000 DOORS AND FRAMES**

#### **A. GENERAL**

1. Select doors and frames that meet the following criteria:
  - a. Minimal maintenance
  - b. Designed to meet appropriate operating frequency.
2. Doors and frames must be designed to meet or exceed ADA requirements.
3. When door pairs are used specify keyed, removable mullions with rim cylinder devices.
4. Specify ½" threshold at all exterior doors to allow for entrance mat clearance. Interior vestibule doors must also provide ½" clearance for walk-off mats.

#### **B. EXTERIOR DOORS AND FRAMES**

1. Specify high frequency use rating
2. Design to place hinge on windward side
3. Specify full insulation, full weather-strip and where no overhang exists, a drip edge.
4. Specify overhead doors, penthouse doors and roof hatches with full insulation, weather-strip and astragal where needed

#### **C. DOOR FRAMES**

1. Hollow metal or aluminum frames are preferred.
2. Specify factory installed reinforcing and preparation when possible

- a. Specify reinforcing for door closer on all frames.
- b. Specify preparation for 4 ½” hinges on all frames.
- 3. Fully welded frames are preferred, knockdown frames may only be used in remodeling and with Facilities and Services approval.
- 4. Specify frames factory primed for corrosion resistance
- 5. Interior remodeling projects should use frames that match existing building characteristics with approval from Facilities and Services.

#### **D. HOLLOW METAL DOORS**

- 1. Specify steel doors factory primed for corrosion resistance
- 2. Specify doors to be factory prepared for hardware
- 3. Exterior metal doors shall be fully insulated.

#### **E. WOOD DOORS**

- 1. Interior doors
  - a. Specify lifetime warranty
  - b. Specify only solid core doors
  - c. Specify
    - 1) AWI premium grade or WDMA grade AA veneer doors only.
    - 2) Matching vertical edges
  - d. If doors are specified “field finished” specify that top and bottom edges must be stained and completely sealed following door manufacturers recommendation
    - 1) Stain and sealer must not obscure manufacturers labeling
  - e. Specify hinged closet doors where possible, exceptions may be allowed by Facilities and Services.
- 2. Exterior doors
  - a. Avoid using wood doors at exterior, moist or humid locations
    - 1) Exterior wood doors will only be considered when attempting to match historical appearance and must be approved by Facilities and Services.

### **08 3000 SPECIALTY DOORS AND FRAMES**

#### **A. INCLUDE**

- 1. Counter doors
- 2. Coiling doors
- 3. Sectional overhead doors
- 4. Gates
- 5. Access doors
- 6. Shop/storage doors such as hydro-swing or sliding
- 7. Pocket doors
  - A. Pocket doors may only be used with Facilities and Services approval.

#### **B. KEYING**

- 1. All specialty doors shall meet keying specification in Division 08 7000
  - A. All locking devices shall accept 7 pin small format interchangeable core.

### **08 4000 ENTRANCES, STOREFRONTS, AND CURTAIN WALLS**

#### **A. GENERAL**

- 1. During design development address the options and costs associated with the use of curtain walls versus storefronts.

2. Take into consideration operating humidity levels when specifying aluminum walls or windows.
3. Specify hardware for aluminum systems in accordance with Division 08 7000.

## **08 5000 WINDOWS**

### **A. GENERAL**

1. Specify manufacturer supplied sill flashing where possible
2. Specify window supplier to provide all required hardware
3. Specify windows to have factory installed weather strip
4. Operability of windows shall be discussed early in design development.
5. If operable windows are used, specify insect screens made of aluminum or non-corroding copper
6. Specify thermal break design on all exterior windows. Take into consideration operating humidity levels when specifying windows.
7. Specify hollow metal frames be factory primed for corrosion resistance
8. Select frames designed to withstand abuse and require minimal maintenance
9. See Division 06 - WOOD, PLASTICS, AND COMPOSITES for information on window sills.
10. Use of wood framed windows will only be considered when matching historic appearance and must be approved by facilities and services.

## **08 7000 DOOR HARDWARE**

### **A. GENERAL**

1. Contractor is responsible for security until substantial completion.
2. In the case of a remodel or addition, an effort must be made to match existing hardware style and finish.
3. Specify a grade of hardware consistent with above requirements for all doors to minimize adjustment, maintenance and repair
4. Include hardware in the base bid, not an allowance
5. Specify that the hardware supplier provide templates to door and frame suppliers (if different suppliers)
6. Review hardware finishes with Project Manager.
7. Finish US 26D is the campus standard. Exceptions may be approved by Facilities and Services
8. Specify integral weather stripping which shall be secured to prevent slipping
9. Specify commercial grade weather stripping, not vinyl, residential grade.
10. All hardware must be ADA compliant
11. Specify access control locksets to have 7 pin small format interchangeable core key override
12. Stand-alone electro-mechanical push button locksets are required to have 7 pin small format interchangeable core key override

### **B. APPROVED HARDWARE MANUFACTURERS/MODELS**

1. Hinges: McKinney, Stanley, Penrod
2. Locksets: Sargent 8200 series or approved equal
3. Exit Devices: Von Duprin 99 series or Yale square bolt 7100 or 7200 series
4. Mullions: Von Duprin or approved equal
5. Closers: LCN 4041 or approved equal
6. Stops: Ives or Quality or approved equal
7. Door operators: Record or approved equal

### **C. HINGES**

1. Specify heavy weight 4.5" X 4.5" ball bearing hinges on all doors, closet or low frequency use doors may be exceptions.

2. Specify hinge to require no maintenance or lubrication
3. Specify hinge guaranteed for life of building

#### **D. EXIT DEVICES AND CYLINDERS**

1. Do not specify hardware with moving parts on the exterior trim
2. Specify surface mounted, single point latching rim cylinder panic devices of the flat bar design
3. Specify cylinder dogging on exit devices
4. Specify night latch function on exterior doors.

#### **E. LATCH SETS, LOCKSETS, AND CYLINDERS**

1. Specify mortise locksets
2. Specify all metal construction in mortise locksets
3. All locking hardware must have 7 pin small format interchangeable core.

#### **F. ELECTRONIC ACCESS**

1. See Division 28 for information pertaining to use and installation.

#### **G. KEYING AND CYLINDERS**

1. Specify that SDSU will create the keying schedule and furnish cut keys and pinned cylinders for the project
2. During construction documents phase be prepared to participate in discussing hardware keying and program requirements with owners representative
3. Specify the owner shall provide and install final cores

#### **H. MISCELLANEOUS HARDWARE**

1. Door operators: Ensure operator and access systems do not interfere with each other's intended operation.
2. Closers
  - a. Specify field adjustable varying spring power non handed closers with separate checking valves for :
    - 1) Back check
    - 2) Speed
    - 3) Latching adjustment
  - b. Specify minimum 10 year warranty
  - c. Specify heavy duty arms at high frequency / high abuse doors
3. Where fire rated doors are held open by electromagnet and release when in alarm, specify blocking/backing for wall-mounted electromagnetic holders.
4. Stops
  - a. Specify wall bumper stops when possible.
    - 1) Resilient round dome style is preferred.
  - b. Specify wall blocking for wall mounted stops
5. Specify stainless steel kick plate on push side of exterior or high traffic doors centered horizontally in the door and within ½" of bottom of door or directly above the sweep.
6. Smoke seals / weather strip / sweeps
  - a. Provide full weather strip and sweep at all exterior locations
  - b. Specify weather-strip at interior cold room/hot room where conditions exist
7. Specify power door operators should be hard wired

### **08 8000 GLAZING**

#### **A. GLASS**

1. During design development discuss glass requirements where security and sound isolation is required.
2. Specify all exterior glass shall be double paned, insulated, low-e glass.
3. Specify compliance with the State Glazing Law.

## **08 9000 LOUVERS AND VENTS**

### **A. GENERAL**

1. Specify non-corroding copper, galvanized steel or aluminum screens with openings no smaller than ½" to prevent bird nesting.
  - A. Refer to Division 23 for information related to intake louvers
  - B. Consideration must be given to ongoing maintenance and cleaning accessibility.

END OF DIVISION 8 OPENINGS

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# Division 09 FINISHES

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# Division 09 FINISHES

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## **09 1000 GENERAL**

### **A. RELATED SECTIONS**

1. Division 01 8000 - SUSTAINABLE DESIGN REQUIREMENTS
2. Division 33 - UTILITIES

### **B. MAINTENANCE OF FINISHES**

1. Where existing floor finishes, need to be protected from undo wear and/or soiling from construction activities, provide detailed specification requirements for protection of floors.
2. Where existing wall finishes, need to be protected from undo wear and/or soiling from construction activities, provide detailed specification requirements for protection of walls.

### **C. PUBLIC AREAS**

1. Wall and floor surfaces of public areas such as lobbies, entrance to elevators, corridors and stair towers shall be of a highly durable, no-maintenance finish.
2. Wood surfaces may be considered.
3. Based on wall surface material used corner guards may be necessary on outside corners. If used all corner guard hardware shall be concealed. Facilities and Services review and approval is required.
4. Stainless steel corner guards are not preferred.

### **B. CUTTING AND PATCHING**

1. Patch areas in a manner that eliminates evidence of patching and refinishing.
2. Refinishing should provide an even surface of uniform finish, color, texture and appearance of all finish surfaces including as much of the surrounding wall as practical. (i.e. corner to corner most adjacent to the patch)
3. Patch, repair, and/or re-hang ceilings to provide an even plane surface of uniform appearance.
4. Restore exterior building enclosures to a weather-tight condition.
5. Clean all areas and spaces removing debris immediately after work has been completed.

### **C. CLEANING**

1. Require pre and post walk through of project site to document conditions.
2. Contractor shall be responsible to get the space to the agreed upon [APPA Level of Clean](#) required in the [SDSU Contractor Cleaning Standard](#) at substantial completion and maintain it at this level through the completion of the punch list.
3. Protect finished floor appropriately during punch list phase.

### **D. RECOMMENDED FLOORING BASED ON FUNCTION OF SPACE**

1. We encourage the use of hard surface flooring in certain spaces. The list includes but is not limited to: vestibules, entrances, corridors, hallways, laboratories, classrooms, faculty offices, student (GTA, GRA) offices, mechanical spaces, custodial spaces, storage rooms, restrooms, changing rooms, locker rooms, food production spaces, resident hall student rooms, and laundry areas.
2. We consider the use of soft surface flooring in certain spaces. The list includes but is not limited to: administrative offices, conference rooms, fine art performance space such as theaters, dining areas, and lounge areas.
3. For spaces not listed above, flooring material types shall be discussed and approved by Facilities and Services.

## **09 2900 GYPSUM BOARD**

### **A. GENERAL**

1. Do not direct-glue gypsum board to masonry below grade.
2. Use cement board or superior product as backer for ceramic tile installations in wet locations such as restrooms, drinking fountain surrounds and labs.

## **09 3000 TILING**

### **A. PUBLIC RESTROOMS AND SHOWERS**

1. Wall surface.
  - a. Ceramic or porcelain tile and epoxy grout.
  - b. Install floor to ceiling; in restrooms a minimum 5'-0" AFF with epoxy paint above may be considered.
2. Floor surface.
  - a. Slip resistant ceramic tile and epoxy grout.
  - b. Grout color to be reviewed by Facilities and Services and approval is required before specifying color, medium to dark colors preferred.
  - c. Use ceramic base and corners.
  - d. Do not use resilient tile or sheet materials.
  - e. If the room has a sloping floor and or a floor drain, evaluate tile sizes and overall design to provide a desirable overall finish. Try to avoid numerous cuts in large tiles, irregular shapes and enlarged grout lines to compensate for floor slope and or drain.

### **B. DRINKING FOUNTAINS**

1. Ceramic tile wall installed to a minimum 5'-0" AFF behind drinking fountain.
2. Stainless steel surrounds shall not be used.

### **C. SAFETY SHOWERS AND EYE WASH STATIONS**

1. If located in hallways or corridors use ceramic tile 5'-0" AFF on walls behind station.
2. Review adjacent walls and propose ceramic tile 5'-0" AFF when reasonable.

## **09 5000 CEILINGS**

### **A. EQUIPMENT COORDINATION**

1. Coordination with mechanical, electrical, and plumbing equipment is required when laying out ceiling grids and supports; no mechanical, electrical or plumbing access should be blocked.
2. A "maintenance access" zone (vertically and horizontally) is to be defined and called out on drawings and maintained through final construction.
3. Lighting shall not be located in the "maintenance access" zones or access points.
4. Removal of ceiling tiles may not be blocked by equipment, piping, and conduit.
  - a. A minimum of 8" from the suspended ceiling to the bottom of equipment and ductwork is desired for ceiling tile removal.

### **B. NON ACCESSIBLE CEILINGS**

1. Access shall be provided to all equipment above non-accessible ceiling.
2. Minimum 24"x24" access consideration shall be given to the equipment in the space.

## **09 5123 ACOUSTIC TILE CEILINGS**

### **A. PANELS**

1. 2'x2' preferred maximum size.
2. Not less than 5/8" thick.

3. Square cut edges preferred, if revealed edge use tapered edge.

#### **B. SUSPENSION SYSTEM**

1. 15/16" wide tees preferred.
2. Tile shall be supported on all four edges. <detail>
3. Suspension system shall only support the ceiling tile.
  - a. Lay in fixtures shall be self-supported.

#### **09 6400 WOOD FLOORING**

##### **A. GENERAL**

1. Wood flooring can be considered for spaces for performing arts, museums and gymnasiums
2. Wood flooring shall not be considered as typical flooring. Facilities and Services review and approval is required for use of any wood flooring.

#### **09 6513 RESILIENT BASE AND ACCESSORIES**

##### **A. GENERAL**

1. Stair treads of medium to dark color are preferred, light colors shall not be used. Facilities and Services review and approval is required before specifying texture and color.
2. Homogeneous resilient base rolled goods preferred over 4' sections.

#### **09 6516 RESILIENT SHEET FLOORING**

##### **A. GENERAL**

1. Facilities and Services review and approval required before specifying any sheet flooring.

#### **09 6519 RESILIENT TILE FLOORING**

##### **A. GENERAL**

1. Vinyl composition tile is preferred.
2. 1/8" thick with full depth pattern.
3. [SDSU Floor Finishing Schedule](#)

#### **09 6813 TILE CARPETING**

##### **A. GENERAL**

1. When carpeting is an approved flooring material, carpet tiles are preferred over rolled goods.

#### **09 6816 SHEET CARPETING**

##### **A. GENERAL**

1. Facilities and Services to review and approve before specifying any sheet carpeting.

#### **09 6900 ACCESS FLOORING**

##### **A. GENERAL**

1. Facilities and Services to review and approve before specifying any access flooring systems.

#### **09 7200 WALL COVERINGS**

##### **A. GENERAL**

1. Wallpaper, vinyl, textile, and woven glass-fiber wall coverings shall not be used as a wall finish in areas such as lobbies, entrance to elevators, corridors and stairs.
2. Facilities and Services to review and approve before specifying any wall coverings.

#### **09 7523 WINDOW SILLS**

**A. GENERAL**

1. Preferred products include but are not limited to, stone, solid surface and ceramic tile.
2. Wood may be considered.
3. Laminate or any painted surface is not acceptable.

**09 9113 EXTERIOR PAINTING**

**A. GENERAL**

1. Specify the most durable and least environmentally damaging paints and coatings available
2. Do not cover or paint any signs, labels, identification, etc. If covered or painted the contractor will be responsible for replacing the items covered or painted.

**09 9123 INTERIOR PAINTING**

**A. GENERAL**

1. Specify the most durable and least environmentally damaging paints and coatings available.
2. Do not cover or paint any signs, labels, identification, etc. If covered or painted the contractor will be responsible for replacing items.

**09 9300 STAINING AND TRANSPARENT FINISHING**

**A. GENERAL**

1. Seal and stain all edges of wood doors especially top and bottom after trimming to fit.

END OF DIVISION 09 FINISHES

# Division 10 SPECIALTIES

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## Appendix

### Standard Details

- 10-010 Accessible Toilet – Elevation
- 10-020 Toilet Partition – Elevation
- 10-030 Restroom Sink – Elevation
- 10-040 Urinal – Elevation

# Division 10 SPECIALTIES

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## **10 1000 GENERAL**

### **A. RELATED DIVISIONS**

1. Division 09 - FINISHES

## **10 1100 VISUAL DISPLAY SURFACES**

### **A. MARKER BOARDS**

1. Specify porcelain finished steel marker boards with aluminum frame and marker tray at bottom

### **B. INTERIOR SIGNAGE**

1. Room number assignment is required at 100% Design Development in accordance with [Room Numbering Policy](#). Room numbering shall be reviewed and approved by Facilities and Services. These room numbers are then to be final with only minor revisions as mechanical/electrical/plumbing schedules will use these designations.
2. Room number signs and corridor signs will be fabricated and installed by Facilities and Services

### **C. DIRECTORY BOARDS**

1. Facilities and Services supplies and installs building directory boards.
2. Consideration should be given for a mounting location in the vestibule, or other approved location at main building entrance. Blocking shall be provided, a minimum 18"x24" area.

### **D. GENERAL POSTING BOARDS**

1. Facilities and Services supplies and installs general posting boards
2. Consideration should be given for a mounting location in the vestibule, or other approved location at main building entrance. Blocking shall be provided.

### **E. DISPLAY CASES**

1. Display cases must be enclosed behind glass when in common areas such as lobbies and corridors. Display security options shall be reviewed by Facilities and Services.
2. Location should be reviewed with Facilities and Services
3. Where applicable, blocking shall be provided

## **10 1416 PLAQUES**

### **A. BUILDING PLAQUE**

1. All state building projects in the Regental system shall have a building plaque as required by [BOR Policy 6:7](#).
  - a. Unless otherwise specified in BOR Policy 6:7, plaque will be 18" w x 24" h
  - b. Blocking shall be provided
  - c. Plaque to be provided by Facilities and Services

### **B. LEED PLAQUE**

1. A LEED education plaque and LEED medallion shall be supplied and installed by Facilities and Services.
2. Consideration should be given for a mounting location in the vestibule, or other approved location at main building entrance. Blocking should be provided.

## **10 1419 DIMENSIONAL LETTER SIGNAGE**

## **A. EXTERIOR BUILDING LETTERING**

1. Cast Aluminum letters, all caps, anodized finish, Times New Roman, concealed stud mounting.
2. Color of lettering shall be selected to stand out against its background, from one of the approved finishes.
  - a. Dark Bronze Anodized, Medium Bronze Anodized, Clear Anodized, or Black Anodized.
  - b. A minimum contrast ratio of 60% is recommended
3. Lettering location, size, and finish to be reviewed and approved by Facilities and Services

## **10 2239 FOLDING PANEL PARTITIONS**

### **A. GENERAL**

1. Folding wall panel shall be allowed. Accordion style wall panels shall not be permitted. Wall panels shall have a STC rating of 50 or higher.
  - a. Installation applications shall be reviewed with Facilities and Services.
    - 1) Shall not be installed for general classroom spaces.
2. Provide temperature control for each individual space when divider is used. When divider is stored, provide one common temperature set point for entire space.

## **10 2113 TOILET COMPARTMENTS**

### **A. GENERAL**

1. Minimum 1" thick solid HDPE (high density polyethylene) with homogenous color and pattern throughout, seamless. Stainless steel is not an option.
2. All non-ADA toilet compartments shall be 36" wide and 56" deep

### **B. FLOOR ANCHORED, OVERHEAD BRACE PARTITIONS**

1. Locate blocking in walls to solidly anchor partition system
2. Hardware
  - a. Stainless steel pilaster shoes
  - b. Continuous aluminum wall bracket
  - c. Integral door hinge
  - d. Aluminum surface mounted slide-bolt latch and strike
  - e. A coat hook shall be installed on the inside of each compartment door. Ensure appropriate clearance between hook and wall when door is fully opened

### **C. WALL MOUNTED URINAL PARTITION HARDWARE**

1. Locate blocking in walls to solidly anchor urinal screens
2. Specify aluminum continuous brackets where available
3. Specify stainless steel fasteners

## **10 2600 WALL AND DOOR PROTECTIONS**

### **A. SEE DIVISION 09**

## **10 2800 TOILET ACCESSORIES**

### **A. GENERAL**

1. Locate accessories to comply with preferred dimensions specified by owner; A/E shall review for ADA compliance.
2. All dispensers and trash receptacles will be owner furnished and installed
3. A/E shall annotate toilet accessories on drawings as owner provided

### **B. LAVATORY**

1. Countertop shall be a solid surface material with integrated 3" backsplash.
  - a. SDSU prefers a minimum of 2 lineal feet additional countertop surface to accommodate other needs
2. All countertops adjacent to wall surfaces shall be designed with backsplashes and end splashes. Open backs, sides, or gaps where countertop meets a wall are not allowed.
3. Minimize seams in countertops. Counter surface shall be planar without ridges.
4. Seamless integrated sinks shall be specified
5. Laminate countertops with top mount or bottom mount sinks are not acceptable.

**C. MIRRORS**

1. Mirrors should be located such that reflected images will not be available from adjacent spaces, such as corridors.
2. Individual mirrors shall be used at each sink rather than one large mirror, 18"x 36" minimum
3. A full-length mirror shall be provided in each restroom

**D. OWNER PROVIDED AND INSTALLED ACCESSORIES**

1. Soap dispensers
  - a. Facilities and Services will provide and install
  - b. Dial brand dispenser
  - c. Locate above countertop next to mirror
2. Towel dispensers
  - a. Facilities and Services will provide and install
  - b. EnMotion brand towel dispenser
3. Toilet paper dispensers
  - a. Facilities and Services will provide and install
  - b. Bay West brand dispenser
4. Waste receptacle
  - a. Facilities and Services will provide and install
  - b. A/E shall show waste receptacle location on plans
  - c. Torpedo style trash can without flap in each restroom

**E. GRAB BAR**

1. Specify according to ADA Guidelines
2. A/E shall detail backing to support the grab bar

**10 4413 FIRE EXTINGUISHER CABINET**

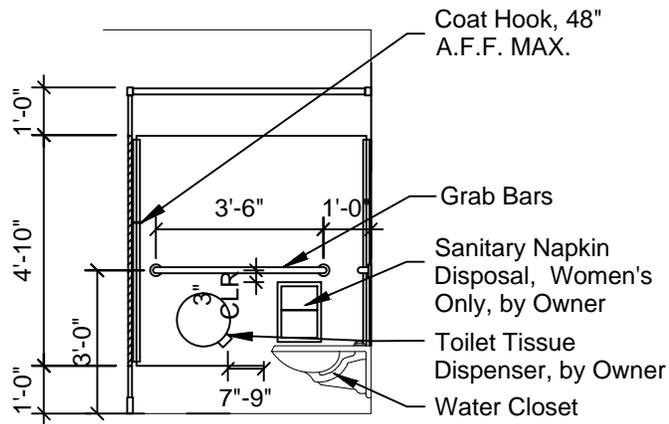
**A. CABINET WITH FRANGIBLE CAM LOCK**

1. Cabinet shall have glass front
2. Install according to NFPA

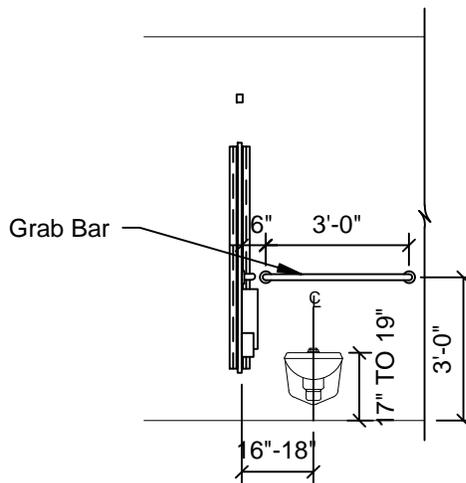
**10 4416 FIRE EXTINGUISHERS**

1. Fire extinguishers will be provided by the Owner.
2. Specify type of extinguisher specific to area

END OF DIVISION 10 SPECIALTIES



**A** TYP. ACCESSIBLE TOILET ELEV.



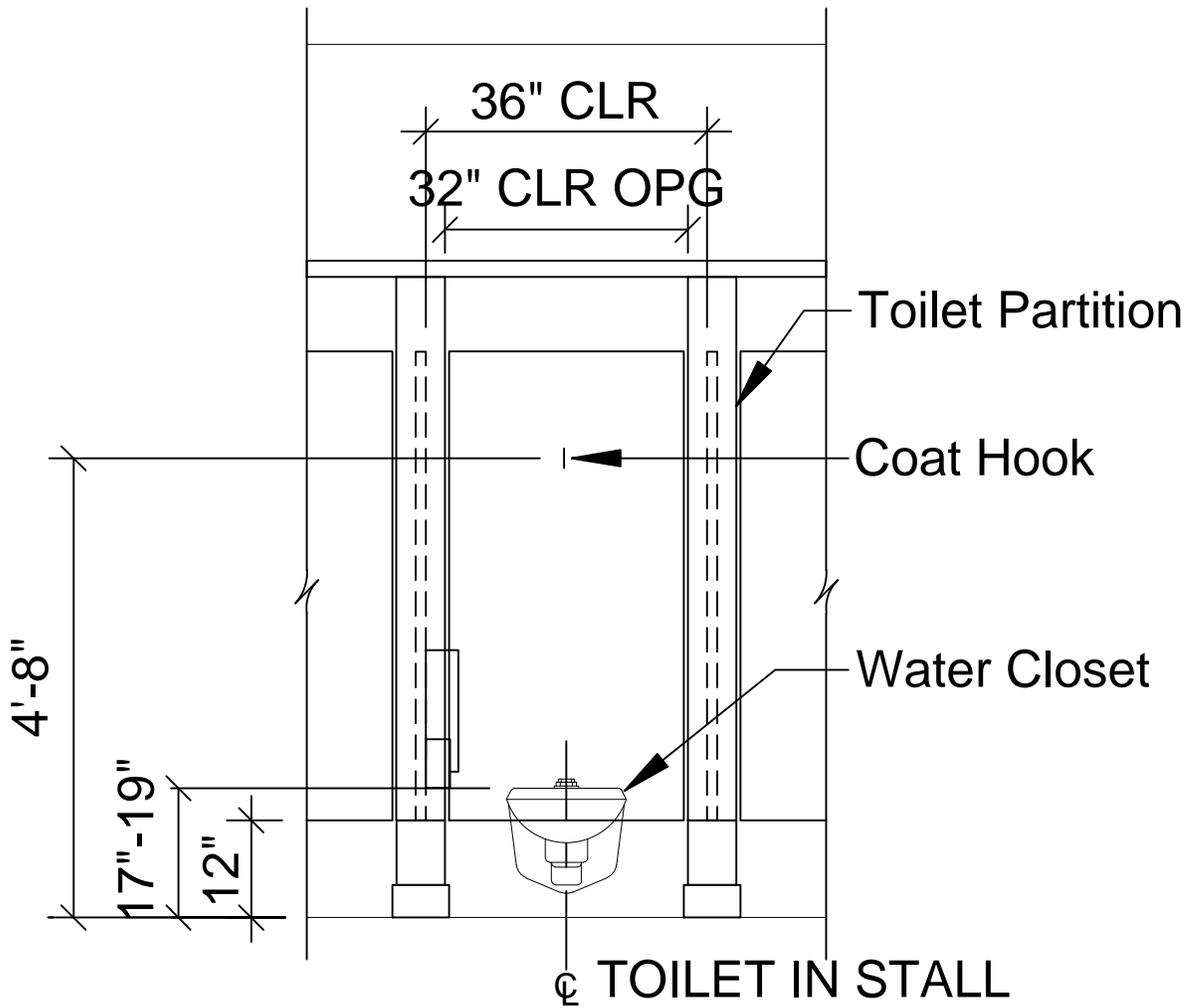
**B** TYP. ACCESSIBLE TOILET ELEV.

NOTE: All dimensions shall be reviewed for compliance with ADA guidelines, current ed.

No.	Revision/Issue	Date

Access. Toilet Elevations  
1" = 1'-0"

	CAD File	Sheet
	STND-DTL	
	Date	5/1/2012
	Scale	As Noted
		10-010

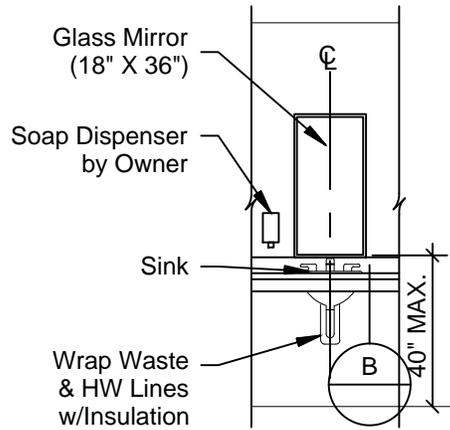


NOTE: All dimensions shall be reviewed for compliance with ADA guidelines, current ed.

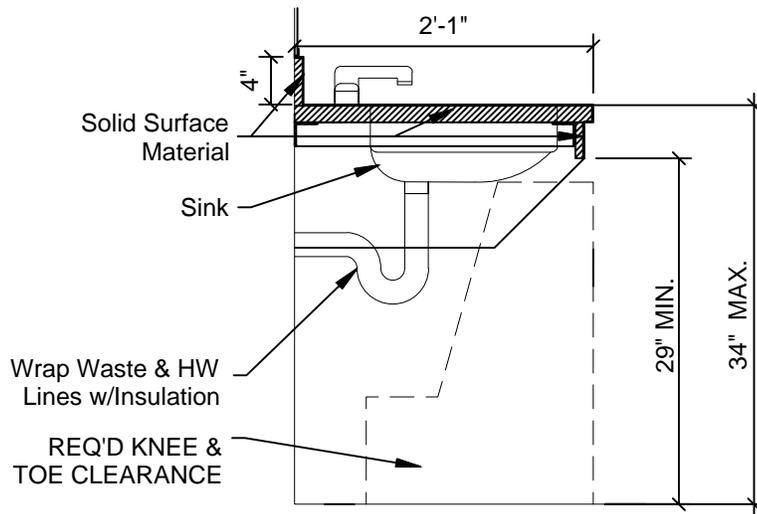
Toilet Partition Elevation  
Not to Scale

	CAD File	Sheet
	STND-DTL	
	Date	5/1/2012
	Scale	As Noted
		10-020

No.	Revision/Issue	Date



**A** TYP. RESTROOM SINK ELEV.  
1"=1'-0"



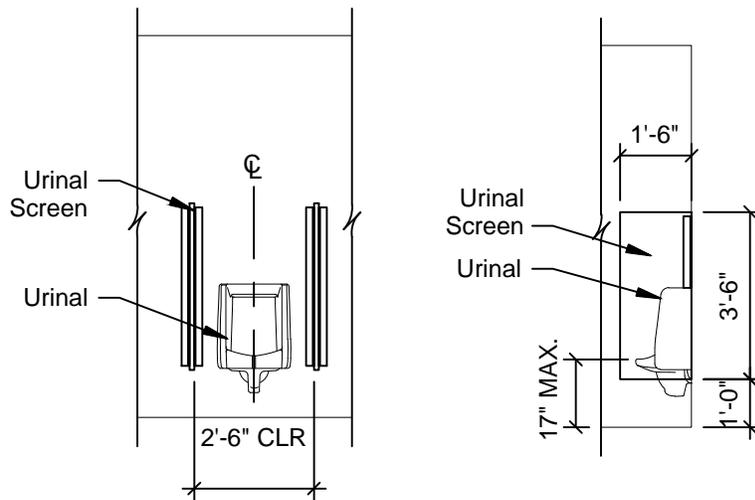
**B** SINK SECTION  
Not to Scale

NOTE: All dimensions shall be reviewed for compliance with ADA guidelines, current ed.

No.	Revision/Issue	Date

Restroom Sink Elevations  
As Noted

	CAD File	Sheet
	STND-DTL	
	Date	
	5/1/2012	
Scale		
As Noted		10-030



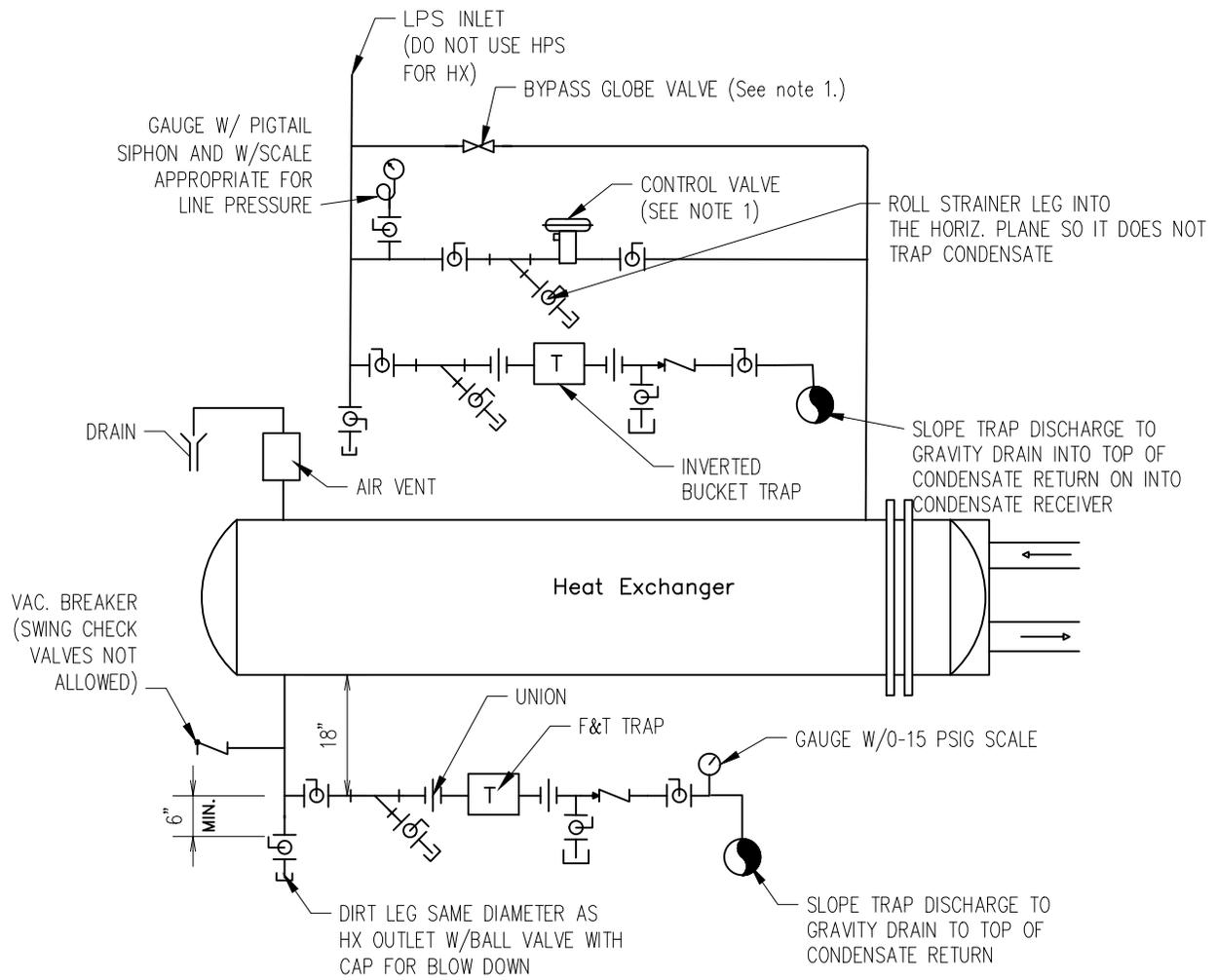
**A** TYPICAL URINAL ELEVATIONS

NOTE: All dimensions shall be reviewed for compliance with ADA guidelines, current ed.

No.	Revision/Issue	Date

Urinal Elevations  
 1" = 1'-0"

	CAD File	Sheet
	STND-DTL	
	Date	
	5/1/2012	
Scale		
As Noted		10-040



TRAP PIPE SIZE BASED ON TRAP SIZE,  $\frac{3}{4}$ " MINIMUM, BALL VALVES  $\frac{3}{4}$ " MINIMUM.

NOTES:

- ON LARGE HEAT EXCHANGERS OR UNITS THAT OPERATE UNDER LOW LOADS A SIGNIFICANT AMOUNT OF TIME, USE TWO CONTROL VALVES IN PARALLEL. ONE SIZED AT  $\frac{1}{2}$ , THE OTHER AT  $\frac{2}{3}$  CAPACITY. BYPASS LINE CAN BE OMITTED IF DUAL CONTROL VALVES ARE USED.

J:\Engineering\Design Standards\Standards Development\Standard Details\Std-DTL.dwg, 5/1/2012, 3:28:01 PM

No.	Revision/Issue	Date

## SHELL & TUBE HEAT EXCHANGER

Not to Scale

	CAD File STND-DTL	Sheet
	Date 5/1/2012	
	Scale As Noted	
	23-050	

# dDivision 11 EQUIPMENT

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# Division 11 EQUIPMENT

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## **11 1000 GENERAL**

### **A. RELATED DIVISIONS**

1. Division 21 – FIRE SUPPRESSION
2. Division 01 – VENDING
3. Division 32 – EXTERIOR IMPROVEMENTS
4. Section 03 – SPACE AND SITE DESIGN

### **B. DEFINITIONS**

1. EH&S – Environment, Health and Safety

### **C. EQUIPMENT RATINGS**

1. In an effort to promote sustainability and energy conservation, SDSU is requiring that all on-campus equipment and appliances have the ENERGY STAR designation. This includes refrigerators, microwaves, washers, dryers, computers, small air conditioners, etc.
2. Equipment must be UL listed.

## **11 1300 LOADING DOCK EQUIPMENT**

### **A. GENERAL**

1. Docks and dock levelers are to be discussed with Facilities and Services.

## **11 3100 APPLIANCES**

### **A. DEFINITION OF APPLIANCES**

1. Refrigerators, ovens, microwaves, washers, dryers, coolers, freezers, ice machines, etc.

### **B. GENERAL**

1. Installation and use of appliances shall be reviewed with the Project Manager.
2. Specify power, plumbing, ventilation, cooling and space requirements.
3. Refrigerators, coolers, freezers, ice machines.
  - a. Where installed in laboratories, these appliances shall be used only for lab products.
  - b. Specify signing to disallow use of lab appliances for storage and preparation of food and drink for human consumption.

### **C. OVEN**

1. Applications for non-commercial ovens and cook tops are required to have a hood that is exhausted directly to the exterior.
2. Lab ovens and cook tops shall be exhausted per manufacturer's written recommendations.

### **D. LAUNDRY**

1. Specify residential facilities shall have a card access system connected to each machine. Coordinate requirements for data and card access system with Project Manager.
2. Provide necessary exhaust and make-up air systems for multi dryer installations.
3. Dryer exhaust shall exit the building to prevent re-entrainment into the building.

## **11 4000 FOOD SERVICE EQUIPMENT**

### **A. GENERAL**

1. Consult with current SDSU food service provider for food service equipment requirement food service locations.
2. Energy Conservation Considerations for Food Storage; Food Preparation; Food Delivery Carts & Conveyors; Food Cooking; Food Dispensing; Ice Machines; Dishwashing Machines; and Hoods.
  - a. Incorporate energy reducing strategies; Examples
    - 1) cooking hoods – variable flow exhaust system
    - 2) make-up air and exhaust systems – heat recovery
    - 3) waste water heat recovery systems
3. Use of central plant steam is not allowed on any food preparation equipment.
4. Also refer to Division 21 – FIRE SUPPRESSION.

## **11 4100 VENDING EQUIPMENT**

### **A. GENERAL**

1. Design to provide power, data for card swipe, plumbing, ventilation, cooling and space required by vending equipment furnished by others.
  - a. Verify requirements with Owner's Representative.
  - b. See Section 03 – SPACE AND SITE

## **11 5200 AUDIO-VISUAL EQUIPMENT**

### **A. GENERAL**

1. Design to provide power, data, cabling pathways, and space required by equipment furnished by the Owner.
2. Supplemental Design Guides/**Instructional and Conference Technologies (Pending)**

## **11 5300 LABORATORY EQUIPMENT**

### **A. GENERAL**

1. Design of the laboratories will required a review and recommendations from Environmental Health & Safety.

## **11 8000 COLLECTION & DISPOSAL EQUIPMENT (SOLID WASTE HANDLING)**

### **A. GENERAL**

1. Design of facilities that involve storage and/or disposal of industrial and/or special materials, chemicals, waste, etc. will require a report and recommendation from EH&S.
2. Recycling Policy – Refer to Facilities and Services service guide – Single Stream Recycling includes and applied in (specific facilities)

END OF DIVISION 11 EQUIPMENT

# Division 12 FURNISHINGS

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## Division 12 FURNISHINGS

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### **12 1000 GENERAL**

#### **A. RELATED DIVISIONS**

1. Division 01 8000 - SUSTAINABLE DESIGN REQUIREMENTS
2. Division 06 - WOOD, PLASTICS, AND COMPOSITES
3. Division 10 - SPECIALTIES
4. Division 11 - EQUIPMENT
5. Division 32 - EXTERIOR IMPROVEMENTS
6. Section 03 - SPACE AND SITE DESIGN

### **12 2100 WINDOW TREATMENTS**

#### **B. GENERAL**

1. Facilities and Services review of window treatments is required prior to any purchase to assure selections will achieve program/room use requirements
2. Treatments will be installed by General Contractor or Facilities and Services
3. Specify blocking for window treatment installations

### **12 3200 CASEWORK**

#### **A. GENERAL**

1. See Division 06 - WOOD, PLASTICS, AND COMPOSITES for general casework
2. See Division 11 - EQUIPMENT for lab casework

### **12 3400 COUNTERTOPS**

#### **A. GENERAL**

1. See Division 06 - WOOD, PLASTICS, AND COMPOSITES
2. See Division 10 - SPECIALTIES for restrooms
3. See Division 11 - EQUIPMENT for labs

### **12 4100 ENTRANCE/WALK OFF MATS**

#### **A. GENERAL**

1. Entrance/walk off mats will be provided by owner
2. Entrance/walk off mats shall provide adequate coverage to reduce foreign material from entering the building. Coordinate with LEED requirements, see Division - 01 7600 SUSTAINABILITY/LEED CERTIFICATION
3. Entrance/walk off mats should be of the same/similar design as existing mats on campus
4. Attention shall be given to the pile height of specified mats to assure any doors that swing over the mats have adequate clearance

### **12 4300 ENTRANCE FLOOR GRILLS**

#### **A. GENERAL**

1. Entrance floor grills shall not be used

### **12 5100 FURNISHINGS**

**A. GENERAL**

1. Furnishing layouts are required at each stage of the design
2. Coordinate the furnishing layouts with MEP systems and provide drawings to verify equipment access and serviceability
3. Review and coordinate locations of data, power, air distribution, etc...
4. Furnishing procurement is typically handled by Facilities and Services
5. Facilities and Services review of furniture and or partition layout is required prior to any purchase or installation
6. If building system and mechanical equipment items are covered by furniture, the department shall be responsible for the cost to remove and or disassemble furniture to access equipment
7. For general classrooms see General Classroom Guidelines document

**12 6100 FIXED AUDIENCE SEATING**

**A. GENERAL**

1. Fixed seating can be either upholstered or non-upholstered
2. If tablets are used with the fixed seating, the tablet needs to flip and recess/drop between seats
3. Continuous tables are preferred
4. For general classrooms see General Classroom Guidelines document
5. American Seating products have not provided the durability required by our users.

**127100 OUTDOOR FURNISHINGS**

**A. GENERAL**

1. Outdoor furnishings shall be discussed with the Project Manager
2. Concrete pads or solid surfaces are required for all items mentioned in this section. See Division 32 - EXTERIOR IMPROVEMETS
3. Outdoor furniture shall be from Victor Stanley, Inc. Steelsites line.
4. Outdoor tables

Victor Stanley; Steelsites RND 363



5. Outdoor seating

Victor Stanley; Steelsites; RB 28



END OF DIVISION 12 FURNISHINGS

# Division 13 SPECIAL CONSTRUCTION

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# Division 13 SPECIAL CONSTRUCTION

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

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## **13 1000 GENERAL**

### **A. RELATED DIVISIONS**

1. Division 23 - HEATING, VENTILATION, AND AIR CONDITIONING
2. Division 26 – ELECTRICAL

## **13 1200 ENVIRONMENTALLY CONTROLLED ROOMS**

### **A. GENERAL**

1. This section applies to environmentally controlled spaces. (ie. refrigerated walk-in units and growth chambers)
2. Self-contained units are preferred.

### **B. VARIATIONS**

1. It is recognized that project conditions and requirements may vary and all items identified herein may not apply in all cases.

### **C. EQUIPMENT DESIGN AND REQUIREMENTS**

1. Condensing Units
  - a. Once through water cooled condensing units shall not be used except as a backup to a primary cooling source.
  - b. Roof mounted equipment shall be avoided.
  - c. Final condensing unit location and design shall be approved by Facilities and Services.
  - d. If condensing units are located out-of-doors, a proper winterization kit should be installed to maintain correct operating pressures.
  - e. Do not utilize condensing units which operate on a vacuum, except on special extra-low temperature equipment.
2. On standard walk-in units, a pump-down cycle, utilizing a thermostat and solenoid, should be specified.
3. Copper tube, Type L-ACR (Air Conditioning and Refrigeration) should be used for field service refrigerant piping. Follow ASHRAE guides for copper supports and piping.
4. Suction lines should be insulated in accordance with Division 23 - ELECTRICAL. When piping runs through the cabinet wall, insulation shall run continuously through the wall with no gaps or joints.
5. Specify a solid core desiccant-type dryer on the liquid line and suction line. All dryers should be mechanically removable. Dryers with replaceable cores are preferred.
6. Liquid line sight glass indicator should have a moisture indicator on it, installed on the downstream side of the dryer.
7. When the unit operates at temperatures below 36° F., an electric or hot gas defrost should be specified on the cooling coil.
8. Vibration
  - a. Specify vibration eliminators on the refrigeration lines, at the source of vibration.
  - b. Specify vibration pads under the condensing unit, if necessary to reduce the noise transmission.
9. Where possible, Specify 208 volt compressors on small units with fractional horsepower.
10. Specify suction line accumulators on low-temperature applications.
11. Refer to Division 23 for refrigerant related requirements.

12. Energy Ratings
  - a. In an effort to promote sustainability and energy conservation, all on-campus equipment and appliances shall have the ENERGY STAR designation, where equivalent equipment is available.
  - b. Equipment must be UL listed.
13. Connect equipment to Building Automation System (BAS) for alarming.
14. Discuss these items with Facilities and Services:
  - a. Extent of alarming to be passed through to BAS.
  - b. Type of control panel needed. Discuss if chart recorder or long term trending data is needed via campus building automation system or localized standalone system.
  - c. Need for redundant heating or cooling source.
15. Locks for door and control panel(s) should be able to accept a padlock or a small-format 7 pin IC core.
16. Refer to Division 26 - ELECTRICAL for Electrical Requirements.

END OF DIVISION 13 SPECIAL CONSTRUCTION

# Division 14 CONVEYING EQUIPMENT

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# Division 14 Conveying Equipment

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

*The Owner encourages improved concept, method and products by the Design Professional; however Project compatibility with existing campus systems, processes and procedures is most desirable.*

## **14 1000 GENERAL**

### **A. RELATED SECTIONS**

1. Division 09 – FINISHES
2. Division 26 – ELECTRICAL

## **14 2000 ELEVATORS GENERAL**

### **A. CAR ENCLOSURE AND ENTRANCE**

1. Finish Materials: Specify durable, low maintenance finish materials inside elevator cab. Refer to Division 9 - FINISHES.
2. Door Finish: Frame and Doors shall be painted steel. Stainless Steel shall not be used.
3. Specify tamper proof hardware inside elevator car
4. Specify a minimum of 3'-6" opening. A larger opening may be necessary depending on the intended use of the elevator.
5. Minimum vertical clearance: 8'-0". Discuss with Facilities Services.
6. Specify the elevator contractor shall supply protection blankets for the inside of the car.
7. Car Lighting
  - a. Specify tamper proof lens on light fixtures
  - b. Refer to Division 26 -ELECTRICAL for fixture requirements

### **B. EMERGENCY PHONE:**

1. Provide built-in speaker phone capable of 2-way voice communication without use of a handset. Provide appropriate safety and operational labeling.
2. Emergency phone shall be capable of functioning in the event of power loss.
3. On activation, the system shall dial a pre-programmed number directly to the SDSU Police Department. Coordinate with Facilities and Services Project Manager.
4. System shall deactivate when receiving end disconnects.
  - a. Special disconnecting procedures are not acceptable.

### **C. ACCESS TO SECURE AREAS:**

1. Locate elevators to conveniently service penthouse and basement mechanical rooms where applicable.
2. If secure access is required (i.e. direct opening to mechanical rooms, loading docks, etc.) provide key system meeting University keying standard. The keying shall only apply to the secure floors.
  - a. Refer to Division 8 - OPENINGS.
3. Lock shall be similar to Storeroom function. The key shall not be able to come out of the core until it is back in the secure position.

### **D. ELEVATOR PIT**

1. Elevator pits shall be designed to prevent infiltration of ground water. Refer to Division 7.
2. A dedicated sump pump and monitoring system shall be installed in all elevator pits.
  - a. Provide high level alarm interfaced to building automation system.
  - b. Provide oil minder system with local audible and visual alarm. Tie to building automation system.
  - c. Refer to Division 22
3. Provide a pit light with wall switch
4. Provide a pit ladder.

5. Provide elevator motor disconnect within the pit.

**E. ACCEPTANCE, MAINTENANCE AND WARRANTY**

1. Specify a 12 month warranty starting on the date of project substantial completion.
2. Extended service contracts are not required with new installations
3. Contractor may use elevator during construction at their risk. Elevators shall be in "New" condition at time of substantial completion. Contractor's use of elevator for construction purposes shall not change the warranty period.
  - a. Specify the contractor shall install a new shaft seal following substantial completion.
4. Training:
  - a. Specify owner training to cover general service and operation.
  - b. Specify owner training to cover emergency response requirements.
5. Service during the warranty period:
  - a. Response time shall not exceed 24 hours for loss of service

**F. ELEVATOR SPEED**

1. Discuss with facilities and Services.
  - A. Speed requirement are on application and service type.

**G. SERVICE TYPES**

1. Elevators are typically designed for both passenger and service functions.
2. Elevator load rating regardless of type of service shall be a minimum of 2500lb.
3. Limited Utility Limited Access (LULA) style elevators and chair lifts shall be pre-approved by Facilities and Services.

**H. ELEVATOR CONTROLS**

1. Specify non-proprietary controller similar to MCE HMC-1000 as basis of specification

**I. MACHINE ROOM**

1. Elevator equipment rooms must be dedicated for elevator equipment only.
2. Utilities unrelated to the elevator equipment shall not be run through the equipment room.

**14 2400 HYDRAULIC ELEVATORS**

**A. GENERAL**

1. Elevator shafts shall be designed to meet the installation requirements for at least three different manufactures of elevators.
2. Hydraulic elevators include single-acting, under-the-car, hydraulic plunger cylinder units with electric pump.
3. Pump
  - a. Specify PCB free, biodegradable oil.
4. Jack-Shaft
  - a. Provide Sleeve and casing
  - b. Ensure hydraulic oil cannot contaminate soil or groundwater in event of a leak. Provide seal over jack-shaft sleeve.
  - c. Specify a new jack-shaft seal is installed at the completion of all construction – no exceptions.
5. Acceptable Manufacturers
  - a. Kone
  - b. Thyssen Krup
  - c. Otis
  - d. Minnesota elevator
  - e. Other with approval of Facilities and Services

## 14 2500 OTHER ELEVATORS

### B. GENERAL

1. The following other types of elevators will be considered by the SDSU Facilities and Services dept.
  - a. Hole-less Elevator
    - 1) Beside the car, telescoping, dual cylinder
  - b. Traction
  - c. Machine-Room-Less (MRL)

END OF DIVISION 014 CONVEYING EQUIPMENT

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# Division 21 FIRE SUPPRESSION

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## Division 21 FIRE SUPPRESSION

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

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### **21 1000 GENERAL**

#### **A. DEFINITIONS**

1. NFPA – National Fire Protection Association
2. A/E – Architect/Engineer
3. OSHA – Occupational Safety and Health Administration

#### **B. GENERAL**

1. Each project should be evaluated for requirement of fire suppression systems.
2. Discuss future capacity needs when sizing piping system.
3. Abandoned items must be removed
4. Hardware that require special tools and/or test equipment must be brought to the attention of the Project Manager prior to specification and/or installation.
  - a. Specify special tools and test equipment be provided with the project.
5. Location of main fire service entrance shall be in a mechanical room.
  - a. Separate location from electrical systems

#### **C. ACCESSIBILITY OF FIRE SUPPRESSION SWITCHES, AND CONTROLS:**

1. Accessible is defined as being capable of being reached without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and ductwork. Access must not exceed 14 feet in height, a typical ladder working height.
2. Design Professional shall include accessibility requirements in the construction documents
3. Refer to and abide by all OSHA requirements, as appropriate.
4. Access to standpipe shall be in publically accessible locations.
5. Maintenance access points must be provided.
  - a. Minimum 12" working clearance at access points are to be maintained.
6. Fire Suppression Access Panels:
  - a. Sprinkler valves and/or equipment shall be provided with an access panel large enough to readily pass equipment/manpower through to make repairs.
  - b. Location is subject to review by the Architect, Engineer and the Project Manager.
  - c. Shall be fire rated the same as wall or ceiling in which it is located.
  - d. Labeling of component(s) behind an access panel.
    - 1) Red label with 1" white lettering.

#### **D. TESTING**

1. Specify a test pressure and duration.
2. Testing shall be witnessed by owner or owner representative.

#### **E. TRAINING (NFPA CERTIFIED)**

1. The vendor shall provide training to SDSU staff and local fire safety personnel. Training shall cover maintenance and operational aspects, both described and demonstrated of the fire suppression systems.
2. Training shall be conducted by a manufacturer's representative thoroughly familiar with the characteristics of the installed system.
3. Specify two training sessions to accommodate staff schedules.

**F. OVERSTOCK, TOOLS AND SUPPLIES TO BE INCLUDED IN EACH SPRINKLER HEAD CABINET:**

1. Per system requirement:
  - a. Sprinkler heads: minimum six (6) per head type.
  - b. Sprinkler head wrenches: minimum two (2) per sprinkler head cabinet.
  - c. Sprinkler head cabinet: one (1) per sprinkler riser.

**G. IN THE OPERATIONS AND MAINTENANCE DATA, PROVIDE THE FOLLOWING INFORMATION ON EACH TYPE OF FIRE SUPPRESSION SYSTEM:**

1. Name and 24/7/365 contact information for system installer and General Contractor.
2. Floor plans showing the layout and location of all sprinkler heads, valves, flow sensors, risers, service entry, standpipes, fire department connections, etc. for each floor.
3. Separate floor plans graphically depicting system zoning for each floor.
4. Reduced scale copy of system zoning plans to permanently mount in room where main fire service entrance is located.
5. Parts and material specifications for specialized system components that require routine maintenance or replacement in the event of activation.

**21 0553 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

**A. GENERAL**

1. Minimum Identification:
  - a. Specify labeling is to be reviewed and approved by Facilities and Services.
  - b. Hydraulic information signs required at fire service main entrance.
  - c. Provide permanent signage, interior and exterior, at all utility boxes, vaults, manholes, main valves, etc.
  - d. Zoned systems must have clearly defined valves.
  - e. Label equipment, piping, etc. with description or verbiage and direction of flow.
  - f. Label all valves with numbers and spaces they serve.
  - g. Label ceilings or ceiling grid (not the tile) at key access points, valves, equipment, etc. with a clear adhesive label and bold black lettering with equipment, ID information, etc..

**21 1300 WET OR DRY -PIPE SPRINKLER SYSTEMS**

**B. GENERAL**

1. For fire sprinkler piping requirements, see [SDSU Standard Pipe Schedule](#).
2. Systems and system component locations should be designed and located in areas that are not exposed to the subfreezing conditions therefore requiring additional insulation, heat tape, etc. (ie. vestibules, exterior walls, loading docks, etc.)
3. In wet pipe systems within areas subject to potential freezing conditions, coordinate with the Building Automation System plans and specifications to provide a temperature sensing element (flat plate or strap-on) near the piping to provide a low temperature alarm.
4. Furnish and install tamper switches, flow switches and weatherproof exterior bell. Coordinate connection to ensure proper function of alarm and supervisory devices.
5. Fire Suppression Piping:
  - a. Do not impede or limit access of doors, windows, openings, or head room; piping shall be configured to provide a maximum amount of access for equipment maintenance.
  - b. Pipe openings shall be closed with caps and/or plugged after installation to prevent entrance of foreign materials before final connections.
  - c. Maintenance and Protection Requirements:

- 1) Flushing locations shall be provided per IBC Standard in accessible locations; reviewed and approved location by the A/E and the SDSU project manager.
  - 2) Flushing connections: 1-1/4 inch nipples with caps at extreme ends of all cross mains.
6. Drains and Drips:
- a. Piping shall drain back to the express drain located beside the standpipe/riser. Where this is not possible auxiliary drains must be provided and discharge location to be reviewed and approved by SDSU Facilities and Services.
  - b. Install auxiliary drains at low points in system.
  - c. Five or fewer trapped heads will not require a drain valve, but may be drained through plugged tee.
  - d. Drains are to have a ¾ hose line connection.
  - e. If discharge of main drains, auxiliary drains, or inspector's test connections will cause exterior landscape or property damage a concrete splash block is to be provided to deflect flow and minimize damage.
7. Provide dielectric unions wherever dissimilar piping materials are connected.

**C. SPRINKLER HEADS & ASSOCIATED EQUIPMENT**

1. Discuss head type (concealed heads) with Facilities and Services.
2. On wet standpipe systems, owner will furnish and install locking caps for standpipe valves.

END OF DIVISION 21 FIRE SUPPRESSION

# Division 22 PLUMBING

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## Division 22 PLUMBING

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

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### 22 1000 GENERAL

#### A. RELATED SECTIONS

1. Division 10 – SPECIALTIES
2. Division 21 – FIRE SUPPRESSION
3. Division 23 – HEATING VENTILATION AND AIR CONDITIONING
4. Division 33 – SITE UTILITIES

#### B. DEFINITIONS

1. ANSI – American National Standards Institute
2. ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
3. NFPA – National Fire Protection Association
4. ASME – American Society of Mechanical Engineers
5. AWWA – American Water Works Association
6. HVAC - HEATING VENTILATION AND AIR CONDITIONING

#### C. GENERAL

1. When new roof openings or penetrations are required for existing buildings, verify with the Owner's Representative whether the roof is under warranty.
  - a. If under warranty, comply with the roof manufacturer's details to prevent voiding the warranty.
  - b. Require roofing contractor be certified to work on manufacturer's roofing system.
2. Verify utility availability at the site with Owner's Representative.
3. Specify the Contractor consult with the Owner's Representative to coordinate service connections to existing systems, see Division 33, site utilities.

#### D. PIPING SELECTION AND LAYOUT

1. Specify piping in compliance with the Owner's standard pipe schedule and applicable code requirements.
2. For pipe material, see [SDSU Standard Pipe Schedule](#).
3. Design using pipe sizes that allow for water flow in pipes that comply with State Plumbing Code.
4. Do not specify plastic pipe for supply piping inside buildings unless required for pure water piping.
5. Verify with Owner's Representative before specifying acid waste piping for laboratories.
6. Lay out piping parallel to building lines where practical.
7. Lay out pipe adequately sloped with drain valves located at low points to facilitate complete draining.
8. For Drain Waste Vent (DWV) piping, specify cleanouts as noted below:
  - a. For waste piping 2" and smaller, specify cleanouts not to exceed 45 feet.
  - b. For waste piping greater than 2", specify cleanouts every 90 feet.
  - c. In areas requiring waste drain piping under supported structural floor slabs, the cleanouts shall extend above the floor line at least to the level of the highest fixture. Vertical to horizontal changes in main soil and waste stacks that occur above furred ceilings shall have a cleanout extended from the base to a floor cleanout through the floor above, or a wall cleanout in the vertical stack above the change in direction. All cleanouts in ceiling spaces shall be extended up to the floor above.
  - d. Provide fully accessible cleanouts for waste lines in each restroom.
9. Layout equipment with adequate clearance to service tubes, filters, strainers, valves, specialties as well as for the general replacement of pipe sections and parts.

- a. Locate sufficient unions, flanges, and valves to permit independent removal of equipment.
- 10. Do not locate plumbing or other piping in the following spaces:
  - a. Transformer vaults
  - b. Elevator Shafts
  - c. Elevator Equipment rooms
  - d. Telecommunication equipment rooms
- 11. Provide a minimum 3 foot wide pipe chase for restrooms.
  - a. Design water closet, urinal drain and sink piping layouts with long sweep fittings to locate cleanouts within the pipe spaces and 6 inches above the highest drained fixture overflow level.
  - b. Pipe chases for restroom groups need to be accessible via corridor, and not through restroom. Restroom chases shall have a minimum 2 foot clearance for maintenance between all carriers and piping.
- 12. Except for sanitary and storm piping, do not bury piping mains under floor slabs.
- 13. Drain lines less than 2" in diameter are not allowed under floors.
- 14. Install accessible piping in building tunnels where practical.
- 15. No plastic piping is allowed within utility distribution tunnels.
- 16. Ensure that architectural drawings require that floors slope to drain.
- 17. Design drawings shall include water risers, gas risers and waste and vent risers.
- 18. Do not locate vent piping or exhaust piping within ten (10) feet of outside HVAC air intakes
- 19. Require that valve stems are located where they are easily accessible for maintenance purposes.

#### **E. ROOF PIPING**

- 1. Require all roof drains to be installed so as to permit full and complete rodding.
- 2. Roof drains shall be located at the lowest point(s) of the roof and use a minimum 3-inch diameter pipe
- 3. All vent pipes through built up roofs shall be flashed.
- 4. All other pipes through built-up roofs shall use lead flashing.
- 5. Horizontal piping on the roof is not preferred.
  - a. If necessary, piping shall be a minimum 12" above the roof.
  - b. Mounts or supports shall be anchored to roof deck and fully flashed and counter-flashed to provide waterproof penetration.
- 6. Refer to Division 07 – THERMAL AND MOISTURE PROTECTION.

### **22 0719 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

#### **A. PIPING**

- 1. Provide pipe identification on all piping.
  - a. Specify wording/color combinations that comply with ANSI A13.1 standards.
  - b. Specify adhesive backed stickers for piping identification with flow arrows
    - 1) Stencils are not acceptable

#### **B. CONCEALED COMPONENTS**

- 1. Specify system components concealed by insulation, such as valves, strainers, unions, etc., are labeled on the outside of the insulation covering.

### **22 0523 GENERAL-DUTY VALVES**

#### **A. GENERAL**

- 1. Show valve locations on Drawings.
- 2. Specify valve locations which isolate branch sections of main lines.
- 3. Specify isolation valves on all items subject to repair or replacement.

4. Only full port ball valves shall be used. Gate valves are not allowed.

## **22 0716 PLUMBING EQUIPMENT INSULATION**

### **A. SEE DIVISION 23 – HVAC FOR PIPE AND EQUIPMENT INSULATION STANDARDS**

## **22 0719 PLUMBING PIPING INSULATION**

### **A. SEE DIVISION 23 – HVAC FOR PIPE AND EQUIPMENT INSULATION STANDARDS**

## **22 1116 DOMESTIC WATER PIPING**

### **A. CLEANING OF POTABLE WATER PIPING**

1. Specify the following flushing procedure:
  - a. Operate flush valves, faucets, and other valves as needed until flow is clean.
  - b. After flushing, remove inlet strainers, aerators and other devices, thoroughly clean and replace.
  - c. Remove valve assemblies to clean out foreign material when necessary and replace assemblies.
2. Specify the following disinfecting procedure and requirements.
  - a. Provide necessary connections at beginning points of individual sections of mains to apply chlorine for disinfecting purposes.
  - b. Verify the system is complete, flushed and clean prior to starting the disinfecting procedure.
  - c. Ensure pH of water is treated until it meets State Code requirements.
  - d. Inject disinfectant (free chlorine in liquid, powder or tablet form) throughout the system to obtain a 50 to 80 mg/L residual.
  - e. Bleed water from outlets to ensure distribution, and test for disinfectant residual at a minimum of 15 percent of outlets.
  - f. Maintain disinfectant in the system for 24 hours.
  - g. If final disinfectant residual tests less than 25 mg/L, repeat the treatment.
  - h. Flush disinfectant from the system until the residual is equal to that of incoming water or 1.0 mg/L.
  - i. Take samples no sooner than 24 hours after flushing. Sample two percent of outlets in addition to a sample directly upstream of the building service and analyze in accordance with AWWA C651.

## **22 1119 DOMESTIC WATER PIPING SPECIALTIES**

### **A. BACKFLOW PREVENTERS**

1. Isolate domestic water from cross contamination using a backflow preventer in the domestic water line.
2. In addition to applicable codes, all backflow preventers shall be installed at or below 5-feet off finished floor.
3. On the main domestic water line to the building, locate two reduced pressure zone type backflow preventers sized at 60% capacity and piped in parallel to allow the Owner to test each device without taking the entire building out of service.
4. Design floor sinks and standpipes that serve reduced pressure backflow preventers with enough capacity to accept full flow discharge from the backflow preventer.
  - a. Locate floor sink within 3 feet of backflow preventer.
5. On the fire prevention system serving the building, use a double check type or other type of backflow preventer as determined by analysis of risk to the domestic water service.
  - a. Where a portion of the fire prevention system contains an elevated risk such as a glycol loop, consider specifying an additional backflow preventer for that portion of the piping.
6. All OSHA access requirements must be followed.
7. Test ports must be accessible.
8. Backflow preventers for irrigation systems require 12" clear under the assembly.
9. Underground installations are not permitted.
10. Exterior installations are not permitted.

11. Pipe drain port off of backflow preventer to drain.
  - a. Inspector's test ports are required on all backflow preventers.
12. Strainers are required on all backflow preventers.

**B. DOMESTIC WATER PIPING ACCESSORIES:**

1. Wye-strainers are to have a valve with a brass cap located on the cleanout port of the strainer.
2. Water hammer arrestors shall be of the permanently sealed shock absorber type. Every arrestor shall be accessible, and provided with an isolation valve to facilitate replacement.
3. Provide all brass dielectric unions wherever dissimilar piping materials are connected.

**22 1329 SANITARY SEWERAGE PUMPS**

**A. GENERAL**

1. All pumps must be duplex systems.
2. Packaged pumps must be complete including pump and controls.
3. Pumps are to be installed on rail systems for access and removal unless they are less than 50 GPM or 40lb pump weight.
4. Pumps and associated piping in areas that might eject hot water must be rated for high temperatures.
5. Furnish complete control unit, including starter, float and alarm control.
6. Pumps are to have cast iron body and motor housing, cast iron impeller, mechanical seals, stainless steel shaft and strainer.
7. Provide ball and rod operated controls arranged to allow pump operation and alarm bell initiation to report to the campus BAS.

**22 1413 FACILITY STORM DRAINAGE PIPING**

**A. PIPE ROUTING**

1. Do not run storm drain piping exterior to the building.
2. Require interior piping be concealed within walls or chases.

**22 1423 STORM DRAINAGE PIPING SPECIALTIES**

**A. ROOF DRAINS**

1. Specify durable cast iron type strainer screens

**22 1429 SUMP PUMPS**

1. Any below grade area and/or tunnel must be provided with a sump pump, sump pit, high water alarm and loss of power alarm.
2. Below grade areas must provide a sump pump and sump pit to avoid any standing water. These areas include:
  - a. Elevator pits
  - b. Utility tunnels and trenches
  - c. Basements below grade
3. If elevator, electrical and/or communication rooms are located below grade, that building level must be equipped with a sump pump system powered by a local standby power source.
4. Pumps and associated piping in areas that might eject hot water must be rated for high temperatures.
5. Furnish complete control unit, including starter, float and alarm control.
6. Pumps are to have cast iron body and motor housing, cast iron impeller, mechanical seals, stainless steel shaft and strainer.
7. Provide ball and rod operated controls arranged to allow pump operation and alarm bell initiation to report to the campus BAS. Loss of power alarm shall also be monitored by BAS.
8. In areas of high water table, dual pump units may be required. Consult with project manager regarding sump pump locations and requirements.

## **22 1513 COMPRESSED-AIR AND VACUUM PIPING**

### **A. LABORATORY COMPRESSED AIR AND VACUUM PIPING**

1. Tubing shall be cleaned for oxygen service by the manufacturer and delivered with capped ends.
2. See [SDSU Standard Piping Schedule](#)
3. Valves shall be shipped factory cleaned and sealed.

### **B. GENERAL-SERVICE COMPRESSED AIR AND VACUUM PIPING**

1. See SDSU Standard Piping Schedule

## **22 1519 PACKAGED AIR COMPRESSORS, VACUUM PUMPS AND RECEIVERS**

### **A. COMPRESSOR TYPE:**

1. Duplex tank-mounted, two stage, screw type or reciprocating air compressor complete with tank, motors, drives and controls.

## **22 3100 DOMESTIC WATER SOFTENERS**

### **A. WATER SOFTENERS SHALL BE REQUIRED:**

1. On all new buildings and remodels where water purification is being installed.
2. On all new buildings and remodels above 5,000 square feet that have a domestic hot water load of 10 GPM or higher.
3. On facilities with high water usage, specify softener to incorporate brine water reclaim technology.

## **22 3300 ELECTRIC, DOMESTIC-WATER HEATERS**

- A. Do not specify electric water heaters except where gas or steam heat is unavailable.

## **22 3400 FUEL-FIRED DOMESTIC-WATER HEATERS**

### **A. GENERAL**

1. Specify commercial-grade units.
2. Provide adequate combustion make up air.

## **22 3500 STEAM-FIRED DOMESTIC-WATER HEATERS**

### **A. GENERAL**

1. Manufacturers known to be acceptable: Aerco, Thrush
2. Specify steam fire instantaneous or semi-instantaneous water heaters when steam is available and when load justifies.
3. Steam fired water heaters shall be designed to use low pressure steam as heating source.
4. Steam control valves to domestic hot water heaters are to be normally closed.
5. Water heater shall be designed for 140 degree outlet temperature.
6. Thermostatic mixing valves shall be used to provide 120 deg F or lower tempered water to the building occupants.
7. Hot water supply temperatures at fixtures shall be maintained by the use of pumped circulating systems.
8. Booster heaters shall be used for dishwashers and other equipment requiring hot water in excess of 120 deg. F. Raising the temperature of the building hot water system is not allowed.
9. If located outside of a mechanical room, then installation must include a plastic pan and drain under the unit.

## **22 4000 PLUMBING FIXTURES**

### **A. WALL HYDRANTS**

1. Provide stainless steel box with concealed hose connection.

2. ¼ turn non-freeze; with integral vacuum breaker.

#### **B. HOSE BIBS**

1. Required locations:
  - a. Building exteriors every 150 feet
  - b. Maximum 25 feet from any exterior HVAC equipment
  - c. One roof top location
  - d. One in each mechanical and/or plumbing room
  - e. Custodial Closets (additional units may be required, consult with F&S)
2. Vacuum breaker spout.
3. ½-inch NPT female thread inlet
4. Control must be via a hose bib key, except in custodial closets.
5. Hose bibs in custodial closets shall have bucket hanger.
6. Isolation valves for hose bibs are to be accessible; located on the building interior for exterior locations.
7. All exterior hose bibs shall be freeze-less.

#### **C. MOP SINKS**

1. One piece and floor mounted
2. Typically 24 inch x 24 inch x 10 inches.
3. Material: plastic, composite
4. Color: White
5. Drain: factory installed type 302 stainless steel bodies with combination dome strainer and lint basket.
6. Manufacturers known to be acceptable: Swanstone

#### **D. FAUCETS**

1. Manufacturers known to be acceptable for industrial use include: Chicago Faucet, Zurn, American Standard
2. Manufacturers known to be acceptable for general use include: Chicago, Moen, Zurn, American Standard
3. Materials: All brass except for Reverse Osmosis (RO) systems.
4. Auto-sensor or solar auto-sensor faucets are required in all public restrooms.
  - a. Provide GFI outlet under sink for auto-faucet power supply. Batteries are not acceptable.
  - b. Provide mechanical thermostatic mixing valve underneath sink.

#### **E. FLUSH VALVES**

1. Manufacturers known to be acceptable: Sloan, American Standard, Moen, Zurn
2. Flush valves for urinals shall be auto-flush with manual override button and ¼ gallon per flush minimum water usage.
3. Flush valves for water closets shall be dual-flush. Provide signage on valve indicating proper usage.

#### **F. FLOOR DRAINS AND SINKS**

1. Specify floor drain traps of sufficient depth to keep traps primed at all times.
2. Where trap primer devices are required by code or adequate trap depth is not possible, specify trap primer devices mounted on a wall and the primer discharge piping routed under the floor. Trap primers shall utilize a timer to control operation instead of pressure control.
3. Required in all restrooms, janitor closets, and mechanical rooms.
4. Adjustable strainer heads.
5. Install floor sinks in mechanical rooms instead of floor drains.

### **22 4213.13 COMMERCIAL WATER CLOSETS**

## **A. WATER CLOSET FIXTURES**

1. Wall mounted toilets with heavy duty carrier and top spud.
2. Manufacturers known to be acceptable: American Standard.
3. NO floor supported toilet fixtures in new construction
4. Color: White

## **22 4213.16 COMMERCIAL URINALS**

### **A. GENERAL**

1. Jet flush urinals are preferred
2. Wall hung only with top spud
3. Manufacturers known to be acceptable: American Standard
4. Color: White
5. No waterless urinals

## **22 4216.16 COMMERCIAL LAVATORIES**

### **A. LAVATORY AND SINK DRAINS:**

1. Grid type strainers only.
2. 17 gauge traps and strainers.
3. 1 ½" minimum trap size.
4. ADA lavatories: Slip type trap
5. Sink shall be integral with countertop, see Division 10.
6. Exposed piping, underneath ADA lavatories shall be insulated per ADA standards.

## **22 4216.16 COMMERCIAL SINKS**

## **22 4223 COMMERCIAL SHOWERS, RECEPTORS, AND BASINS**

## **22 4500 EMERGENCY PLUMBING FIXTURES**

### **A. TEMPERED WATER**

1. If more than three emergency eyewash fixtures or stations will be installed as part of a remodeling or new construction project, consider designing a tempered water system to serve these fixtures instead of having one mixing valve per fixture.

## **22 4713 DRINKING FOUNTAINS**

### **B. DRINKING FOUNTAINS AND BOTTLE FILLERS:**

1. Refrigerated fountains are preferred
2. Fountains are not to contain additional filtering of potable water.
3. All drinking fountains in the building shall include integral bottle fillers.
4. Manufacturers known to be acceptable: Elkay

## **22 6700 PURE WATER PIPING**

### **A. CLEANING**

1. Cleaning of deionized water piping minimum requirements
  - a. Specify the following procedure and requirements.
    - 1) For sterilization, furnish chemicals that do not exceed 1 percent chlorine concentration in the sterilization tank.
      - (a) Where approved by the Owner's Representative, use hydrogen peroxide instead of chlorine.

- 2) With the complete system operating, including UV sterilizers, fill the system with deionized water.
  - 3) Remove air from the system.
  - 4) Perform a pressure test not including the tank.
  - 5) Balance water flow to branches.
  - 6) With the circulating pump running, slowly add chlorine to the storage tank until the total system chlorine content is at least 50 PPM.
    - (a) Continue to circulate for 6 hours.
    - (b) Comply with State Plumbing Code.
  - 7) Drain the system and refill with deionized water.
  - 8) Run the system at full capacity for three days with the reverse osmosis system on manual and excess water eliminated via the tank overflow drain.
    - (a) Do not allow chlorinated water to pass through the reverse osmosis water membrane.
- b. Specify the Owner's Representative observe the sterilization and cleaning operations.
2. Refer to the [SDSU Standard Piping Schedule](#)

## **22 6701 PURE WATER SYSTEM EQUIPMENT**

### **A. GENERAL**

1. All pure water equipment components shall be provided as part of a package by a single manufacturer. Manufacturers known to be acceptable: Culligan Commercial, Millipore

END OF DIVISION 22 PLUMBING

# Division 23 HVAC

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Standard Details

23 - 010 Condensate Receiver Detail

23 – 020 Steam Main Drip Trap Detail

23 – 040 Outside Air Intake Detail

23 – 050 Shell & Tube Heat Exchanger

DRAFT

## Division 23 HVAC

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*This design standard is directed to the Design Professional to be incorporated into the Project.*

*The Owner encourages improved concept, method and products by the Design Professional; however, project compatibility with existing campus systems, processes and procedures is most desirable.*

### **23 0001 GENERAL HVAC REQUIREMENTS**

#### **A. EQUIPMENT LIFE**

1. SDSU has concerns about the quality of the equipment as well as the capability to control the equipment. Equipment must be designed for long life span. Provide commercial or industrial grade equipment. No residential/light commercial equipment shall be used unless approved by the project manager.
  - a. AHU's should be designed for at least a 20 to 30 year life.

#### **B. ROOF OPENINGS**

1. When new roof openings or penetrations are required for existing buildings, verify with the Owner's Representative whether the roof is under warranty.
  - a. If under warranty, comply with the roof manufacturer's details to prevent voiding the warranty.
  - b. Require roofing contractor be certified to work on manufacturer's roofing system.

#### **C. EQUIPMENT SERVICE ACCESS AND MAINTAINABILITY**

1. A "maintenance access" zone (vertically and horizontally) is to be defined and called out on drawings and maintained through final construction. The maintenance access zone shall match the manufacturer's recommendations and shall extend from the top of the unit or equipment to the finished floor without obstruction other than removable ceiling tile or moveable furnishings.
  - a. Coordination with architectural, mechanical, electrical, fire protection and plumbing equipment is required; no service access shall be blocked.
2. Accessible equipment is defined as:
  - a. Being capable of being reached without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformer, piping, ductwork, light fixture, structural members, conduits, fixed equipment, casework, and fixed furnishings.
  - b. Maximum access height of equipment:
    - 1) For mechanical room: Within 7' of finished floor unless approved in advance by the SDSU project manager.
    - 2) For equipment above lay-in ceilings: No more than 4' above ceiling grid or an absolute maximum of 14' above the finished floor.
    - 3) For equipment above hard ceilings, provide minimum 24"x24" access panel. Locate equipment no more than 4' above ceiling height.
- c. Equipment requiring service access shall include but not be limited to:
  - 1) Fire dampers/actuators
  - 2) Duct access doors
  - 3) VAV boxes
  - 4) Fan powered boxes (filter and controls)
  - 5) Laboratory control air valves
  - 6) Damper actuators
  - 7) Valve actuators
  - 8) Control valves
  - 9) Isolation Valves
  - 10) Sensors, switches and other control devices or instrumentation
  - 11) Motors

- 12) Pumps
  - 13) Air bleeders or air vents
  - 14) Steam traps
  - 15) Strainers
- d. Pull space for coils and heat exchanger tube bundles needs to be defined and shown on plans and equipment elevation views. Isolation valves need to be located outside the coil pull space to allow for removal without draining down the entire system.
  - e. No vertical, or ships ladders, leading to small roof hatches are allowed to service air handlers, chillers, condensers, etc. Access to any roof mounted equipment will have to be full size stairs that lead to a full size door in a doghouse. Keep in mind that routine service includes hauling boxes of filters every few months, refrigerant cylinders and recovery equipment to the units. Roof hatches are only allowed for service access to small exhaust fans. Refer to Division 7.

**D. DESIGN CONDITIONS. UNLESS APPROVED OTHERWISE, SHALL BE BASED ON 2009 ASHRAE FUNDAMENTALS HANDBOOK FOR BROOKINGS, SD AS FOLLOWS.**

- 1. Heating Dry Bulb Design Condition (99.6% values): -15.2 degrees F (-20 degrees F for critical environments).
- 2. Humidification (99.6% values):
  - a. Dew Point: -26.2 degrees F.
  - b. Humidity Ratio: 1.4 grains of moisture per pound of dry air
  - c. Mean Coincident Dry Bulb Temperature: -9.6 degrees F.
- 3. Cooling (0.4% values):
  - a. Dry Bulb: 89.5 degrees F
  - b. Mean Coincident Wet Bulb: 73.2 degrees F.
- 4. Evaporation (0.4% values):
  - a. Wet Bulb: 75.4 degrees F.
  - b. Mean Coincident Dry Bulb: 85.4 degrees F.
- 5. Dehumidification (0.4% values):
  - a. Dew Point: 72.4 degrees F.
  - b. Humidity Ratio: 127.4 grains of moisture per pound of dry air
  - c. Mean Coincident Dry Bulb: 82.3 degrees F.
- 6. Enthalpy (0.4% values)
  - a. Enthalpy: 40.1Btu/lb
  - b. Mean Coincident Dry Bulb: 86.2 degrees F.
- 7. Monthly Climatic Design Conditions: See 2009 ASHRAE Fundamentals for Brookings, SD.
- 8. Equipment Sound
  - a. Discuss requirements with Project Manager
- 9. Ventilation Rates
  - a. Ventilation rates shall comply with the most current ASHRAE Standard 62.1.
- 10. Energy Efficiency
  - a. Comply with the ASHRAE Standard 90.1 and applicable LEED requirements.

**E. PART LOAD CONDITIONS**

- 1. The peak and partial loading of equipment is critical. Designers need to reduce the amount of short cycling by careful design consideration of part load performance. If just a few zones will be occupied or calling for cooling while the rest are unoccupied or calling for heat, separate systems need to be considered. For example, we don't want to start a 100 ton chiller to serve one interior conference room

while the rest of the building isn't calling for cooling. Understanding the intended use and occupancy is vital to making design decisions that allow the system to be operated properly.

2. Provide equipment with adequate turndown to prevent short-cycling or reduced life expectancy of equipment.

#### **F. COORDINATION WITH EXISTING SYSTEMS**

1. On any remodel, addition or renovation, the A/E shall be responsible for understanding the operation and capacity of existing systems that are intended to remain, and take that into account with the design of the new equipment and its operating sequence. This would include building air pressurization issues.

#### **G. EXISTING CENTRAL UTILITIES**

1. SDSU has a central steam and chilled water distribution system that should be utilized when possible. Refer to Division 33 of this Standard.

#### **H. PERIMETER ZONES**

1. Forced air heating alone shall not be used in perimeter spaces, especially when ceilings taller than 8' are involved. Radiation shall be used in conjunction with forced air to provide even temperature control in the space during heating season. Budget projects accordingly during early design stages to avoid this becoming a budget breaker as the design develops. In-floor or baseboard radiation is preferred over radiant ceiling panels.
2. Control valves, strainers, isolation valves, air bleeders, etc. for radiation serving perimeter offices shall be located in accessible locations in the ceiling. Modular office furniture often blocks access to valves, strainers, etc. and cannot be easily moved to facilitate service.
3. Coordinate design of perimeter radiation with planned furniture layout to ensure proper airflow patterns/overall operation of the radiation and service access.

### **23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

#### **A. GENERAL**

1. Provide inverter duty rated motors with shaft grounding rings on all motors driven by variable frequency drives.
2. All motors above 2 HP shall be NEMA premium efficiency rated.
3. Motors shall be 1750 RPM unless approved in advance by the Project Manager.

### **23 0519 METERS AND GAGES FOR HVAC PIPING**

#### **A. GENERAL**

1. Thermometer wells need to extend far enough into piping (roughly half), but no less than 2", for good temperature indication. Thermometers in tanks shall extend a minimum of 4-1/2".
2. Thermometers shall utilize heat transfer paste to provide good heat transfer from the well to the sensor bulb.
3. Utilize separable wells made of brass or stainless steel. Utilize stainless steel separable wells for all corrosive environments such as steam condensate, DI, domestic water or open condenser water systems.
4. Thermometers with digital displays using solar power shall be used versus liquid filled thermometers. The larger digits on the digital thermometers are easier to read from a distance or at an angle than the small numbers on the liquid filled thermometers.
5. Provide shutoff valves for all gauges and pressure sensors so it can be swapped out without draining the system.
6. Include a pigtail siphon on all steam pressure sensors or gauges.
7. Pressure gauges at pumps should be a single gauge with taps connected to the pump discharge, pump suction and inlet side of pump strainer or suction diffuser. Use 1/4" or larger ball valves on gauge piping, not needle/gauge valves or gate valves.
8. Specify high quality liquid filled gauges, minimum 4.5" in diameter.

9. Pressure gauge range shall be suitable for the system pressure. For pressure gauges, with all fluids, scale range shall be two times the normal operating pressure. Provide compound gauges capable of reading both vacuum and pressure where needed.
10. All utilities (water, irrigation, cooling tower/fluid cooler makeup and blowdown, electrical, steam condensate, chilled water BTU's, and natural gas) in new construction or renovations will be metered and meter readings tied into the existing Energy Essentials software. Refer to Section 23 0900 and Division 33 for additional metering standards.

### **23 0523 GENERAL-DUTY VALVES FOR HVAC PIPING**

#### **A. GENERAL**

1. Where balancing is required, manual balance/metering valves are strongly preferred over the automatic flow control valves (with moving parts or fine screens) from a maintenance standpoint. We've seen many failures (fouling and sticking) of the automatic flow controls when hydronic systems contain even a little sediment.
2. Use venturi balancing/metering type, not calibrated ball valves such as circuit setters.
3. When using butterfly valves, specify that the contractor verify adequate clearance for the valve disc to operate without dragging on the inside of the adjoining pipe fittings. Demonstrate proper operation to Owner or Owner's Rep.

### **23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

#### **A. GENERAL**

1. All equipment tags need to be unique to the entire building so that there isn't any confusion at electrical panels, disconnects or with the control system. [This is especially true of remodels or renovation where there may already be an AHU-1 or a pump P-1. On such remodels or renovation, new equipment tags may NOT duplicate any existing equipment tags. The designer shall refer to equipment schedules from as-builts and from control drawing as-builts to determine existing equipment tags.]
2. Provide directional flow arrows on all piping and ductwork at minimum 50 foot intervals and at all tees, junctions or service entrances.
3. Specify color coded adhesive type pipe labels with directional flow arrows. Do not allow painted stencil type pipe identification.
4. Identify and label all control instruments and sensors.
5. For equipment located above suspended ceilings, label ceiling grid (not the tile) at key access points (air flow control valves, fire or fire/smoke dampers, VAV boxes, equipment, filters, etc.) with a clear adhesive label with bold black lettering (font size 16) with equipment, etc., ID information.

### **23 0593 TESTING, ADJUSTING, AND BALANCING FOR HVAC**

#### **A. GENERAL**

1. Specify the Balancing Contractor is a subcontractor to the General Contractor, and not an employee or sub-contractor of the Mechanical Contractor or its subsidiaries.
2. Balancing Contractor shall not be a subsidiary, affiliate or part of the same parent company of the major equipment supplier for the project.
3. Variable pitched sheaves used during balancing shall be replaced with fixed pitch sheaves at the completion of the balancing activity.
4. Testing and balancing shall be required on all projects where existing systems are being modified. Discuss scope with project manager.
5. A/E shall thoroughly review the Testing and Balancing Report and make recommendations to the Owner and Contractor on how to correct deficiencies.
6. Fume Hood testing shall be tested in accordance with Division \_\_\_ of this document.
7. Specify each air system served by air filters is balanced using artificial static loading of the system to demonstrate, test and obtain system pressure drop data.

- a. Specify the following general requirements:
    - 1) Provide dirty filter pressure drop conditions on system at approximate 80 percent of peak pressure drop value.
    - 2) If units are equipped with high efficiency filters (MERV 10 or higher), do not use high efficiency filters in testing and balancing. Static pressure losses may be simulated by using wood or sheet metal blanking plates in high efficiency filter rack housings.
    - 3) Specify the maximum air filter pressure drop and the test value of the simulated pressure drop.
  - b. Upon completion of the static pressure tests, remove temporary blanking plates and re-install proper filters prior to beginning tests of coil performance.
8. Operating Test
- a. After the systems are balanced, specify an operating test of not less than 24 hours duration to demonstrate to the satisfaction of the Owner's Representative that the systems comply with requirements of the Drawings and Specifications, and that all equipment and controls are functioning properly under normal operating conditions (no control overrides, valves under normal control, etc.).

**23 0713 DUCT INSULATION**

**A. GENERAL**

- 1. Insulation Types:
  - a. Type A – Flexible glass fiber liner with abrasion resistant coating on air side surface.
  - b. Type B – Flexible glass fiber duct wrap with foil scrim facing.
  - c. Type C – Semi-rigid glass fiber board insulation on exterior of duct with reinforced foil scrim facing.
  - d. Type D1 – Non-fibrous flexible elastomeric insulation of closed cell structure to reduce moisture vapor transmission used as a liner.
  - e. Type D2 – Non-fibrous flexible elastomeric insulation of closed cell structure to reduce moisture vapor transmission used as a wrap.
  - f. Type E1 – Non-fibrous flexible polyolefin insulation of closed cell structure to reduce moisture vapor transmission used as a liner
  - g. Type E2 Non-fibrous flexible polyolefin insulation of closed cell structure to reduce moisture vapor transmission used as a wrap.
- 2. Applications:

Mechanical Rooms and Concealed Applications	Insulation Type
Outside Air Intakes	C, D2 or E2
Low or Medium Pressure Supply Air Ducts	A, B, C, D1, D2, E1 or E2
Supply Air Ducts within 50' of a humidifier	D1, D2, E1 or E2
Return Air Ducts In Unconditioned Spaces	A, B, C, D1, D2, E1 or E2
Relief/Return Air Ducts from Plenum at Louver back to Relief Air Damper plus 36"	C, D2 or E2

Exposed Applications	Insulation Type
Outside Air Intakes	C, D1 or E1
Round Supply Air Ducts	B
Round Return Air Ducts in Unconditioned Areas	B
Rectangular Supply Air Ducts	C, D1 or E1
Rectangular Ducts In Unconditioned Spaces	C, D1 or E1
Relief/Return Air Ducts from Plenum at Louver back to Relief Air Damper plus 36"	C, D1 or E1

## **23 0716 HVAC EQUIPMENT INSULATION**

### **A. GENERAL**

1. Refer to ASHRAE Standard 90.1 for insulation thickness requirements.
2. Match equipment insulation material type to piping insulation material type.
3. Generally the following equipment shall be insulated:
  - a. Chilled Water Pumps
  - b. Chilled Water Buffer Tanks
  - c. Air Separators (Hot and Cold Piping)
  - d. Chemical Pot Feeders (Hot and Cold)
  - e. Shell and Tube Heat Exchangers
  - f. Flexible vibration piping connections
  - g. Removable jacket (blanket) insulation shall be provided on the following:
    - 1) Valves (3 inches and larger)
    - 2) Expansion Joints and Loops
    - 3) Pressure Reducing Valves
    - 4) Pressure Relief Valves (Services greater than 220 degrees F)
    - 5) Steam Traps (1-1/2" and larger)
4. Generally the following equipment shall be un-insulated:
  - a. Hot water pumps
  - b. Expansion Tanks
  - c. Condenser Water Components (Fluid operating temperatures of 60-90 degrees F)
5. Removable blanket insulation shall be constructed of silicone impregnated fiberglass cloth.
  - a. Shall be fastened with durable straps and D-rings
  - b. Thickness as required to maintain surface temperatures of 120 °F and lower.
6. Jacketing- match jacketing material to the pipe insulation jacket on the adjoining piping.

## **23 0719 HVAC PIPING INSULATION**

### **A. GENERAL**

1. All cold piping (chilled water, domestic cold water, cooling coil drain lines, etc.) insulation shall be polyolefin, elastomeric closed cell type, polyisocyanurate or other pre-approved alternative. Our experience with fiberglass in these applications is that it's nearly impossible to maintain a tight vapor barrier.
  - a. Do not allow pipe supports or clamps to be in direct contact with the piping. Pipe supports on uni-strut channels should be Cush-A-Clamp or equal.
  - b. Ball valves shall be furnished with insulated valve stem extensions. This is intended for ball valves where operation of the ¼ turn handles on typical valves tends to tear the insulation or vapor barrier. The stem extensions need to be provided so full size insulation can cover the valve and the adjacent piping without the potential of being torn or damaged by the operation of the lever handle.
2. At pipe hangers, rigidly support pipe in order to avoid compressing the insulation.
3. A/E shall provide details of all pipe insulation at hangers, fittings, valves. Follow manufacturer recommendations for proper pipe support at hanger locations.
4. In exposed public areas, provide PVC jackets.

## **23 0800 COMMISSIONING OF HVAC**

### **A. GENERAL**

1. Commissioning is generally required on most projects. Discuss requirements with the Project Manager.
2. Generally the commissioning agent is hired by the Owner.

## **23 0900 INSTRUMENTATION AND CONTROL FOR HVAC**

### **A. NON-PROPRIETARY CONTROLS:**

1. SDSU and OSE support the use of a non-proprietary controls specification. However, the specifications must be performance based and comply with the following requirements. Use of this specification language is defensible.

### **B. SPECIFICATION LANGUAGE: THE FOLLOWING LANGUAGE NEEDS TO BE INSERTED INTO THE PROJECT SPECIFICATIONS AS WRITTEN:**

1. Provide a seamless connection to the existing Johnson Controls Metasys building automation system (BAS) with no loss of functionality and no additional gateways, interface devices or servers. Entire system must be compliant with South Dakota Bureau of Information and Telecommunications (BIT) standards and protocols. Functional requirements include, but are not limited to:
  - a. Upload/Download of controllers from the existing campus Johnson Controls ADX server.
  - b. Flashing of controllers with permanent changes to controller programs.
  - c. Controller level occupancy scheduling.
  - d. Parameter access for controllers.
  - e. Global data sharing and scheduling.
  - f. Setpoint change.
  - g. Number of terminal unit points limited to those specified or needed for the operational sequence.
  - h. Include point mapping and graphic construction.
  - i. Global processes to include, but not limited to fire alarm system management (alarm and trouble), outdoor lighting, and meter management; including the integration and connection of any new utility meters to the existing Johnson Controls Energy Essentials software.
  - j. Fire alarm reporting and dispatch must route through the existing BAS to the University Police Department for remote monitoring. Special consideration must be used to test and confirm fire alarm reporting is functional at the University Police Department's workstation.
  - k. All work by the temperature control subcontractor shall be independent of other vendors and Owner intervention.
  - l. Temperature control subcontractor to provide all training needed to allow Owner to operate and maintain the system.
  - m. Temperature control subcontractor to provide electronic copies of all operating system software and project database.
  - n. Temperature controls subcontractor to provide copies of all software configuration files (\*.caf, etc.) for all field controllers after the balancing and adjustments.
  - o. Owner to provide all operator workstation hardware including peripheral devices.

### **C. GENERAL**

1. Unless approved otherwise, nearly all mechanical equipment shall be connected to the campus BAS for control and monitoring purposes.
2. Wiring: Subject to compliance with BIT standards and protocols, use plenum cable above drop ceilings, conduit in exposed spaces and in mechanical rooms. Use of cable trays is allowed if cable is neatly bundled together. Refer to Division 26 for color coding scheme for all wiring.
3. Prior to the start of any renovation or remodel project, the A/E and controls contractor shall obtain the current as-built control drawings for the existing building from SDSU's HVAC Shop. The SDSU

version of the as-builts should be the most current and may differ from the as-builts completed at the end of the previous projects.

4. Approved temperature control shop drawings will be sent to SDSU and then replaced with the final copy of the O&M manual when the project is completed. The approved shop drawings can be digital (PDF) files only. The O&M manual shall be both hard copy and digital copies of the files.
5. A digital file of the final O&M's shall be provided to SDSU so they may be installed on the operator workstations, or folder on the network drive where they can be accessed by anyone that needs it.
6. Temp sensors in heat exchanger piping shall be at least 10 ft from the heat exchanger.
7. Campus Ethernet connection(s) will need to be provided (if not already installed) for building temperature control system to communicate to the BAS workstations on campus. Provide 120V power and data ports at every building level controller location. There may be several per building in some cases.
8. At least one new building level controller shall be provided for each new or renovated building. Multiple building level controllers may be required for some buildings if BACnet or Lon devices need to communicate with the control system. Unless approved by the Owner in advance, Lon integration shall not be used.
9. All field controllers (UNT's, DX9100, VMA's, FEC's, etc.) shall have the inputs and outputs clearly identified as to the device being controlled or monitored.
10. The existing Johnson Controls ADX Server shall be updated to the latest software release at substantial completion of the project.

#### **D. THIRD PARTY INTEGRATED HARDWARE AND SOFTWARE**

1. Specify that subcontractor providing third party hardware and software to be integrated to BAS provide copies of all software configuration files for all field controllers after the balancing and adjustments.
2. Specify that packaged control components are subject to same specifications requirements as BAS hardware and software. For example:
  - a. Use current transformers for proving fan and pump status.
  - b. All temp sensors shall be averaging elements, not single point sensors on coils.
  - c. Refer to Paragraph D below.

#### **E. CONTROLS EQUIPMENT**

1. Provide an uninterruptable power supply (UPS) at each building level network automation engine.
2. Nickel elements should be used for all temperature sensors.
3. Temperature sensors where stratification can occur, (i.e. across coil faces, within mixing boxes) shall utilize averaging elements strung across the entire face of the coil. Do not allow single point temp sensors for these applications.
4. Warmer/Cooler sensors will be used for terminal equipment zone sensors with set points (adjustable) between 68° and 76°. User adjustable sensors will generally only be used in private offices or where required to obtain LEED credits for individual temp control. Sensors without set point adjustment will be used in spaces determined by SDSU in the pre-submittal review (generally speaking this will be public spaces).
5. Discharge air temperature will be monitored on all VAV boxes.
6. Condensate temperature sensor shall be installed in all condensate receivers in the lower (flooded) portion of the receiver to help detect blown-through steam traps.
7. Provide condensate receiver high alarms or connection to high level alarm contacts provided by the condensate receiver manufacturer.
8. Provide condensate pump status on pump tied to the BAS and alarm if either pump runs for more than 3 min. (adj.)
9. Install steam pressure sensor (0 to 25 or 0 to 100 psi as applicable) downstream of PRV, or automated isolation valves, to indicate failure of the pressure reducing valve or isolation valve.

10. Each building level controller shall have a dedicated outdoor air temperature sensor so that it can operate independent of communication to higher level or other networked controllers. Do not use a temperature sensor from a LON or BACnet piece of equipment as the main outdoor air sensor for the building. A separate one shall be provided by Controls Contractor for the building controls.
11. Unless there's a highly critical application for humidity control, campus outdoor air humidity shall be shared globally to minimize the number of expensive and high maintenance humidity sensors.
12. Heat exchangers shall use a 1/3 and 2/3 steam valve assembly for better part load controllability.
13. VFDs provided by controls contractor shall interface via BACnet (over MSTP).
14. Air Filter Status - None needed on most systems.
15. TEC sensor (thermostats) may be used for fan coils, zone radiation, unit heaters, etc.
16. AHU static pressure and low temp alarm shall be shown at the OWS and shall be mapped out as individual points on field controller inputs.
17. Hot Water and Chiller Water pumps shall have an adjustable (5 minutes) time delay before turning off the pumps to help prevent nuisance alarms. Use pump lead/lag backup process that does not require software reset to restore any pumps that are reset in the field (i.e. JCI small plant using CCT).
18. All hydronic systems shall have a pressure transducer installed near the expansion tank connection. The pressure transducer shall be tied to the BAS and set to alarm for both high and low pressure situations. The high pressure alarm shall be set approximately 5 psig below the relief valve setting and the low alarm sufficient to prevent cavitation of the pumps.
19. All pneumatic transducers shall have a 0-30 psig gauge installed on the branch line.
20. N2 and FEC Trunk cable always blue jacketed 3-conductor 18awg.
  - a. BLUE= N2+
  - b. BLACK= N2-
  - c. WHITE= Reference
21. Use stranded cable on all field wiring.
22. Polarity on 24 VAC feed from transformer to TEC stat does matter. If 24 VAC common and "hot" are turned around the TEC stat will energize BUT the radiation valve will have the wrong common out share to it and valve will not modulate!
23. Do not to put more than 5 devices on a 100 VA 24 volt circuit.
24. Electrician shall document as-built drawings to indicate what devices are in parallel on the same circuit. Location of all transformer panels, field sensors, control devices shall be documented on the as-built set of plans. Include location of: static pressure sensors, DP sensors, minimum flow bypass circuits, wireless coordinators etc. All 120 volt feeds (panel and ckt. #) shall be documented on as-builts and in the field at each control panel).

#### **F. PARTS WARRANTY**

1. Controls vendor shall provide a three year parts replacement warranty on all control components provided on the project. Warranty period begins on the date of manufacture.

#### **G. BAS GRAPHICS**

1. Floor plans graphics will be discussed on a project to project basis. Generally they will be required and should be specified.
  - a. When desired by SDSU, floor plan CAD drawings, in a size and format suitable for use by Controls Contractor, will be provided free of charge to Controls Contractor by the Architect/Engineer prior to submission of shop drawings.
  - b. Floor plans shall clearly indicate which rooms are served by each air handling system. Utilize shading, or some other means to clearly depict this.
  - c. At a minimum, the floor plan shall include a basic building floor plan with the following information for each room

- d. Room number
  - e. Zone temperature
  - f. Zone setpoint
  - g. Clearly identify which rooms are fed from a common same VAV controller, etc.
  - h. Equipment graphics shall be labeled to indicate room(s) that the equipment serves.
  - i. Because of the size and complexity of the SDSU system, all alarms shall include labels of which equipment they serve. Example: Low supply temperature for USU HX-3 (heating converter for radiation and reheats in 2006 addition).
2. Controls contractor shall provide SDSU with all the necessary software and training to add/modify/delete/edit graphics with in-house technicians.

#### **H. BAS ALARMS**

1. Unless agreed upon otherwise, the controls contractor shall be responsible for setting up all the alarm and trend extensions.
2. Trend extensions shall be set up to record a minimum of 4 days worth of data taken at 30 minute intervals on analog points. On binary points the trend extensions shall be set up to record on a change of state and shall include enough samples to get at least 4 days worth of normal on/off cycles (or a minimum of 30 change of states). Trend extensions shall be included on all analog and binary inputs and outputs/setpoints, including BACnet or other integrated points of a critical nature.
3. Alarm priority, routing (i.e. automatic email, text messaging, etc.), and alarm message will be determined at the prior to substantial completion.
4. Alarm messages shall be put in by the controls contractor complete with a description of the alarm. SDSU will provide assistance in the text to use but JCI shall put the messages in. Example:
  - a. Bldg. XYZ, VAV Room 178 zone temperature alarm. Day radio HVAC, after hours callback HVAC Shop.
5. Generally speaking, zone alarm limits will be set at 60° low limit and 80-85° high limit. Critical rooms may need tighter alarms limits, which need to be determined at the pre-submittal review or during training.
6. The A/E shall provide Controls Contractor and SDSU with recommended alarm limits, alarm delays, etc. based upon their design and operating intent for the building in the Points List that they develop. Controls Contractor will set up the trend extensions and implement the alarm limits.
7. Unless approved otherwise in writing, on any refrigeration system, provide run status for each compressor and alarm indication if the compressor status doesn't match the command. Monitoring compressor status helps identify short cycling problems on compressors.
8. On heating lead-lag pumps, run-time totalization shall be monitored and used to automatically select the lead pump based on any change of state to the pumps. If not change of state occurs, the run-time totalization will be checked at a minimum of once per month and if needed rotate the lead pump. The switching of the pump shall occur during normal weekday working hours.
9. Anywhere multiple or redundant equipment is provided, runtime totalization shall be monitored and used to check and change lead unit as described above.

#### **I. INSTALLATION STANDARDS:**

1. Boiler safety shutdown switches, which may be required by code or state law, to be located in any public spaces, shall be connected to the BAS to signal an alarm at the BAS if the safety switch is tripped.
2. Hydronic pressure sensors need to be installed in the piping near expansion tank connection to the main to indicate when the pressure has dropped to an unacceptable level. Locate between air separator and pump. Provide air bleed between shutoff and transducer).
3. The designer shall establish the low and high alarm values to be used for the pressure alarm.

#### **J. BAS DISCUSSION ITEMS – TO BE DISCUSSED WITH A/E, OWNER AND CONTROLS CONTRACTOR ON A PER PROJECT BASIS**

1. Enthalpy control – SDSU has concerns about reliability of humidity sensors and maintenance costs to keep them working properly. We will allow enthalpy control where needed but care should be given to careful application.
2. Building static pressure control strategies.
3. Pneumatic demo-Controls Contractor vs. SDSU (depending on current SDSU work load). On most jobs, it shall be part of Control Contractor's scope of work.
4. Sensor guards
5. Wired versus wireless controllers.
6. Use of building occupancy sensors to control temperature in the zones.

### **23 0993 SEQUENCES OF OPERATIONS FOR HVAC CONTROLS**

#### **A. GENERAL**

1. Low limit protection
  - a. All makeup air units that do not have coils fully protected with glycol shall include a manual reset low limit temp sensor that will shut the unit down if the unit's discharge air temperature drops below the limit. Proper location and a detailed sequence of operation is imperative for this to work well without nuisance trips of the low limit device.
  - b. If adequate glycol is provided in all coils, use a software low limit protection using discharge air temp sensor to minimize risk of nuisance freeze stat trips. When the discharge air temperature drops below the low limit setpoint, shut down the unit and close the outside air damper and leave the heating valve in control.
2. Individual control loops shall be provided for each heating loop (heat recovery, preheat(s) and final discharge). Stagger setpoints so simultaneous heating and cooling do not occur. For example an air handling with a heat recovery coil, heating coil, and cooling coil in series, install a temperature sensor immediately after the heat recovery coil that controls heat recovery valve. Install another temperature sensor downstream of the heating coil that controls heating valve. Do not try to use a single discharge air temperature sensor and control loop to control all of these. The mass of the coils will create a lag time that will negatively affect the controllability. Individual control loops shall be matched to their immediate discharge air temperature sensor react faster and tune to one set of coil/valve characteristics. The individual coil temperature setpoints shall be interlocked to the calculated discharge air temp setpoint so that they automatically adjust as the discharge air temperature is adjusted.

### **23 2113 HYDRONIC PIPING**

#### **A. GENERAL**

1. Refer to Supplemental Design Guides [SDSU STANDARD PIPE SCHEDULE](#) for proper selection of pipe, fittings and associated pipe testing requirements.

### **232116 – HYDRONIC SPECIALTIES**

#### **A. GENERAL**

1. Filter Feeder: Install 5 gallon or larger filter/feeders in each system. Provide with a filter sock and cage assembly for removal of sediment from the system. Connect inlet to the discharge side of pump and the outlet to the suction side of the pump. Install isolation valves on both sides of filter feeder and a drain valve on the low point. Provide flow sight glass indicator between isolation valves.
2. Sample Point: Install a sample point on a common point in the system. Sample point should be off the side (not top or bottom) of the pipe. Sample point shall consist of a ½" threaded pipe with a ball valve, 6" long nipple pointed down and fitted with a cap.
3. Air Separator: All hydronic systems shall be equipped with combination dirt/high efficiency air separators similar to Taco 4900 AD series or Spirotherm Spirovent Air/Dirt Separator. Units shall have a coalescing medium designed for removal of 100% of free air, 100% of entrained air and 99.6% dissolved air in the fluid. Dirt separation shall be at least 80% of all particles 35 micron and larger within 100 passes.

4. Relief Valve Piping: All hydronic systems with glycol shall have the relief valve piping directed to a minimum 30 gallon plastic translucent drum (steel drum is acceptable if plastic is not suitable for the fluid temperature) with a lid to capture the liquid for re-use and prevent it from entering the sewer system. Drum shall be fitted with:
  - a. A bung and drain valve with threaded garden hose connection at bottom of drum.
  - b. A high level alarm in the tank tied to the BAS.
  - c. An overflow at least 6" above the tank high alarm level.
  - d. The drum does not need a pump and automatic makeup system.
5. Expansion Tanks:
  - a. A/E shall design expansion tanks with acceptance volume of 1.5 times the calculated minimum. [*We have had many problems with undersized expansion tanks on past projects.*]
  - b. Use a bladder style instead of a diaphragm style.
  - c. A/E shall specify air side charge pressure and provide contractor with initial charging procedures.
  - d. A/E shall provide an expansion tank piping detail including:
    - 1) Proper thermal loop on hot systems.
    - 2) Air vent at the high point in the expansion tank thermal loop piping.
    - 3) Hydronic system fill pressure sensor in the branch to the expansion tank tied to BAS to alarm on low water pressure.
  - e. A/E shall locate all expansion tanks on the floor for easy access by maintenance staff.
    - 1) Small tanks may be hung as long as they are no higher than 7 feet off the floor and are installed to allow access to all components that may require service.
  - f. Specify the following installation requirements for expansion tanks:
    - 1) When filling a system keep the isolation valve between the system and the expansion tank closed.
    - 2) Fill system with the system pumps off. In order to avoid cavitation and potential damage, the system pumps may not be used to circulate the fluid until the system has been filled and bled with contractor provided pumps.
    - 3) Manually bleed air from system, as required, and circulate hydronic system as long as needed to ensure that all the air is out of the hydronic system.
    - 4) The gage pressure at the high point in the system shall read at least 2-6 psig (8 psig max) with the pumps off. If no gage is present at the high point, then install a gage wherever feasible. Once 2-6 psig is reached, stop filling. If you exceed 8 psig drain system fluid until the standing pressure is 2-6 psig.
    - 5) Refer to the Supplemental Design Guides\ [SDSU Hydronic System Checklist](#) and follow Step 1. Record all pressure readings as indicated and the hydronic fluid temperatures with system pumps still off and at fill temperature. (It is understood that once the fill water is in the system the water temperature will try to reach the temperature of the surrounding environment. Throughout this document the system fluid temperature will be referred to as fill temperature (before it gets heated or cooled by the mechanical equipment). Pressure reading can be taken from any gage at the low point of the system. When the pumps are off, the suction and discharge pressure readings should be the same. If not check and repair pressure gauges or gauge line as needed.
    - 6) **With the valve still closed between the hydronic system and the expansion tank, charge the air-side of the bladder expansion tank to the same standing pressure reading as the low point in the system (with pumps off and system at fill temperature).** Note, the expansion tank arrives from the manufacturer with an unknown charge. Test tank charge before adding compressed air or dry nitrogen. Depending on hydronic system, you might have to lower expansion tank charge by releasing some air from the air-side of the bladder.

- 7) Once the expansion tank is charged with proper air-side pressure, open the isolation valve between the expansion tank and system and bleed any air that may exist in the line leading to the tank.
  - 8) Turn on the appropriate number of systems pumps. Do not over pump the system by running backup pumps when they are not intended to be used for normal flowrate.
  - 9) Bleed air from system as required and add water or glycol as needed. Do not make any further adjustments to the expansion tank air-side pressure at this time. Continue to circulate fluid until contractor is satisfied that all air is bled from system.
  - 10) To insure that the expansion tank has been charged correctly, turn pumps off to system and leave the expansion tank online with the system.
  - 11) Check the pressure at the high point in the system. As long as the gage reading at the high point is between 2-6 psig, then refer to the "Hydronic Check List" and follow step 2. (If gage reading at the high point isn't at least 2 psig then add de-ionized water or proper glycol mixture to system until gage at high point is at least 2-6 psig.)
  - 12) If the pressure reading at the low point is +/- 2 psig of the air-side charge in the expansion tank then no changes are required, skip the remaining steps. If the pressure reading at the low point (with pumps off and system at fill temperature) is greater than +/- 2 psig of the expansion tank air-side charge, then perform the following:
    - (a) Valve off expansion tank from system.
    - (b) Open expansion tank fill port. This should release any water that might be in it.
    - (c) Close fill port.
    - (d) Refer to Supplemental Design Guides\SDSU Hydronic System Checklist and follow step 3. Charge the expansion tank air-side charge (with pumps off and system at fill temperature) to the same pressure as the pressure reading from the low point of the system.
    - (e) Open valve and bring expansion tank back online with system.
    - (f) Start the appropriate number of pumps and bring the heating system within 10 degrees of the maximum leaving temperature and entering temperature. For cooling systems, start pumps and bring the cooling system within 5 degrees of the maximum leaving temperature and entering temperature. Coordinate with controls contractor and trades to assure systems are operated properly to achieve these temperatures. Once design temperature is achieved proceed to the Supplemental Design Guides\SDSU Hydronic System Checklist Step 4.
    - (g) Submit a completed SDSU Hydronic Check List to project manager and retain a copy for inclusion in the Operation and Maintenance manuals.
6. Automatic Air Vents: Specify high quality and high capacity air vents at the top of all air separators. Where possible, install an isolation ball valve between air separator and air vent to facilitate replacement of automatic air vent without need to partially drain the system.
  7. Manual Air Vents:
    - a. Where space allows, use a ball valve for manual air bleeding instead of coin operated air bleeders.
      - 1) Coin operated air vents are only allowed in extremely confined spaces such as the inside of a cabinet unit heater enclosure.
    - b. In mechanical rooms, pipe air vent discharge away from piping and equipment. Locate outlet so that a bucket can easily be placed under discharge during bleeding operations.
  8. Pressure Gauge Manifold: Provide a single gauge, three valve manifold for checking system pressure. One tap at strainer inlet, one tap at pump inlet, and one tap at pump discharge.
  9. Triple Duty Valve: Provide triple duty valve on pump discharge with stainless steel stem and trim, not brass.
  10. Pressure Independent Control Valves: Pressure independent control valves such as Delta P Valves, shall not be used unless discussed and approved by Facilities and Services.
  11. Include stainless steel flex connectors on inlet and outlet of all pumps over 2 HP.

12. For all hydronic systems, install a ¼" tap in the main line near the expansion tank connection with a ball type shut-off valve for a hydronic pressure transducer to be installed by the BAS contractor and connected to the campus BAS.
13. Permanently install a pressure gage at a high point in the system in a location approved by the Owner and Engineer. Record the location of pressure gage on the Record Drawings. Pressure gauge will be used to verify that contractor has achieved proper fill pressure.

### **23 2123 HYDRONIC PUMPS**

#### **A. GENERAL**

1. Each main heating system shall always have a redundant (back-up) pump installed (N+1 capacity).
2. Pumps shall be accessible.
3. Install isolation valves on either side of all pumps.
4. On pumps being controlled by VFD's, pump motor shall be inverter duty with shaft grounding ring.
5. Motors above 2 HP shall be NEMA premium efficiency.
6. Specify that impellers are polished and back-filed.
7. Do not trim impeller if pump is controlled by a VFD, specify maximum impeller diameter that will fit in volute.
8. Condenser water pumps shall be designed for not more than 1750 RPM
9. In-line pumps are preferred over base-mounted end suction style pumps for most applications.
10. If base mounted pumps are used, they shall be laser aligned by independent testing contractor.
11. Specify high quality pump couplings that can tolerate minor mis-alignment and provide long service life.
12. Specify that the contractor provide a spare coupling and seal kit for each pump and clearly identified the spare parts with the pump number on the package.

### **23 2213 STEAM AND CONDENSATE HEATING PIPING**

#### **A. GENERAL**

1. Specify piping in compliance with the Owner's standard pipe schedule and applicable code requirements.
2. For pipe, fitting and testing requirements, refer to Supplemental Design Guides \SDSU STANDARD PIPE SCHEDULE.
3. Steam line reducers shall be eccentric, not concentric. Install eccentric reducers with the flat side down to prevent condensate from building up at the reducer.
4. Steam and condensate return systems shall be insulated and jacketed with aluminum or PVC jacketing to prevent moisture and other physical damage to the insulation.
5. Steam and condensate pipe insulation thickness shall meet or exceed requirements of ASHRAE Standard 90.1.
6. Buildings fed from the steam system shall be designed for operating conditions up to 135 psig at the steam service entrance to the building. Utilize at a minimum 150 psi rated traps, valves and fittings. Consult with SDSU Utility Systems Engineers to obtain specific operating pressures for the point of connection to the steam mains.
7. Pressure reducing stations
  - a. PRV's shall be sized based on inlet pressure of 90 psig.
  - b. Shall be provided at each building to reduce the pressure of the steam used within the building to 10 psig.
    - 1) Steam pressure reducing stations shall be two stage reduction with appropriately sized bypass with globe valve where multiple steam pressures are required within the building (i.e. autoclaves) or
    - 2) Parallel arrangement in a single reduction with a one third/two third arrangement for better part load control.

- c. PRV's shall be Spence or Armstrong.
  - d. Provide strainer ahead of each PRV.
  - e. Reducing station shall have relief valve(s) piped to meet ASME Process & Power Piping Sec 31.3 & 31.1 codes. Sized from 125 psi to 15 psi.
  - f. All steam pressure reducing stations shall be located within the building mechanical rooms, not in occupied spaces of the building.
  - g. Avoid running high pressure steam mains through occupied portions of the building.
  - h. A SETRA, or approved equal, steam pressure sensor shall be provided on the low pressure side of the PRV station and connected to the campus BAS system to detect PRV problems. Install similar steam pressure sensor on the high pressure side of PRV on buildings located near the end of the distribution system. Show a separate tap on piping for the sensor. Refer to Section 230519.
  - i. Provide pressure gauges on both high and low sides of PRV.
8. Condensate return is to be collected at the building with vented condensate receivers and pumped back to the Central Heating Plant. Receiver vents shall be piped to the exterior of the building so that blown steam traps do not create humidity problems in the mechanical room. Deviations from this plan must be approved in writing by the Owner. Refer to Detail 23-010.
9. Valves
- a. Use high quality valves on steam mains or any major points of isolation within a building. Valves shall be High Performance Butterfly Valves.
    - 1) They should be designed for bubble tight dead end service.
    - 2) Where parallel main lines exist, or it is possible to back feed a system if parts are down for maintenance, use of valves that are bi-directional, bubble tight dead end service are required.
    - 3) Butterfly valves shall be lug design so that downstream flanges can be removed while the valves are closed if needed.
    - 4) Valves and seats shall be rated for 150 psig and 365 Degrees F service.
    - 5) Verify butterfly valve disc can rotate freely without dragging on adjoining pipe fittings. Demonstrate proper operation to the Owner or Owners Representative.
  - b. Bronze ball valves with stainless steel ball and stem and 150 psig rating (similar to Apollo Series 70) shall be used on low pressure steam and steam condensate lines as opposed to gate valves. Variations from this design must be approved in writing.
  - c. Provide isolation valves on all run outs and branches. The more isolation valves the better.
10. The condensate from the building shall be metered with a flow meter mounted downstream of the condensate return pump in a flooded section of the condensate line. We typically do not meter steam because our steam loads vary dramatically from season to season, and steam meters capable of accurately reading down to 5% of design flowrate don't seem to exist within reasonable price ranges. Refer to Section 230519 for meter requirements. See Detail 23-010.
11. Steam Traps
- a. Inverted bucket steam traps: Basis of design shall be by Armstrong 800 series.
  - b. Float and thermostatic traps: Basis of design shall be Armstrong or Hoffman.
  - c. Radiator traps: Basis of design shall be TLV or Hoffman.
12. Refer to Detail 23-020 provided for minimum requirements for steam drip leg assemblies.

## **23 2223 STEAM CONDENSATE PUMPS**

### **A. GENERAL**

- 1. Condensate receiver shall be cast iron or steel.
- 2. Provide duplex pumps
- 3. Provide lead-lag pump alternator
- 4. Provide with high level alarm contact provided with pump set and connect to BAS.

5. Size wire and circuit breaker to accommodate both pumps running at the same time.
6. Provide hand-off-auto switches for each pump.
7. Each pump shall be individually fused.
8. Provide Current Transformer connected to BAS on circuit feeding condensate receiver set to provide pump status and alarm indication.
9. Elevated storage tank is preferred where space allows
10. Provide isolation valves between the receiver and the pump inlets
11. Provide sight glass with isolation valves on side of tank
12. Provide tank with ¾" FPT bung in flooded portion of tank for condensate temperature sensor and connect to BAS.
13. Provide separate drain down port, minimum ¾".
14. Install soft seated, spring loaded check valves on discharge of each pump.
15. Install unions on pump discharge before isolation valves to facilitate pump service and removal.
16. See condensate receiver detail 23-010.

### **23 2300 REFRIGERANT PIPING**

- A. Refer to Supplemental Design Guides \SDSU STANDARD PIPE SCHEDULE for proper selection of pipe, fittings and testing requirements for refrigerant piping.
- B. Specify that dry nitrogen be purged through the piping during brazing or silver soldering.

### **23 2500 HVAC WATER TREATMENT**

#### **A. GENERAL**

1. Do not install auto-fill systems connected to straight water (domestic water) supply on any hydronic systems whether or not they contain glycol. The auto-fills would dilute the glycol and corrosion inhibitors. Instead, provide a hydronic pressure sensor tied to the BAS that will alarm if the system pressure drops to an unacceptable level. Refer to Section 23 0900 for further details.
2. Provide hydronic fill stations at readily accessible locations so the Owner can fill as needed with proper fluid and inhibitors.
3. Specify that all glycol and water treatment chemicals on site shall be contained in a contractor provided spill container and the spill container shall hold at least 110% of the largest volume container.
4. Contractor shall provide service and maintenance of hydronic system for one year from the warranty start date. This shall include all testing, glycol, inhibitors and pure water during the warranty period.
5. Cleaning chemicals shall be designed for hydronic systems and compatible with pipes, fittings, coils, valves, equipment, gaskets, O-rings, and heat exchangers.
6. During all filling and rinse processes, contractor shall add a flash rust inhibitor as recommended by the water treatment specialist to prevent flash rusting that can occur when the system is being filling and flushing process.
7. FINAL RINSE(S) shall be done with de-ionized water to insure that all calcium, magnesium, sulfate, and chloride ions left behind by flushing are removed. During final rinse(s) contractor shall add flash rust inhibitor. The hydronic system shall be filled with de-ionized water and rinsed as many times as necessary in order to insure the hydronic system fluid meets the de-ionized water requirements. Record system volume and flash rust inhibitor quantity on the "SDSU Hydronic Check List". During the final fill, do not add flash rust inhibitor since glycol containing inhibitors will be added in the next step.
8. Once the hydronic system meets the water quality requirements below, notify Engineer and Owner's Representative to demonstrate cleanliness and approve test results before filling the system. Using the metered volume, drain the required water in order to add the required glycol to achieve the specified level of protection as stated in the specifications.
9. Specify that any system containing any detectable amount of glycol shall not be allowed to be dumped down any sanitary waste line, storm sewer or onto the ground. All glycol that is removed from a system shall be drained into appropriate containers and disposed of properly, or taken to an off-site location for

recycling. Any damage caused by improper disposal of glycol, or subsequent remediation required, shall be at contractor's expense.

10. Draining a non-glycol hydronic system: If the hydronic system to be drained contains no glycol, the contractor shall test the pH level of the hydronic fluid before draining the system into the sanitary sewer. If needed, contractor shall adjust the pH level of the fluid to meet Sewer Use Rules and Regulations. Once the pH level is within the acceptable range, drain the fluid as quickly as possible to keep pipe velocities high to add in flushing any solids from the system.
11. Specify that when the system is initial filled with water for the purpose of hydrostatic pressure testing and/or system flushing, the system volume shall be metered. System volume shall be included in the O&M manuals provided to the Owner.
12. Specify that the contractor ensures all isolation valves, automatic control valves, etc. are wide open to facilitate complete filling or draining of the system. They shall coordinate with temperature controls contractor as required to lock automatic control valves in open position during draining, flushing and filling. Contractor shall return control valves to automatic mode upon completion.

**B. HYDRONIC SYSTEM FLUID TESTING**

1. Specify that the contractor is responsible for any hydronic system water or glycol tests as needed throughout this process in order to meet specifications. All hydronic samples taken by South Dakota State University's representative will be tested by Interstate Chemical Company Incorporated, Dow, Fremont or the Owner's water treatment representative. SDSU will only test the final hydronic fluid to ensure that it meet specifications. Initial test will be at Owner's cost. If initial sample fails to meet specifications, any subsequent testing required will be at contractor's expense. If the hydronic system doesn't meet the above requirements, consult with the Engineer and SDSU's project manager for recommendations. However, it remains the contractor's sole responsibility to bring the system into compliance, which may involve increasing the glycol concentration, adding more inhibitors, filtering out the sediment or complete draining, flushing and re-filling in accordance with these specifications.

**C. WARRANTY OF HYDRONIC SYSTEM**

1. The hydronic system warranty shall commence with Final Acceptance of the building, but only if the sample results prove that the hydronic system meets water and hydronic fluid requirements. If initial sample does not meet requirements, then contractor shall remediate as required and request additional sample(s) to be taken at the end of the remediation process. Warranty period for the hydronic system shall not commence any sooner than final approved test result of hydronic system.
2. After the hydronic system is initially approved, it shall be tested by SDSU periodically during the warranty period to evaluate on-going condition of system. Contractor shall provide any necessary service and materials during the warranty period to maintain proper system pressure levels, glycol concentration, inhibitor concentrations, etc. to maintain system in accordance with these specifications.
3. The hydronic system fluid warranty period shall expire one year after warranty start date established in paragraph C.1 above or by the one year contractors warranty for the entire project, whichever is later.

**D. HYDRONIC SYSTEM WATER:** Straight water (systems not containing glycol) is fine if there's no chance for freezing conditions, i.e. like a "reheat only" system. In that case, DI or RO grade pure water should be used with proper inhibitors added to achieve acceptable water chemistry. Hard water is not acceptable for final fill.

1. HYDRONIC SYSTEM WATER QUALITY REQUIREMENTS (Systems not containing glycol).
  - a. pH: 9.0 – 10.5
  - b. "P" Alkalinity: 100-500 ppm
  - c. Boron: 100-200 ppm
  - d. Chemical Oxygen Demand: 100 ppm maximum.
  - e. Soluable Copper: 0.2 ppm maximum
  - f. Tolyltriazole: 10 ppm minimum
  - g. Total Suspended Solids: 10 ppm maximum
  - h. Ammonia: 20 ppm maximum (as NH3)
  - i. Microbial Limits:

- 1) Total Aerobic: 1000 cfu/ml
- 2) Total Anaerobic: 100 cfu/ml
- 3) Nitrate Reducers: 100 cfu/ml
- 4) Sulfate Reducers: 0 cfu/ml
- 5) Iron: 0 cfu/ml

j. Total Iron as Fe: Less than 0.25 ppm as Fe

**E. GLYCOL**

1. A mix of pure water and no less than 25% inhibited glycol solution shall be used in all systems requiring freeze or burst prevention. Refer to the Table below for proper concentration.
2. If the work consists of connecting to an existing piping system that contains glycol, consult with Owner and specify the same brand and type of glycol be used to maintain chemical compatibility and system color coding consistent with existing campus standards.
  - a. Ethylene glycol is preferred for most applications and shall be one of the following: Dowtherm SR-1, Interstate NFE or Fremont 9132). These three are currently stocked by SDSU. No other brands or types shall be allowed.
    - 1) Specify the glycol with following dye colors to match SDSU's existing stock:
      - (a) Dowtherm SR-1: Fluorescent pink
      - (b) Interstate NFE: Purple
      - (c) Fremont 9132: Pink
  - b. Propylene glycol shall only be used when the fluid could potentially come in contact with food or for other safety reasons with prior approval from Owner. The following are currently stocked by SDSU: Dowfrost, Interstate NFP and Fremont 9134. No other brands or types shall be allowed. Note that Dowfrost does not contain any corrosion inhibitors to protect copper piping and therefore should not be used in any systems containing copper piping or equipment exposed to the hydronic system fluid.
    - 1) Specify the glycol with following dye colors to match SDSU's existing stock:
      - (a) Dowfrost: Clear (colorless)
      - (b) Interstate NFP: Orange
      - (c) Fremont 9134: Green

c. Glycol Concentration Recommendations:

Hydronic System	Minimum Ambient Air Temperature Possible in Equipment	Glycol Percentage
Chilled Water (Air Cooled Chiller or Chilled Water Coil exposed to Mixed Air Temp <35 deg.)	-20° F	30 – 35% (burst protection only is required since fluid does not need to be pumped at low ambient temp.)
Preheat / Heating Water (100% outside air)	-20°F	40 – 50% (freeze protection)
Heating Water (Mixed Air Temp)	32°F	25% (freeze protection)
Reheat / Baseboard Water	50°F	Not required (*)
Condenser Water (Open Loop Cooling Tower)	-20°F	Not required (**)
Condenser Water (Closed Loop – Heat pump and evaporative coolers)	-20°F	40 - 50% (freeze protection)
Heat Recovery (Run-around-loop)	-20°F	40- 50% (freeze protection)

Chilled Water (Campus Distribution System)	NA	Not required
--	----	--------------

\* Consider location of equipment. Recommend glycol for vestibule, entry, loading dock heaters or other locations where ambient air could drop below freezing.

\*\* System designed to be drained down and left dry during seasonal shut down.

3. FINAL RINSE WATER AND DILUTION WATER FOR GLYCOL: Shall be distilled or de-ionized water meeting the following requirements:
  - a. Sulfate < 25 ppm
  - b. Chloride < 25 ppm
  - c. Calcium < 1 ppm
  - d. Magnesium < 1 ppm
  - e. Silica < 25 ppm
  - f. Electrical Conductivity < 5.0 umho/cm @ 25 degrees C
  - g. Total water hardness as CaCO<sub>3</sub> < 60 ppm
4. HYDRONIC SYSTEM FLUID REQUIREMENTS FOR SYSTEMS CONTAINING GLYCOL: After diluted, thoroughly mixed and circulated through the system, the fluid shall be tested by the laboratory supplying the glycol and the system shall meet the following criteria:
  - a. For Dowtherm SR-1 or Dowfrost:
    - 1) Clarity shall be clear.
    - 2) Color:
      - (a) Fluorescent pink for SR-1
      - (b) Clear (colorless) for Dowfrost
    - 3) Sediments < 0.01 wt%.
    - 4) Percent volume of glycol shall be +/-2% of specified (but never below 25%)
    - 5) PH acceptable range: 8.0 to 10.5.
    - 6) Reserve Alkalinity > 8 ml of 0.1N HCl
    - 7) Iron inhibitor (phosphate) must test as "acceptable" to Dow.
    - 8) Copper inhibitor (azole) must test as "acceptable" to Dow.
    - 9) Chloride < 100 ppm Cl
    - 10) Sulfate < 250 ppm SO<sub>4</sub>
    - 11) Total Hardness < 200 ppm CaCO<sub>3</sub>
    - 12) Ferrous metal corrosion rate < 0.5 mils per year (mpy)
    - 13) Copper corrosion rate < 0.5 mils per year (mpy)
    - 14) Nitrite < 100 ppm NO<sub>2</sub>
    - 15) Nitrate < 100 ppm NO<sub>3</sub>
    - 16) MBT < 100 ppm MBT
    - 17) Diethylene Glycol < 1 vol % DEG
    - 18) Triethylene Glycol < 1 vol % TEG
  - b. For Intercool NFE or Intercool NFP:
    - 1) Clarity shall be clear.
    - 2) Color:
      - (a) For NFP: Orange
      - (b) For NFE: Purple
    - 3) Sediments < 0.01 wt%.

- 4) Percent volume of glycol shall be +/-2% of specified (but never below 25%)
  - 5) PH acceptable range 8.0 to 9.5
  - 6) Reserve Alkalinity 3.0 to 6.0
  - 7) Iron (Fe) < 5 ppm
  - 8) Copper (Cu) < 5 ppm
  - 9) Aluminum (Al) <5 ppm
  - 10) Zinc (Zn) < 5 ppm
  - 11) Magnesium (Mg) < 1 ppm
  - 12) Calcium (Ca) < 1 ppm
  - 13) Silica (SiO<sub>2</sub>) < 25 ppm
  - 14) Nitrate (NO<sub>3</sub>) < 25 ppm
  - 15) Molybdenum (Mo) < 25 ppm
  - 16) Lead (Pb) < 5 ppm
  - 17) Arsenic (As) < 5 ppm
  - 18) Chloride (Cl) < 25 ppm
  - 19) Sulfate (SO<sub>4</sub>) < 25 ppm
  - 20) Acidity (Organic) < 1000 ppm
  - 21) Phosphate (PO<sub>4</sub>) 2250-3750 ppm
  - 22) Boron (B) > 150 ppm
  - 23) Tolyltriazole (TTZ) > 150 ppm
  - 24) NACAP, (MBT) > 150 ppm
5. Specify that the Contractor must fill out and submit a copy of the SDSU HYDRONIC SYSTEM CHECKLIST Supplemental Design Guides [SDSU Hydronic System Checklist](#) for each system immediately following the filling of the system. Provide copy to Owner's Representative within one week of system fill and also include in the O&M manuals at completion of the project.

### **23 3300 AIR DUCT ACCESSORIES**

#### **A. GENERAL**

1. Provide balancing dampers on branch take-offs near main trunk and not at the diffuser.
2. Provide inspection doors at:
  - a. Before and after reheat coils
  - b. Before or after fire dampers, control dampers.
  - c. At outside air louvers
  - d. Before and after air flow measuring stations
3. Provide low point in outside air intake duct where moisture and snow can settle out. Install drain and pipe to a sanitary floor drain.
  - a. See detail 23-040
4. Louvers
  - a. Install stainless steel welded mesh ½" by ½" bird screens on all intake louvers.
  - b. Do not orientate outside air intake louvers facing north or west to minimize snow ingestion.
5. Manual balancing dampers are to be provided with shaft protruding through both sides of duct and shall be fitted with quadrant control with standoff to extend through insulation.
6. Fire smoke or smoke dampers shall be equipped with end switches tied to the BAS system.

### **23 3600 AIR TERMINAL UNITS**

#### **B. GENERAL**

1. Fan powered boxes
  - a. Provided fan powered boxes in perimeter zones that do not have radiation in order to provide a source of heat when the AHU is cycled off in unoccupied mode.
  - b. Return air filters shall be designed for 2" deep pleated filters (MERV 7 or higher).

### **23 3713 DIFFUSERS, REGISTERS, AND GRILLES**

- A. Slot diffusers shall be used to counteract heat loss or solar heat gain on perimeter window glazing if perimeter radiation is not provided in the space.
- B. Select diffusers or supply registers carefully to provide adequate air distribution at occupant level throughout the range of expected airflows.
- C. In rooms with ceiling heights exceeding 10 feet that utilize overhead supply air, 75% of the return air shall be returned near the floor level.

### **23 3723 HVAC GRAVITY VENTILATORS**

- A. Install on elevated roof curb at least 24" above roof surface.

### **23 3813 COMMERCIAL-KITCHEN HOODS**

- A. Designers shall incorporate heat recovery and variable air flow (e.g. Melink) where total hood exhaust exceeds 2,000 CFM.

### **23 4100 PARTICULATE AIR FILTRATION**

- A. See individual equipment sections for filtration requirements.

### **23 5213 ELECTRIC BOILERS**

- A. Shall not be used without prior approval.

### **23 5216 CONDENSING BOILERS**

- A. Condensate piping shall incorporate a p-trap per manufacturer specifications.
- B. The following points (at a minimum) shall be integrated to the campus BAS
  1. Boiler Enable/Disable
  2. On multiple boiler installations, alarm messages shall indicate which boiler is in alarm.
  3. Alarm messages shall be classified as alarms (boiler shuts down) or faults (boiler still running but something out of normal).
  4. Staging or firing rate.
  5. Hot water supply temperature sensor
- C. Factory control packages shall allow hot water supply temperature setpoint adjustment from campus BAS.
- D. Heating systems shall be designed for N+1 redundant boiler capacity.
- E. Emergency gas shutoffs shall be specified per NFPA and shall be equipped with cover or guard to prevent inadvertent shutoffs.
- F. Locate combustion air intakes adequate distance from humid exhaust air to avoid frosting.
- G. Oversize air intake pipe diameter by one size at the intake location to minimize chances of the bird screen from frosting over.

### **23 5700 HEAT EXCHANGERS FOR HVAC**

- A. Shell and Tube Heat Exchangers (typical hydronic heating)
  1. Separate heat exchangers (converters) should be provided for systems with completely different load profiles. For example air handlers and perimeter fin-tube radiation could possibly be on the same converter since they are both capable of being shut down when outside air temperature rises. Reheat systems that need to run all, or almost all, year round should generally not be put on the same converter as the AHU's and radiation. Furthermore, where applications required tight control and/or elevated water temperatures, separate system is required (i.e.: animal holding facilities). The designer needs to be cognizant of part load performance. Will the heating control valve(s) be able to control well if one huge converter is installed when only minimal reheat is needed? SDSU strongly suggests that, if there is a reheat system, it has its own converter. If multiple systems are combined, the designer has to be extremely careful about implementing reset schedule based upon outdoor air. Will the VAV's have enough capacity if the hot water supply temperature setpoint is dropped to 140 or less in the summer? In critical heating systems, consideration should be given to multiple converters in parallel with each one sized for at least 60% of the total load.

2. Hot water supply temperature reset based upon outside air temperature or call for heat from the system's heating valves is recommended.
  3. The steam control valve arrangement at the heat exchanger shall utilize two valves in a 1/3 – 2/3 type configuration with either an outdoor reset or demand based reset. Use a single steam control valve only where approved by F&S for smaller units or units that do not require significant turndown.
  4. Steam converters based on either Bell and Gossett or Taco.
  5. Install vacuum breakers on all converter shells to allow condensate to drain when the control valve closes completely.
    - a. Do not allow swing check valves as vacuum breakers.
  6. Install converters at sufficient height to allow for a minimum of 18" between converter outlet and steam trap, with gravity flow from steam trap to the condensate receiver. See detail 23-050.
- B. Plate and Frame Heat Exchangers (typical for central chilled water distribution)**
1. Plate and Frame heat exchangers shall be used between chilled water distribution system and building chilled water loop.
  2. Size unit based on proper fluid velocities per manufacturer to ensure proper heat transfer.
  3. Provide isolation valves on primary and secondary side of heat exchanger.
  4. Install a two way control valve on the primary side to control chilled water supply temperature on secondary side. This valve actuator shall be proportional not incremental.
  5. Install a BTU meter for chilled water metering purposes on the primary side of heat exchanger and connect to the BAS.

### **23 6200 PACKAGED COMPRESSOR AND CONDENSER UNITS**

- A.** Condenser coils must be fitted with hail guards that adequately protect the units but are also easily removable for condenser coil cleaning.
- B.** Provide low ambient kit and crankcase heater

### **23 6000 GENERAL CHILLER REQUIREMENTS**

#### **A. GENERAL**

1. Chillers should have multiple circuits whenever possible. Preference for chillers with no more than one compressor per circuit because a burnout on one compressor can harm the other compressor and shorten its life if they share the same refrigerant.
2. Chiller condenser coils must be fitted with hail guards that adequately protect the units but are also easily removable for condenser coil cleaning.
3. Chillers need to be rodent proof. They should either be fitted with factory panels or field installed ½" mesh all around the lower perimeter of the chiller, or have all control wiring shall be encased in conduit. We've had multiple cases of rabbits or other rodents chewing through chiller control wiring which can be a real problem to troubleshoot.
4. A/E MUST check system water volume and chiller manufacturer's recommended minimum system volume during design process. If the piping and equipment doesn't provide enough system volume, the designer must either provide chilled water buffer tanks or oversize the piping to increase system volume BEYOND manufacturer's minimums. This must be done to prevent short cycle chillers during low load conditions.
5. Multiple chiller installations must be separated from each other by at least 1.5x what the manufacturers recommend and must be orientated in accordance with chiller manufacturer's recommendations with regards to prevailing wind direction. This information is generally available in the installation manuals for chillers and must be reviewed by the A/E during design.
6. Chillers must be located to provide free air movement around the chillers so that they don't re-introduce their own hot condenser discharge into the inlet of the condenser or hot exhaust from other systems. Manufacturer's recommended clearances should be multiplied by at least 1.5 to account for less than perfect conditions (slightly dirty condensers, aging heat transfer surfaces, wind conditions, etc.).

Coordinate with the landscape design to avoid bushes, etc. that could obstruct airflow or result in excessive leaves or plant matter from being drawn into the unit.

7. Multiple chillers in parallel must be provided with means to automatically isolate the idle chiller to prevent blending of chilled water from the active chiller with warm return water passing through the inactive chiller.
8. Any installation with multiple chillers and primary/secondary piping systems shall be well thought out for part load operation with complete sequences of operation finalized and approved by SDSU and Controls Contractor before going out for bids.
9. Provide redundant chilled water pumps for systems over 100 tons, or for any applications deemed critical enough to need highly reliable cooling, unless directed otherwise.
10. Designers must also be cognizant of spaces that have cooling loads during seasons when chiller equipment isn't able to run (based on low ambient air lockouts, etc.) unless economizer cooling is provided. Small DX or other equipment may be necessary for a few spaces if there are any such loads that can't be satisfied by the larger centralized systems. If considering connecting to campus central chilled water system, discuss with Facilities and Services about the availability.
11. Chiller equipped with outdoor air temperature sensors must be capable of providing a reliable temperature signal between -30 deg. F and 130 deg. F.
12. Unless approved otherwise, all chilled and condenser water pumps shall be designed with pump/motor speed no greater than 1800 RPM. 3450 RPM motors shall not be used unless specifically approved by the Owner.
13. In existing chiller plant, refrigerant must be R-134A to match existing chillers.
14. Air-cooled chiller basis of design shall be Trane or York but other manufacturers shall be allowed to bid.
15. Where size allows, SDSU prefers scroll compressors. In larger chillers, screw or centrifugal compressors can be considered.
16. Use solid state Hall Effect flow switches, such as IFM Efector, instead of paddle switches.
17. When specifying packaged factory controls on chillers, the designer shall clearly specify which points are to be integrated with the campus BAS. Specify which points are monitor only and which ones are writeable from the BAS to the chiller controls. Designer shall consult with Facilities and Services regarding these points early in design.

#### **23 6416 CENTRIFUGAL WATER CHILLERS**

- A. Centrifugal water cooled chillers shall be basis of design where cooling loads exceed 150 tons.
- B. Magnetic bearing chillers shall be considered where capacity will allow.

#### **23 6419 RECIPROCATING WATER CHILLERS**

- A. Reciprocating water chillers shall not be used at SDSU.

#### **23 6423 SCROLL WATER CHILLERS**

- A. Where used, shall be designed with multiple compressors or capacity control methods to eliminate short cycling and provide adequate turn down ratio. Consult with Facilities and Services regarding turn down ratio at Schematic Design if not already dictated in OPR.

#### **23 6426 ROTARY-SCREW WATER CHILLERS**

- A. Where used, shall be designed with multiple compressors or capacity control methods to eliminate short cycling and provide adequate turn down ratio. Consult with Facilities and Services regarding turn down ratio at Schematic Design if not already dictated in OPR.
- B. Magnetic bearing chillers shall be considered where capacity will allow.

#### **23 6500 COOLING TOWERS AND FLUID COOLERS**

- A. **If cooling towers need to run below freezing conditions:**
  1. Provide indoor remote sumps or tanks instead of outdoor basins.
  2. Discuss bypass options

3. Discuss heat tape or basin heaters
  4. Locate piping components such as strainers and valves that retain water indoors
  5. Provide adequate drain down points
- B. Towers with integral basins shall be equipped with basin cleaning systems.
  - C. Tower basins shall be stainless steel in construction. Consult with Facilities and Services about materials of construction for remaining tower components.
  - D. Provide a separate drain (in addition to the main condenser water outlet) fitted with an isolation valve in a low point in the catch basin to facilitate cleaning of debris from tower without running it into condenser water piping.
  - E. Tower fans shall be variable speed controlled.
  - F. Tower fan motors located outside the air stream are preferred.
  - G. Probe type high and low alarm/level controllers with binary out to BAS for each alarm.
  - H. Fluid coolers shall have factory interlock to prevent the basin heater and spray pump from energizing when the basin is at or below low alarm level.
  - I. Provide adequate service platforms with OSHA approved handrails.
  - J. Provide jib crane to facilitate removal of the motor on larger units.
  - K. Provide covers over hot water distribution deck to prevent UV rays from encouraging algae growth.
  - L. Water Treatment:
    1. Provide either chemical or non-chemical water treatment; discuss pros and cons with Facilities and Services at initial design.

### **23 7313 MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS**

#### **A. GENERAL**

1. All air handlers shall be located inside the building mechanical rooms or totally enclosed penthouses. Deviations will only be allowed with written approval from the Assistant Vice President of Facilities and Services.
2. The A/E shall also keep partial building occupancy in mind while designing equipment and the operating sequences. For example if one portion of a building is likely to have significantly different hours of operation than another part, it may be necessary to separate not only the supply air, but also the exhaust air systems from the other part of the building. The goal would be to keep completely independent operation of the different areas of the building. Don't rely on makeup air from one system to provide some or all of the makeup air for a different zone or area of the building.
3. Outside air intakes need to be carefully designed to avoid snow ingestion from making it to the AHU filter bank (such as intake plenum and storm rated louvers). Ideally the outside air should have to make a 90 degree turn upward and rise above the top of the louver before turning horizontal. The outside air plenum should be sized for very low velocity to give snow and rain a chance to drop out. Drains should be provided at the low point in the outside air plenum. Outside air intakes shall be located above grade (minimum 6').
4. SDSU has had good success when using 2 heating coils in series when equipment has to handle a huge variation in coil entering air temperature. Consideration should also be giving to using two control valves on large coils and steam heated coils so that 1/3 of load is provided by one valve and 2/3 of the load is provided from the other (provide OAT or EAT reset). This gives much better controllability than does a single valve trying to work over a huge range of flow conditions.
5. Coil loop pumps shall also be used if the AHU is capable of a large percentage of outside air.
6. Air blenders should be used, or the mixing section located a significant distance from the coil, to prevent stratification. Standard filter mixing boxes are generally not acceptable for units with any significant percentage of outside air unless prior approval by SDSU.
7. On AHU's, provide access sections, minimum 24" wide with minimum 16" doors with a clear opening not less than 14" wide, between all coils. All AHU coils need to be accessible through hinged access doors on the inlet and outlet side of each coil for cleaning purposes.
8. Provide windows in access doors for fan, humidifier and coil access sections.

9. Provide double sloped stainless steel drain pans under all AHU coil sections (for cleaning purposes), not just cooling coils.
10. It is the A/E's responsibility to know the static pressure of the cooling coil section of each air handler and to clearly call out the minimum height of the cooling coil outlet above the floor so that proper traps can be installed in the drain pan outlet piping. Do not rely on the contractor to measure the static in the unit after startup and then try to pipe it correctly. It could lead to insufficient height from the drain pan outlet to the finished floor and back condensate up in the unit resulting in an expensive fix. Ensure adequate equipment base height (equipment rail and pad) is provided so all system piping remains above finished floor.
11. Provide lights inside air handlers for service with switches at the access doors on the outside of the unit. Exceptions may be allowed for small units with approval from the project manager.
12. Filter banks in AHU's shall be designed for 2" pre-filters (MERV 7 or higher) and higher efficiency final filter 4" deep (MERV 10 or higher). Variations of this are acceptable depending upon application. Filter racks should provide tight seals to access doors and prevent unfiltered air from bypassing around filters.
13. Provide one spare set of filters at completion of the job.
14. Filter racks should not have filler plates/bars to offset gaps.
15. Humidification may be accomplished with direct use of the boiler plant steam with understanding of the boiler water treatment chemicals are in use and only with prior approval. Electric-to-steam or steam-to-steam type humidifiers may also be used when humidification is necessary. Designer shall define exactly when humidity control is required and why. SDSU recommends limiting its use to only to those areas where it is absolutely needed. Supply water to stand alone steam generators shall be treated to meet application requirements. Soften water would be a minimum.
16. Energy Recovery System systems shall be designed to recover both latent and sensible heat whenever possible. Other systems may be considered if discussed and approved in advance.
17. All energy recovery systems shall incorporate a means to bypass the energy recovery system in the event it is not needed. We want to avoid recovering heat, dumping into the inlet of an air handler that may have to turn around and mechanically cool it. There needs to be means to economizer cool when it's needed and available.
18. Energy recovery wheels employing frost protection schemes must use wheel speed modulation as opposed to starting/stopping the wheel. Alternative approaches utilizing pre-heat coils upstream of the wheel can be considered to prevent frosting of the wheel.
19. All makeup air units located outside shall have a damper in the discharge (supply air) duct to prevent the moisture from the building migrating up into the unit and frosting it up or causing condensation to form in the unit.
20. All makeup air units that are provided with permanent washable filters shall be provided with two sets of filters to allow for immediate replacement when the installed set gets dirty or covered with frost.
21. Drive belts shall be premium quality belts.
  - (a) 7.5 HP and up to 25HP drives, use a minimum of two groove B width belt drives with premium belts.
  - (b) 25 HP thru 60 HP use minimum of 3 belt drives with premium belts.
  - (c) 75 HP and higher use 4 belt drives.
  - (d) After air balancing is complete, contractor shall replace all adjustable pitch drives with fixed pitch that matches the final rpm as set by balancer.
  - (e) Align drives and re-tension all belts after 48 hours run time.

## **23 7413 PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS**

### **A. GENERAL**

1. Rooftop mounting of any major equipment is not recommended and only allowed in certain circumstances with written approval of SDSU Facilities and Services Dept. All initial cost estimates shall be based upon NOT using roof mounted equipment. As much equipment as possible should be put in the mechanical rooms, penthouses or inside the building. Exceptions are allowed for small exhaust fans. Refer to Section 237313.

### **23 7433 DEDICATED OUTDOOR-AIR UNITS**

#### **A. GENERAL**

1. Refer to Section 237313

### **23 8100 DX SYSTEM GENERAL REQUIREMENTS**

#### **A. GENERAL**

1. Chilled water systems are generally preferred over large DX systems. Where available, connect to existing chilled water distribution systems with adequate capacity. Refer to Division 33.
2. Compressor/condensing units shall be equipped with a manual reset high pressure switch and either a "loss of charge" or "low pressure" switch.
3. For units not intended to run below 55 degrees outdoor air temperature, include an ambient lockout switch to prevent the unit from trying to start below its intended operating temperature.
4. DX systems should typically not be used when the AHU is a VAV system.
5. Condensing units for DX systems that are expected to operate during winter months must be set well above grade or the roof line (where allowed by special written permission) so that drifting snow does not plug the unit up. Designer needs to be cognizant of adjacent equipment, site and building features that could cause significant drifting at the unit.

### **23 8216 AIR COILS**

- A. Specify chilled water coils for air handlers have minimum 0.035 inch wall thickness copper tube, minimum 0.049 inch wall thickness bends or cast iron headers, and aluminum fins.
  1. Specify certified to ARI Standard 410.
  2. For coils being fed from local chillers designer should strongly consider using the following coil design conditions:
    - a. 43 degree F entering water temperature
    - b. 57 degree F leaving water temperature
  3. The Central Chiller Plant is designed for a 42 degree F chilled water supply temperature and a 54 degree F chilled water return water temperature. For coils connected directly to the Central Chiller Plant, the cooling coil design temperature should assume at least a 1 degree temperature gain of the chilled water supply between plant and the building. Specify coil design with a 12 degree delta between entering and leaving water:
- B. Provide according to good construction techniques and application of coil integral drain pans and center supports.
- C. For fan coil units using chilled water, specify 0.020 inch wall thickness copper tube and aluminum fins.
- D. For coils in air handlers using steam or hot water, specify 0.035 inch wall thickness tube.
  1. Specify non-freeze type coils have 1 inch tube diameter and 0.035 inch wall thickness.
- E. Specify all water coils provided with integral minimum ½ inch vent and drain extended to the outside of the housing and valved.
- F. Specify cooling coils not to exhibit condensate carry over.
  1. Specify cooling coil face velocity of 500 fpm or less.
- G. Specify no more than 6 rows for any single coil.
  1. If more rows are required, specify coils installed in series.
  2. Specify space is provided between coils to allow for coil repair and cleaning.
- H. Specify drains for chilled water coils routed to a storm drain.

### **23 8233 CONVECTORS**

- A. Locate control valves above ceiling.

### **23 8239 UNIT HEATERS**

- A. Coils shall be easily accessible for cleaning.
- B. Shall contain a disposable air filter.
- C. Shall contain tamper proof fasteners and hardware
- D. Shall contain on/off switch with fan speed selector
- E. Specify gas or electric only when steam or hot water is not available.

### **23 8245 CHILLED BEAMS**

**A. GENERAL**

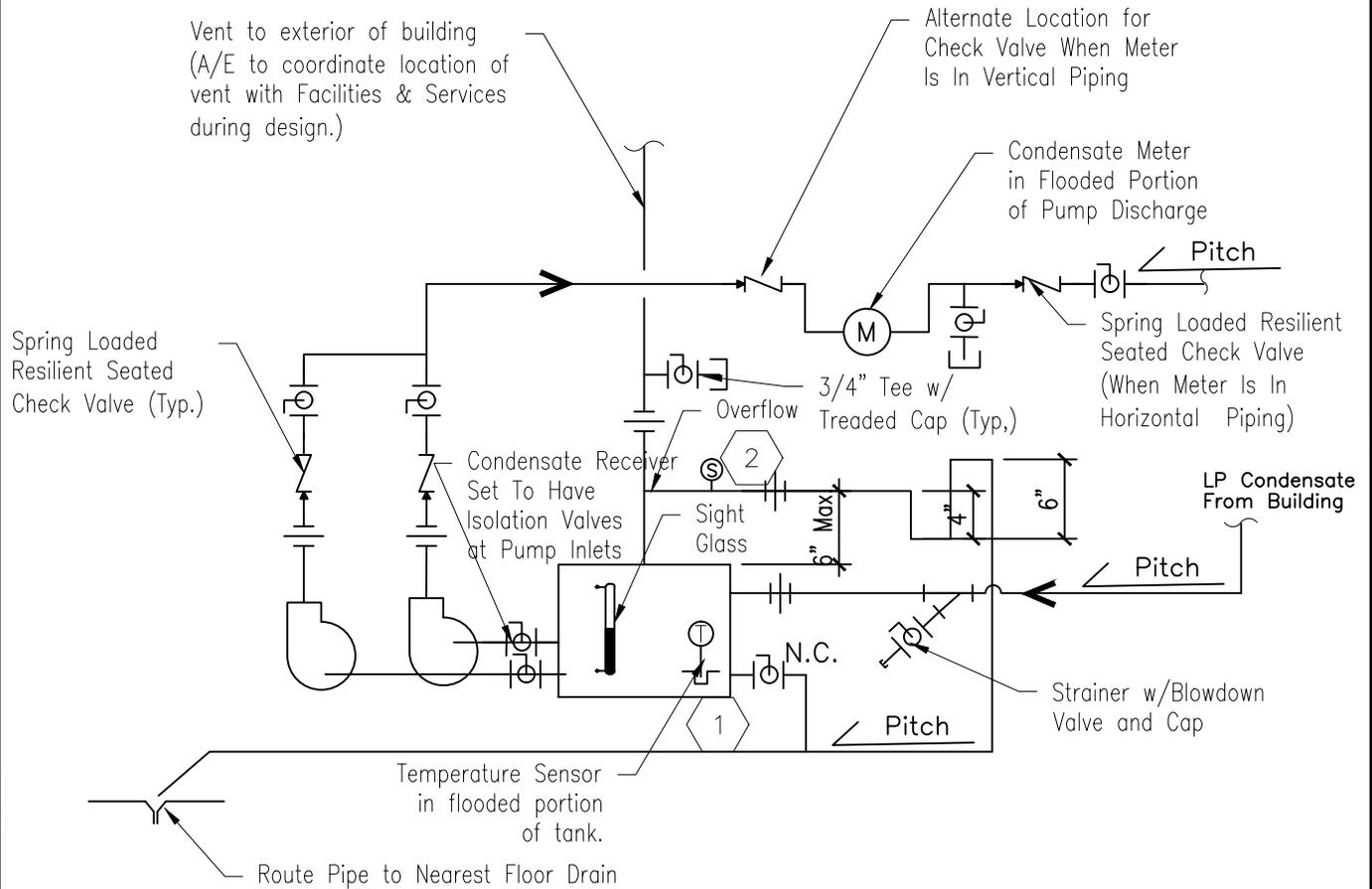
1. Should only be considered in a new facility without operable windows and very good building envelope to prevent condensation problems. If these criteria are met, please consider them as a viable alternative system.

**23 8413 HUMIDIFIERS**

- A.** Specify low distance absorption grids that prevent steam from impinging on AHU coils, motors, etc. Do not allow steam grid dry bar type units with jacketed manifolds.
- B.** Specify steam-to-steam exchanger type packaged units, or a steam fired steam boilers.
  1. If a boiler is used, specify it to meet all requirements of the state Boiler and Pressure Vessel Rules.
    - a. Specify RO or DI makeup water if available, softened water if not available.
  2. Unless approved otherwise, steam from the campus Central Heating Plant shall not be directly injected into the air stream.
- C.** Locate the unit in the air system where design conditions will allow the humidifier to work properly.
- D.** Reset humidity setpoint based on outdoor air temperature.

END OF DIVISION 23 HVAC

DRAFT



Individual pump status shall be provided via current transformers and connected to BAS alarm if pump status is on for more than 5 minutes (adjustable).

- 1 Use Elevated Tank Whenever Feasible.
- 2 High Level Alarm tied to BAS. (Can be integral to control panel.)

No.	Revision/Issue	Date

## CONDENSATE RECEIVER DETAIL

Not to Scale

	CAD File STND-DTL	Sheet
	Date 5/1/2012	
	Scale As Noted	23-010

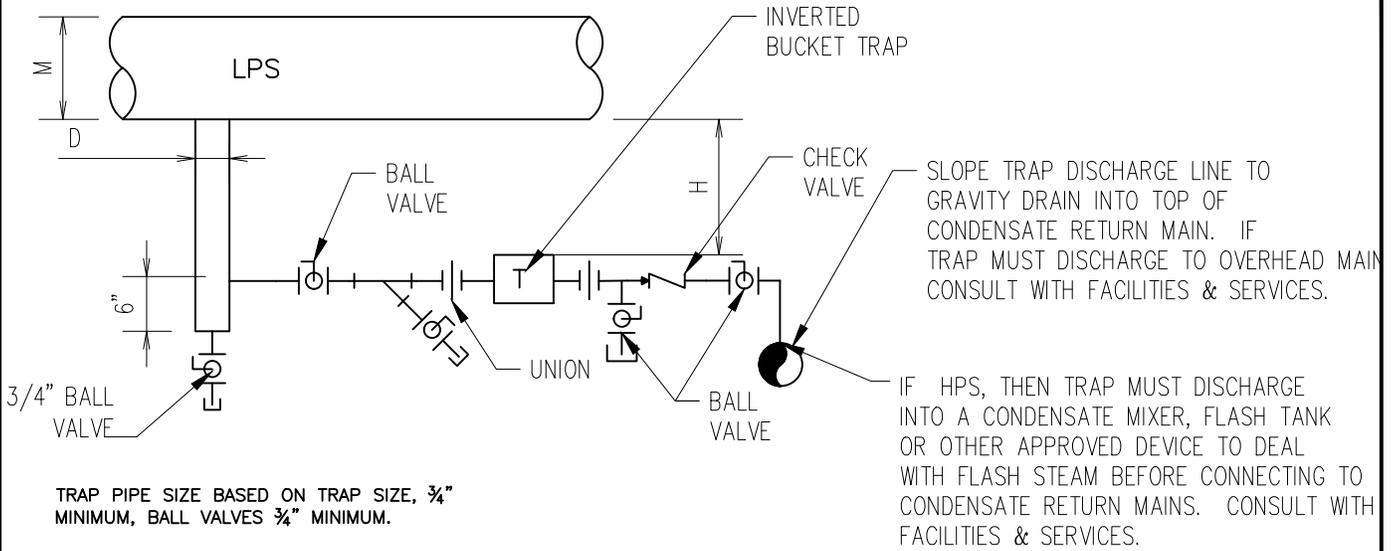


TABLE 1

STEAM MAIN & BRANCH LINE DRIP LEG SIZING			
M	D	H	
		DRIP LEG LENGTH MIN. (IN)	
STEAM MAIN SIZE (IN)	DRIP LEG DIAMETER (IN)	SUPERVISED WARM-UP	AUTOMATIC WARM-UP
1/2	1/2	10	28
3/4	3/4	10	28
1	1	10	28
2	2	10	28
3	3	10	28
4	4	10	28
6	4	10	28
8	4	12	28
10	6	15	28
12	6	18	28
14	8	21	28
16	8	24	28
18	10	27	28
20	10	30	30
24	12	36	36

UTILIZE AUTOMATIC WARM-UP COLUMN UNLESS APPROVED OTHERWISE

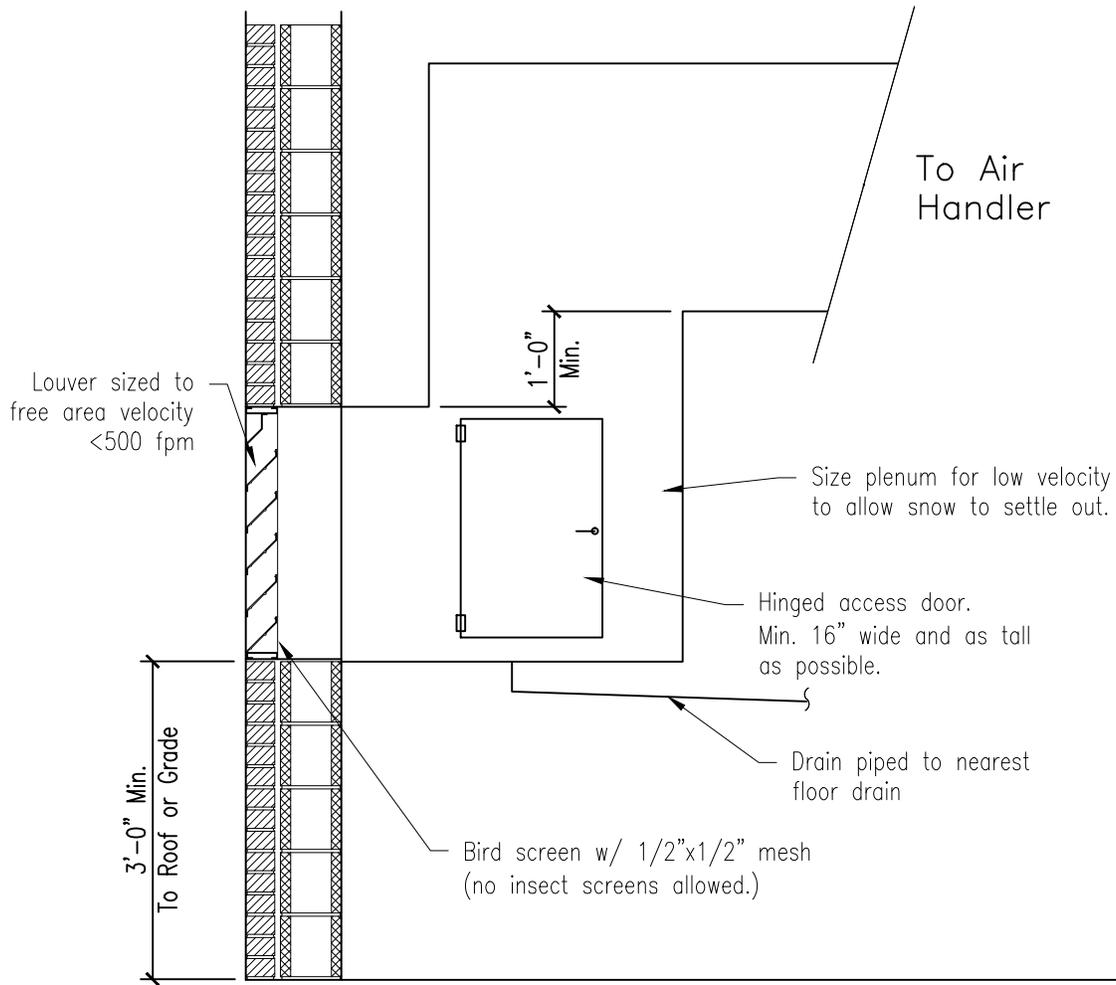
J:\Engineering\Design Standards Development\Standard Details\Std-DTL.dwg, 5/23/2012, 11:33:12 AM

No.	Revision/Issue	Date

STEAM MAIN DRIP TRAP DETAIL

Not to Scale

	CAD File	Sheet
	STND-DTL	
	Date	5/1/2012
	Scale	As Noted
		23-020



No.	Revision/Issue	Date

**OUTSIDE AIR INTAKE DETAIL**  
Not to Scale

	CAD File STND-DTL	Sheet
	Date 5/1/2012	<span style="font-size: 2em;">23-040</span>
	Scale As Noted	

# Division 26 ELECTRICAL

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## Appendix

### Standard Details

- 26-010 Large Light Base
- 26-020 12' Light Pole
- 26-030 Small Light Base

# Division 26 ELECTRICAL

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

*The Owner encourages improved concept, method and products by the Design Professional; however Project compatibility with existing campus systems, processes and procedures is most desirable.*

## **26 1000 GENERAL**

### **A. CODE**

1. All electrical design and installations shall be in compliance with the current version of the National Electrical Code.

### **B. RELATED SECTIONS**

1. Division 23 – HEATING VENTILATION AND AIR CONDITIONING
2. Division 27 – COMMUNICATIONS
3. Division 28 – ELECTRONIC SAFETY AND SECURITY
4. Division 33 – UTILITIES

### **C. ABBREVIATIONS**

1. ANSI – American National Standards
2. NEMA – National Electrical Manufacturers Association
3. NEC – National Electrical Code
4. UL – Underwriters Laboratories
5. AWG – American Wire Gage
6. GFCI – Ground Fault Circuit Interrupter

### **D. DEFINITIONS**

1. Branch Circuit - The part of a distribution system consisting of circuit conductors, between the final overcurrent protection and the outlet or load attached.
2. Feeders – A circuit conductor between the power supply source and a final branch circuit overcurrent device
3. Primary – The term primary may be used to describe a voltage or a circuit. This refers to the high voltage in the campus main distribution system. The primary voltage on campus is 7200/12,470V.
4. Secondary - The term secondary may be used to describe a voltage or a circuit. This refers to the stepped-down voltage after the building transformer. The secondary voltage on campus will be either 120V/208V or 277/480V.
5. Motor Control Center (MCC)- A modular assembly specifically designed to plug in motor control units. Motor control centers are supplied by a common bus, usually straight from the switchboard.
6. Main Distribution Panel (MDP) – Switching, disconnecting, over-current and metering equipment rated 600V or less which feed distribution panelboards or motor control centers.
7. Panelboard – A single panel distribution cabinet or wall cutout box that holds automatic overcurrent protection devices for lighting, heat, or power circuits

### **E. DRAWING REQUIREMENTS**

1. The electrical bid document shall include the following (minimum requirements)
  - a. A symbols list
  - b. One Line diagrams for all systems involved
  - c. Connected loads at each switchboard, panelboard, motor control center, etc.

- d. Panelboard schedules with connected loads
  - e. Fixture Schedules
  - f. Home runs to panel boards indicating circuit numbers
  - g. The quantity of wires in conduit (preferably with hash marks)
  - h. If a dedicated circuit is provided for a known piece of equipment, indicate the label on the drawings.
2. Indicate under-floor conduit shall be 12" below the floor slab and marked with caution tape.
  3. If coordination studies are required, submit documentation to Facilities and Services.
  4. See associated drawing standards
    - a. Transformer Pad
    - b. High voltage switch man-hole

#### **F. EQUIPMENT SERVICE ACCESS AND MAINTAINABILITY**

1. Starters, switches, receptacles, pull boxes; etc. shall be located to provide easy access for operation, repair and maintenance. If a component is concealed in a wall, ceiling or other location, access panels/doors shall be specified.

### **26 0519 CONDUCTOR**

#### **A. POWER CONDUCTOR UNDER 600V**

1. Conductor
  - a. All building conductor shall be copper
  - b. Minimum wire size shall be 12 AWG
  - c. Wire size 10AWG and under may be solid and Wire over 10 AWG shall be stranded
  - d. Specify colored wiring for Phase and neutral. Wire size over #2 may be black insulation with tape used for color coding.
    - 1) 480Y/277 3 Phase
      - (a) Phase A – Brown
      - (b) Phase B – Orange
      - (c) Phase C – Yellow
      - (d) Neutral - Gray
    - 2) 208Y/120 3 Phase – Black, Red, Blue
      - (a) Phase A - Black
      - (b) Phase B – Red
      - (c) Phase C – Blue
      - (d) Neutral - White
    - 3) Grounding – Green

#### **B. POWER CONDUCTOR OVER 600V**

1. See Division 33 Site Utilities campus electrical distribution cable
2. For all other applications consult with Facilities and Services

#### **C. LOW VOLTAGE CONDUCTOR**

1. Telecom (Voice and Data)
  - a. Subject to compliance with SDSU's University Networking office standards and BIT (Bureau of Information Technology) protocols. Use plenum rated cable above drop ceilings, conduit in exposed spaces and mechanical rooms. Use of cable tray is allowed unless otherwise stated.
  - b. Cat 5e/6 Voice cabling shall be white
  - c. Cat 5e/6 Data Cable shall be blue

- d. Refer to Division 27 – Communications
- 2. Building Control Conductor (BAS)
  - a. Control wiring will typically be installed by the Building Automation System Contractor. Refer to Division 23.
- 3. Fire Alarm Conductor
  - a. Fire alarm conductor shall be run in conduit. It is not allowed in cable tray.
  - b. Use of MC Cable is only allowed with approve of SDSU Facilities and Services.
  - c. Refer to Division 28 -
- 4. Card Access
  - a. Card access conductor may be run in cable tray.
  - b. See Division 28 for specific requirements.
- 5. Security systems (video surveillance) – see division 28  
Classroom Technologies (Audio/Video) – see division 27

#### **D. CONNECTORS AND TERMINATIONS**

- 1. Wire 10AWG and Smaller - Wire Connections shall be properly sized wire nuts
- 2. Push-in style (i.e. In-Sure) and crimp on splices are not permitted
- 3. No split-bolt splicing allowed
- 4. Terminations in panel boards, Disconnects, VFD's, Motors, shall be bolt-in style. Specify torque testing requirement prior to final acceptance. Provide documentation of testing.
- 5. Exterior site Lighting (Path and Parking Lot)
  - a. Splice kits shall be suitable for direct bury conditions if applicable.
  - b. If in-ground, flush junction boxes are used, they shall be labeled appropriately on as-built drawings.

### **26 0533 RACEWAY AND BOXES, CABLE TRAY, HANGARS AND SUPPORT**

#### **A. GENERAL**

- 1. Unless otherwise approved by SDSU Facilities and Services, specify  $\frac{3}{4}$ " minimum for all conduit in building line-voltage systems.
- 2. Unless otherwise approved by SDSU Facilities and Services, specify  $\frac{3}{4}$ " minimum for all conduit in low voltage systems where conduit is required.
- 3. Spare Conduit:
  - a. Specify that all spare conduit shall have a pull string left in place for future wire pulls
  - b. Specify a minimum of 25% spare conduits stubbed out of recessed panelboards to an accessible location.
  - c. During programming phase, initiate discussion with Facilities and Services regarding spare capacity above or below 25%.
- 4. Seal ends of all conduits that run between different environmental conditions using duct-seal or similar product.

#### **B. CONDUIT TYPES AND USES**

- 1. Electrical Metallic Tubing (EMT)
  - a. EMT may be used for interior feeder and branch circuits in dry locations.
  - b. EMT may be concealed in walls (including CMU) and above ceilings or exposed. Use of exposed EMT in finished locations must be approved by Facilities and Services.
  - c. EMT may be used for low voltage applications that are not exposed in cable tray.
  - d. EMT shall be used for fire alarm circuits in dry locations
  - e. Do not use EMT underground, under-floor or in wet locations.

- f. Compression fittings are preferred. The use of set-screw fittings must be approved by Facilities and Services Project Manager.
- g. If using exposed EMT in finished locations, paint the conduit to match the room.
- 2. Flexible Metal Conduit (MC)
  - a. Flexible metal conduit may be used for final connection to fixtures, devices and equipment.
    - 1) The maximum length shall not exceed 6'
  - b. Pre-wired flexible metal conduit (MC) may be considered for use when running a branch circuit to a device in a finished framed wall. This must be approved by the Facilities and Services Project Manager
- 3. Liquid Tight Flexible Metal Conduit (seal-tight) may be used for final connection to motors, HVAC equipment, and other equipment susceptible to vibration, movement, moisture, or oil-vapor. The maximum length of seal-tight shall not exceed 3'.
- 4. Rigid Galvanized Metal Conduit (RMC)
  - a. RMC shall be used in the following situations
    - 1) All underground/under-floor conduit within a building
    - 2) Where exposed to possible impact
    - 3) Where exposed to sunlight
    - 4) Wet locations
    - 5) Hazardous and/or corrosive locations (coated RMC may be necessary)
    - 6) Utility Tunnels
    - 7) Greenhouses
- 5. Surface Metal Raceway
  - a. Surface metal raceway includes pre-engineered raceway systems designed for surface applications such as Wire-mold, Panduit etc.
  - b. Surface metal raceway may be considered where concealing is not an option.
  - c. Surface metal raceway may be desirable in certain applications to increase quantity and/or flexibility of device locations (i.e. Panduit in a lab setting)
  - d. Consult with Facilities and Services Project Manager prior to specifying surface metal raceway.
- 6. Rigid non-metallic Conduit (PVC)
  - a. Schedule 40 PVC Conduit shall be used for all underground primary and secondary circuits.
  - b. Schedule 40 PVC Conduit shall be used for all underground site-lighting circuits
  - c. Specify glued fittings for PVC conduit

#### **C. BOXES**

- 1. Device Boxes
  - a. Device boxes for receptacles, switches etc. shall be a minimum of 2-gang.
- 2. Junction boxes
  - a. The minimum size for J-boxes shall meet NEC Requirements.
  - b. In certain applications, the owner may require larger junction boxes. Consult with the Facilities and Services Project Manager.
- 3. Boxes and Covers must be labeled appropriately for the system they serve
- 4. In-ground junction boxes may be used with permission of Facilities and Services on exterior site lighting only. Specifically indicate locations on bid documents to ensure an accurate as-built.

#### **D. CABLE TRAY**

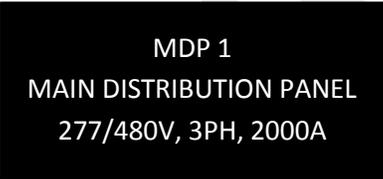
- 1. Cable tray shall be provided and installed by the electrical contractor.
- 2. Cable tray shall be wire mesh basket style similar to B-Line Catalog number WB-218 or approved equal.
- 3. Cable tray may be ceiling mounted or side-wall mounted depending on location.

4. Specify a minimum of 25% spare capacity in cable tray systems.

## 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

### A. EQUIPMENT LABELING

1. On remodels and/or renovation projects, new equipment tags may NOT duplicate any existing equipment tags.
  - a. The designer shall conduct site visits and refer to equipment schedules from as-builts to determine existing equipment tags.
  - b. On major remodels, renovations and/or building additions, investigate the possibility of complete relabeling of all electrical equipment to create a new building-wide labeling scheme.
  - c. Coordinate with mechanical systems.
2. Electrical equipment labels shall be plastic engraved, and mechanically fastened to equipment when possible.
  - a. Labels shall be black with white letters with the exception of emergency circuits, which shall be red with white letters.
  - b. Discuss other sizes and mounting requirements with Facilities and Services as the need may arise.
3. Specify labeling on the following items – coordinate with mechanical systems
  - a. Main Distribution Panel (MDP) – Main equipment label
    - 1) Equipment tag (i.e. MDP1)
    - 2) Name of equipment or panel (i.e. Main Distribution Panel 1)
    - 3) Voltage, Amps, Phase info (i.e. 277/480V 3PH 2000A)
    - 4) Example (not to scale)
    - 4)



MDP 1  
MAIN DISTRIBUTION PANEL  
277/480V, 3PH, 2000A

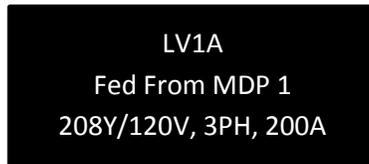
- b. Main Distribution Panel Breakers (Loads Served) – locate adjacent to breakers
  - 1) Equipment Tag (i.e. MCC1)
  - 2) Name of Equipment (i.e. Motor Control Center 1)
  - 3) Location of Equipment (i.e. Room xxx)
  - 4) Example (not to scale)



MCC1  
Motor Control Center 1  
Location: ROOM xxx

- c. Provide similar labeling scheme for building distribution panels at other locations throughout facility as applicable. This includes distribution centers, motor controls centers, motor starters, disconnects, etc.
- d. Building Panelboards – Equipment Label
  - 1) Use the following label scheme
    - (a) Panel tag (i.e. LV1A) where:
      - (i) LV or HV – designates voltage – use LV for 120/208, and HV for 277/480.

- (ii) 1 – Designates the floor the panel is on
- (iii) A – Panel designation
- (iv) Continuation will include LV1B, LV1C, LV1D, etc for first floor, LV2A, LV2B, LV2C for second floor etc.
- (v) Feeder Source (i.e. Fed From MDP 1)
- (vi) Voltage, phase, Amps (i.e. 208Y/120, 3PH, 200A)
- (vii) Example



(b) Emergency Panel tag



- e. Interior Building Transformers and Other Specialized Electrical Equipment and/or Dedicated systems shall be labeled appropriately.

## B. OTHER LABELING

1. Panel Circuit Schedule
  - a. Provide typed panel schedule
  - b. Panel Label Scheme
    - 1) Room Number, Location and/or equipment served
    - 2) For specific equipment – use specific equipment tags. Coordinate with mechanical and BAS.
2. Engraved receptacle cover plates are not considered a reliable labeling system.
3. Emergency circuit receptacles shall be orange and shall be labeled appropriately
4. Junction box covers shall be color coded and labeled
  - a. Fire Alarm – Red
  - b. Emergency Power – Orange
  - c. Data/Telecom – Blue (see division 27)
  - d. Control (BAS) – Brown
  - e. 480Y/277 – unpainted
  - f. 208/120 – unpainted

## 26 2000 DISTRIBUTION EQUIPMENT

### A. BUILDING DISTRIBUTION DESIGN

1. Building Distribution shall be specified as either 120/208V or 277/480V.

### B. DRY TYPE TRANSFORMERS

1. Dry type transformers shall be utilized within the building to convert 480/277V to 120/208V
2. Dry type transformer shall be installed in dedicated electrical rooms, or as authorized by Facilities and Services Project Manager.
3. Buck-Boost Applications

- a. Buck-Boost transformers are typically only necessary in specialized applications and must be coordinated with Facilities and Services.
- b. Buck-Boost transformers shall not be utilized to fix a voltage discrepancy caused by faulty equipment.

### **C. METERING**

1. Electrical meter shall be provided at the building main distribution system and shall connect into the existing campus BAS. Report instantaneous demand as well as a totalized value at a minimum. Discuss specific requirements with Owner.

### **D. SWITCHBOARDS (MDP)**

1. Preferred Manufacturers:
  - a. Square D
  - b. General Electric
  - c. Specify approved equal
2. Provide the following instrumentation
  - a. Multifunction Digital electronic power meter with the following capabilities
    - 1) Current, Phase, Neutral
    - 2) Real Power KW per phase and total
    - 3) Reactive Power KVAR per phase and total
    - 4) Apparent power KVA, per phase and total
    - 5) Power Factor
    - 6) Frequency
    - 7) Demand current, per phase, neutral, present and peak
    - 8) Real power demands (kWd)
    - 9) Reactive power (kVARd)
    - 10) Real energy (kWh)
    - 11) Reactive energy (kVARh)
    - 12) Apparent energy (kVAh) three phase total
    - 13) Energy accumulation modes, signed, absolute, energy in, energy out
    - 14) Total harmonic distortion (THD)
    - 15) Date and time stamping, peak demands, power up/restart resets
  - b. Metering shall include self-diagnostics
  - c. Metering shall include point of termination with pulse output to campus central control system. This shall be tied into Metasys with projects.
3. Specify copper bus bars
4. Specify 50% spare capacity in MDP.
5. Specify they contractor provide spare breakers with the installation. Verify specific requirements with Facilities and Services.
6. Locate MDP's in dedicated electrical rooms separate from mechanical rooms.
7. Place MDP's on 4" concrete housekeeping pads
8. Seal all conduit between MDP and transformer (seal at transformer also). Preferred material is duct-seal or equivalent.
9. Bus-Duct Assemblies for risers are not allowed unless specifically approved by Facilities and Services.

### **E. PANEL BOARDS**

1. Preferred Manufacturers:
  - a. Square D
  - b. General Electric

- c. Specify Approved Equal
- 2. Enclosure types
  - a. Specify appropriately depending on location
  - b. Specify Hinged Doors with locking mechanism by panel manufacturer. Specify keys are provided with panels.
  - c. Specify bolt-on type breakers rated at 65/75C and 10,000 AIC minimum
- 3. Branch panelboards may be installed in electrical rooms, corridors or the space they serve. Locations shall be approved by Facilities and Services Project Manager.
- 4. Specify 25% additional 20A breakers, and 25% additional unused spaces.
- 5. Typically specify a 42 circuit panel unless conditions justify otherwise.
- 6. Specify copper bus bars.

#### **F. MOTOR CONTROL CENTER (MCC)**

- 1. Preferred Manufacturers:
  - a. Square D
  - b. General Electric
  - c. Allen Bradley
- 2. Install Motor Control centers in dedicated electrical rooms. Consideration will be given to installation in mechanical rooms if placed appropriately away from wet locations.
- 3. Control Voltage transformers shall be within the MCC enclosures.

#### **G. VARIABLE FREQUENCY DRIVES – SEE DIVISION 23 - HVAC**

### **26 3000 – LIGHTING AND LIGHTING CONTROLS**

#### **A. INTERIOR LIGHTING**

- 1. General
  - a. On new construction or when all building fixtures are being replaced as part of remodeling project, specify all light fixtures to have lamps with a 4100 K color temperature.
  - b. Exceptions to the 4100 K T8 bulb
    - 1) Art Museum
    - 2) Heritage Museum
    - 3) Briggs Library
    - 4) Grove Hall (3D Arts)
  - c. On partial remodels, match color temperature of adjacent fixtures within the building.
    - 1) Avoid introducing additional bulb types on partial remodels.
    - 2) Select fixtures that utilize the same types of bulbs within the building to simplify SDSU maintenance stock.
  - d. If high bay fixtures are required, specify high bay fluorescent fixtures instead of high intensity discharge type fixtures unless mounting height makes this impractical.
  - e. Locate all fixtures in locations that can be serviced without special equipment.
    - 1) Locations that require man-lifts or scaffolding are not acceptable.
  - f. Review lighting in arenas or theatres where fixtures must be located over the seating area with Facilities and Services.
    - 1) Light bulb replacement shall not require removal of fixed seating to maneuver a man lift.
    - 2) Performing Arts Center-Larson Memorial Concert Hall is a good example of a design that does not account for bulb replacement without removal of seating.
  - g. Decorative lighting that accents interior building elements is discouraged.
  - h. Incandescent fixtures are not allowed.

- i. Do not specify fluorescent fixtures utilizing 8' bulbs.
- j. Do not specify fluorescent fixtures utilizing U-tube designs.
- k. Standard fluorescent fixtures shall utilize 4' tubes and a 28 Watt T8 bulb type
- l. Do not specify T5 fluorescent bulbs

## **B. EXTERIOR LIGHTING**

- 1. General: Security always takes precedence over energy efficiency.
  - a. Design fixture quantities and placement to meet or exceed OSHA minimum light level requirements.
- 2. Pathway lighting
  - a. Match existing 12' poles and fixture utilizing 250 Watt Metal Halide
  - b. Match King Luminaire fixtures on ring road.
  - c. Bollards shall be LED bulb type.
- 3. Building mounted wall packs
  - a. HID fixtures are not allowed
  - b. Fluorescent fixtures are not allowed
  - c. LED fixtures are the only acceptable bulb type on SDSU campus.
- 4. Parking Lots
  - a. Standard design is 40 foot poles and 400W metal halide.
  - b. Provide LED pole layout design as an alternate to be accepted if budget allows.

## **C. EMERGENCY LIGHTING**

- 1. In buildings that are not on emergency power, specify emergency ballasts to be located in a select amount of light fixtures to provide requirements. Do not specify stand-alone emergency light fixtures.

## **D. LIGHTING CONTROLS**

- 1. In general, lighting in occupied spaces shall be controlled by a wall switch, and tied to occupancy sensors.
  - a. This includes corridors, restrooms, offices, laboratories and classrooms.
  - b. Do not install occupancy sensors of any types in custodial spaces or mechanical rooms.
- 2. Dimming Controls shall only be used in special circumstances and only with approval by Facilities and Services.
- 3. Integration to Building Automation System and Scheduled lighting systems may be necessary in certain circumstances. This shall include an enable/disable function during adjustable time-of-day schedule. Specific features shall be discussed with Facilities and Services.
- 4. Exterior lighting controls
  - a. Use photo sensor for all exterior lighting control.
  - b. Provide lighting contactor panel to control exterior lights vs. individual photocells on each fixture.
- 5. Daylight Control:
  - a. Daylight control is acceptable and may be considered. When designing a daylight control system, use fixtures that are tolerant of frequent on/off cycles. A pre-engineered controls system shall be provided designed specifically for this purpose. Daylight control shall be pre-approved by Facilities and Services.

## **26 4000 ELECTRICAL PROTECTION AND GROUNDING**

### **A. LIGHTNING PROTECTION**

- 1. Lightning Protection shall be discussed with Facilities and Services prior to design and installation.

## **26 5000 – ENGINE GENERATORS AND TRANSFER SWITCHES**

### **A. GENERAL**

1. Generators shall only be specified on projects with the approval of Facilities and Services. Emergency Generators are typically only provided for facilities where motor loads are critical to the function of and/or life safety in the building. Discuss specifics with SDSU Facilities and Services Project Manager.

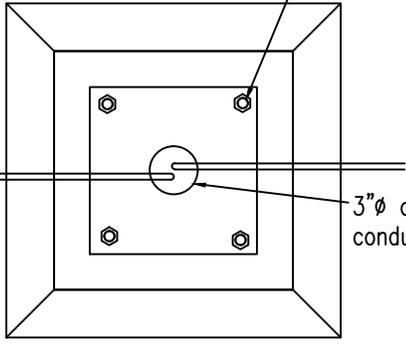
### **B. MONITORING AND ALARM POINTS**

1. Generators shall be monitored with the following alarm points
  - A. Run status – indicate when generator is running
  - B. Fault – indicated if generator has a trouble fault. Details of alarm are not necessary. SDSU personal will be dispatched to the site to investigate.

END OF DIVISION 26 ELECTRICAL

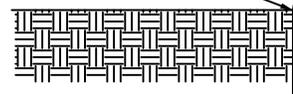
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3/4" Anchor Bolt location



Top View

Form base to point  
8" below grade.  
Rub smooth exposed  
concrete



#6 Ground

1/2" Conduit  
for Ground

5/8"x8' Ground  
Rod (Copperweld)

1'-8"

Handhole

Bolt Cover

1-1/4"x42" Galv. Anchor Bolt  
(4 Required)

2'-0"

#6 Rebar, vertical (8 required)  
#3 Ties @ 24" o.c. each  
way (hoop)

3'-0"

9'-0"

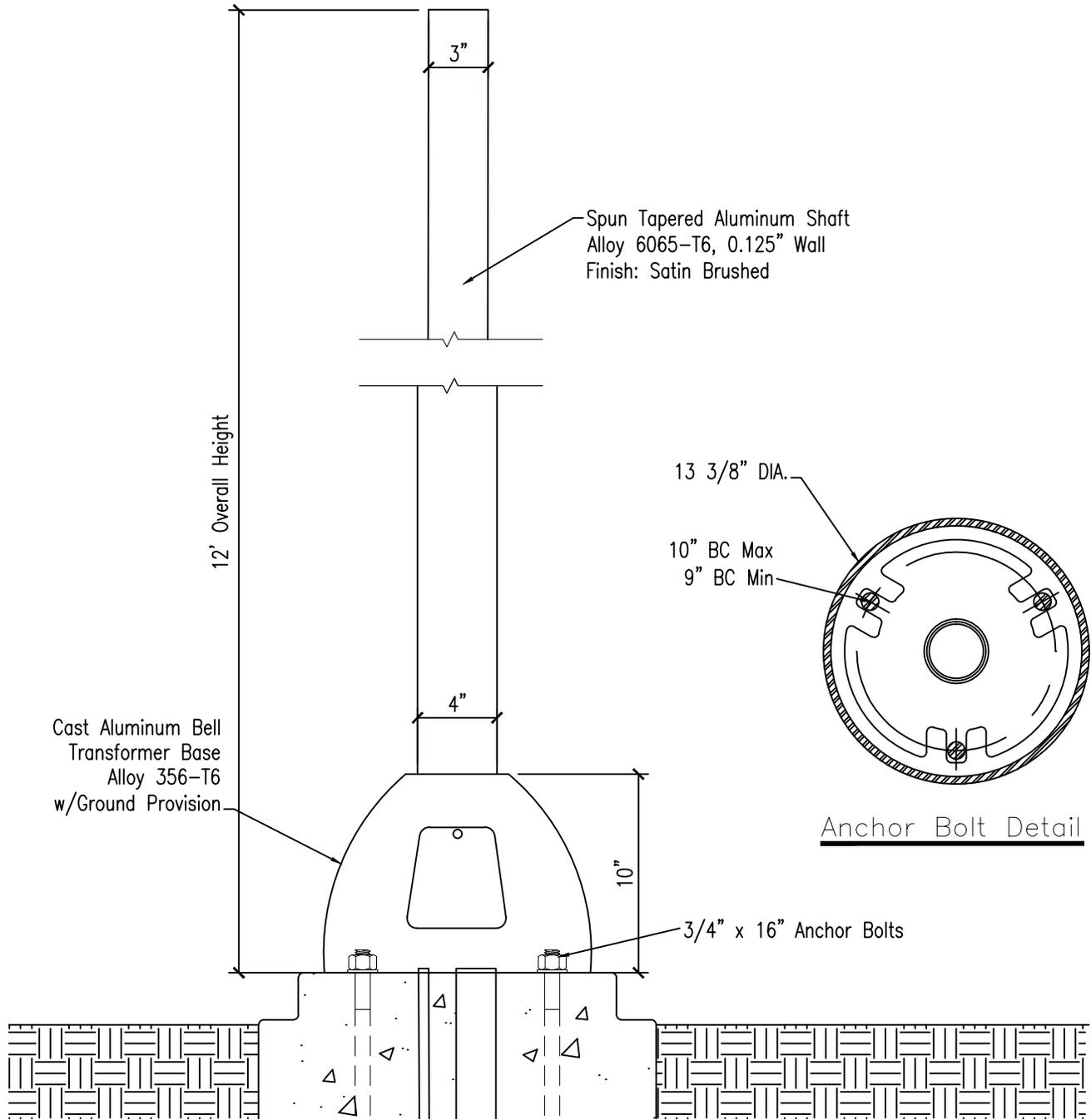
Conduit - See Area  
Plan for Size & Direction

2'-4"

No.	Revision/Issue	Date

Large Light Base  
1/2" = 1'-0"

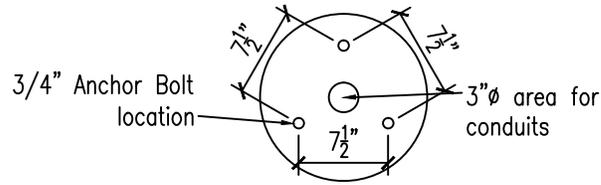
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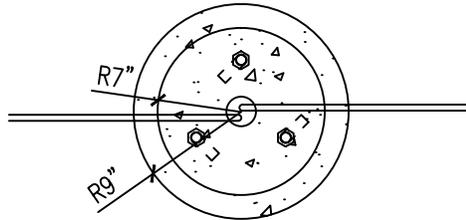
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**12' Light Pole**  
 1 1/2" = 1'-0"

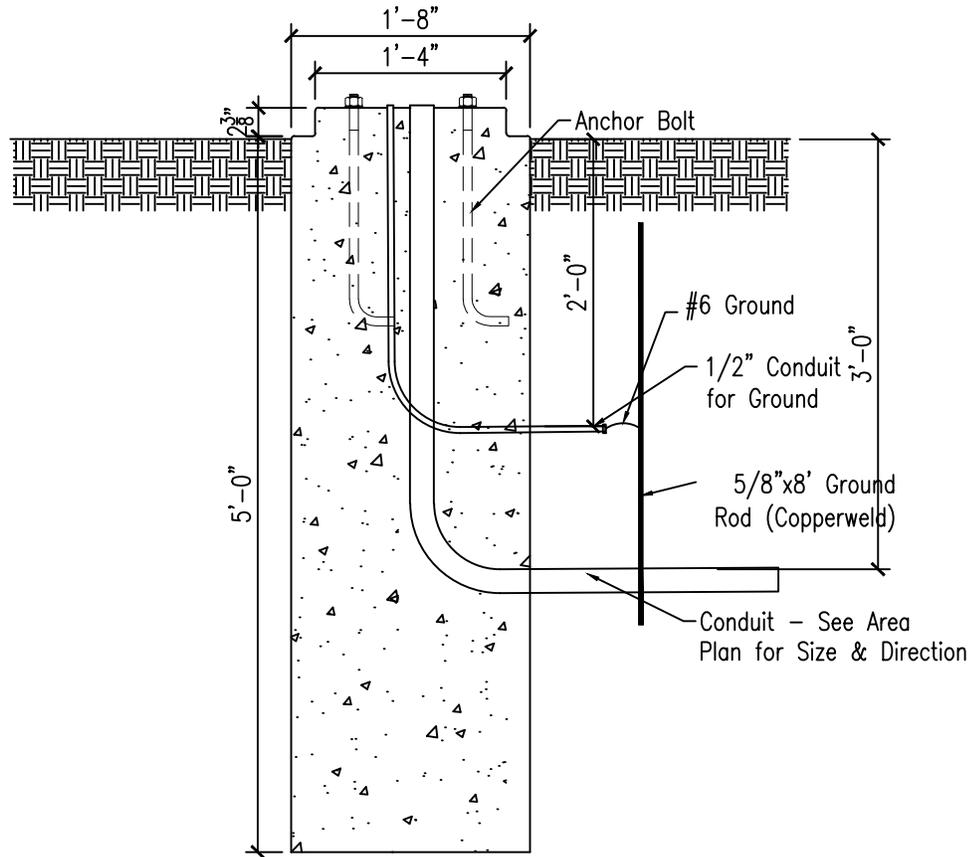
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Anchor Bolt Detail



Top View



Small Light Base

1/2" = 1'-0"

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	Scale	As Noted
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No.	Revision/Issue	Date

# Division 28 ELECTRONIC SAFETY AND SECURITY

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## Division 28 ELECTRONIC SAFETY AND SECURITY

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

*The Owner encourages improved concept, method and products by the Design Professional; however Project compatibility with existing campus systems, processes and procedures is most desirable.*

### **28 0000 GENERAL**

#### **A. DEFINITIONS**

1. ASME - American Society Of Mechanical Engineers
2. NICET - National Institute For Certification Of Engineering Technologies
3. NFPA - National Fire Protection Association

### **28 3111 DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM**

#### **A. DESIGN REQUIREMENTS**

1. Specify compliance with the following current codes and standards.
  - a. State Building Code
  - b. Fire Marshal's Rules.
  - c. NFPA 70 (National Electrical Code)
  - d. NFPA 72 (National Fire Alarm Code)
  - e. NFPA 101 (Life Safety Code)
2. Specify addressable systems installed in new buildings and major remodels of existing buildings.
  - a. Smaller buildings and minor additions to existing systems may have zone type systems.
  - b. Voice systems are required by the Owner in most new construction.
  - c. Discuss the basic system type with the Owner's Representative prior to design.
3. On additions or remodels to existing systems, specify equipment supplied by a factory-authorized distributor with service personnel located within 100 miles of campus.
  - a. The following are approved manufacturers:
    - 1) Simplex
    - 2) Siemens
    - 3) Ban-Koe (Edwards)
    - 4) Gamewell
    - 5) Notifier
4. Discuss the following items with the Owner's Representative during Schematic Design:
  - a. Location of fire department attack entrances.
  - b. Locations where information is available to emergency responders.
  - c. Location of the fire alarm control panel and any annunciators
  - d. Basic system configuration, i.e. addressable, zone, voice
  - e. HVAC fan shutdown
  - f. Fire rated hinged door hold-open system and voltage
  - g. Security/Access system
  - h. Atrium detection system
  - i. Fire extinguishing system
  - j. Elevators

#### **B. CONSTRUCTION REQUIREMENTS**

1. When the Contractor is working on operating fire alarm systems, specify that only circuit(s) involved in the work may be bypassed or disconnected and only during working hours.
  - a. Specify that the system must be operational at the end of each work day.
  - b. Specify that disconnections and bypasses are performed only by the Owner's maintenance staff.
2. Specify the Contractor to cover detectors in construction areas during dust producing operations and to uncover detectors at the end of each work day.
3. Specify the final wiring inside the fire alarm control panel is installed by the panel manufacturer's technicians.
4. Specify the following functions are performed by a NICET level 3 or level 4 fire alarm technician.
  - a. Submittal Information
  - b. Shop Drawings
  - c. Design of Software Programming

**C. CERTIFICATION TESTING**

1. Specify start up and certification testing done by a NICET level 2 or higher certified fire alarm technician, with the technician's name and certification number appearing on the certification documents.
2. Specify acceptance testing witnessed by the Owner's representative.
3. Specify testing and documentation in accordance with NFPA 72, or document as acceptable to the regulating authority.
4. Specify notification appliance circuits are measured and recorded on certification documents as follows:
  - a. In the alarm condition, the final system operating current and voltage at the fire alarm control panel and the voltage at the end of line for each horn and strobe circuit.
    - 1) The maximum voltage drop must be less than 10%; correct if needed before certification.
  - b. The final system loop resistance of speaker circuits:
    - 1) The maximum loop resistance must be less than 20 ohms; correct if needed before certification.

**D. DOCUMENTATION:**

1. Specify one set of as-built fire alarm drawings per NFPA 72.
  - a. Provide an electronic record of the fire alarm system superimposed on the building background.
  - b. Show a wiring/connection diagram for fire alarm devices where new fire alarm hardware is connected into an existing system.
2. Specify submitting the completed and signed NFPA 72 certification documents to the Owner's Representative when the fire alarm system is commissioned.
  - 1) If acceptable to the regulating authority, specify submitting manufacturer's standard documentation instead of NFPA Certificate

**E. CONDUCTORS AND CABLES**

1. Design the fire alarm system as a "power limited" system.
  - a. Specify wiring in ¾ inch minimum raceway
  - b. Cable tray is not to be used for fire alarm conductors
2. Specify minimum size #18 AWG conductors, with large sizes as needed.
3. Specify fire alarm cable is plenum rated, even though it will be run in a raceway.
4. Specify wire and cable size and type as recommended by fire alarm manufacturer.
5. Where cable shields and conductors are spliced, specify the splices are soldered and then insulated.
  - a. Wire connectors (wire nuts) are not acceptable as insulation.
6. For risers and other splice points with more than three conductors, specify the use of junction boxes with terminal boards to eliminate soldering and allow easy disconnection for isolation.
  - a. Specify wire type, size and manufacturer recommended by the equipment manufacturer.

## F. GROUNDING AND BONDING

1. Specify shields isolated from ground, except at designated points.
2. For proper circuit monitoring, specify that fire alarm enclosures, boxes and raceways are grounded, even if they carry only power limited circuits.

## G. IDENTIFICATION

1. Specify junction boxes are marked by painting them red and stenciling "FA" on the cover.

## H. FIRE ALARM CONTROL PANEL

1. Locate in a non-public, low traffic area with an annunciator at the fire department attack entrance.
  - a. Discuss locations with the Owner's Representative.
2. Power Supplies
  - a. For the main power source, specify 120 VAC building power with emergency generator backup if available.
    - 1) For a secondary emergency power source, specify an internal battery pack.
    - 2) Do not specify an inverter backup.
  - b. In buildings without emergency generators, specify battery capacity as follows:
    - 1) 24 hours of standby plus 5 minutes in alarm with all notification appliances operating.
    - 2) Additional 50% spare capacity.
  - c. In buildings with emergency generators, specify battery capacity as follows:
    - 1) 4 hours of standby plus 5 minutes in alarm with all notification appliances operating.
    - 2) Additional 50% spare capacity.
  - d. For pre-action sprinkler systems, specify batteries with 90 hour standby capacity.
  - e. For new fire alarm control panels, specify oversize enclosures to have a minimum 25% spare initiating zone or addressable point capacity and 25% spare notification appliance capacity.
  - f. Specify a dedicated circuit for each fire alarm control panel with the breaker installed with a breaker lock and plainly marked per NFPA 72.
  - g. Locate a convenience receptacle for service purposes within 3 feet of the fire alarm control panel.
3. Bypass Switches
  - a. Specify switches with an associated light emitting diode (LED) in the control panel programmed for the following bypass functions:
    - 1) Door holder release bypass
    - 2) Air handling unit shutdown bypass
    - 3) Alarm and Supervisory signal bypass
    - 4) Horn and Strobe disable
    - 5) Elevator capture bypass
  - b. Specify that enabling any of the above bypass functions will result in trouble signal.
    - 1) Specify that trouble signals cannot be bypasses.
  - c. Voice Systems
    - 1) Specify voice systems for new buildings and major remodelings
    - 2) Discuss alternative system requirements with Owner's Representative.
  - d. Communication with Campus Emergency Responders
    - 1) The Owner has a Johnson Control Building Automation System (BAS) in most campus buildings.
      - (a) Discuss system availability and connection point location with the Owner's representative before fire alarm design begins.
    - 2) Specify a stand alone fire alarm system in each building that communicates with the BAS.

- (a) Provide a programmable dry relay contact at the fire alarm control panel for each of the following functions.
  - (i) General alarm (evacuation)
  - (ii) System trouble
  - (iii) Supervisory alarm (when used)
  - (iv) Chemical spill (when used)
  - (v) Special alarms (when used)
- 3) Specify the fire alarm control panel is configured to provide contacts which open on alarm.
- 4) Specify a ¾ inch conduit with 18-2 shielded cables are specified, as required, between the fire alarm control panel and the nearest building automation panel.
- 5) Specify the fire alarm control panel to have a digital alarm communicator installed, which will not be enabled at this time.

## I. INITIATING DEVICES AND CIRCUITS:

- 1. General
  - a. Where zoned systems detectors are located in elevator shafts, attics, crawl spaces and familiar locations, specify a remote LED is installed in an accessible location.
    - 1) Specify a sign which indicates the detector type and location
    - 2) If access to the detector is not apparent, specify directions that are included on the sign.
    - 3) Specify black ¾ inch upper case characters on a white background on or adjacent to the LED cover.
  - b. Except in special cases, do not specify remote LEDs for addressable systems.
- 2. Pull Stations
  - a. Locate at every entrance to a stair tower.
  - b. Specify single action type with centerline at 42 inches above finished floor.
    - 1) Discuss the use of double action type with Owner's Representative
    - 2) Specify pull station covers at child care areas and areas of potential vandalism.
- 3. Detectors
  - a. Specify photoelectric type smoke detectors for general use.
  - b. Do not specify ionization type smoke detectors without first consulting with the Owner's Representative.
  - c. Where the environment allows, specify electronic type heat detectors.
  - d. Specify rate of rise plus fixed heat detectors in laboratories.
  - e. In stair towers, locate the top detector accessible from a ladder placed on the top landing.
  - f. Before specifying, review atrium detection with Owner's Representative.
  - g. Where possible, locate door release smoke detectors to satisfy both NFPA 72 requirements and corridor detector requirements.
  - h. Specify air-sampling duct detectors following NFPA 90A requirements.
    - 1) Locate upstream from humidification equipment.
    - 2) Do not specify air handling unit shut down and wired to relay bases in detectors.
- 4. Sprinkler System Devices
  - a. Specify to install sprinkler valve tamper switches to initiate "supervisory" condition.
  - b. Specify tamper switches are provided for post indicator, zone shut off and back flow prevention valves.
  - c. Specify programming of water flow switches to sound the general alarm and provide time delays as necessary for stable system operation.

- d. Locate a transient voltage surge suppression device just inside the building on wiring to remote post indicator valve(s).

**J. NOTIFICATION APPLIANCES AND CIRCUITS:**

1. General
  - a. Where ceiling height permits, locate the centerlines of wall mounted horns, speakers, strobes, and combination devices at 92 inches above finished floor.
    - 1) In all cases, locate the centerline of the device at least 6 inches below the ceiling.
  - b. Provide adequate circuits for Audible and Visual Devices.
    - 1) Give careful attention to wire sizing for voltage drop when specifying high current visual devices.
    - 2) High current devices may require specifying expansion power supplies.
  - c. In an alarm condition, specify to measure and record the circuit current and the voltage at both the fire alarm control panel and at the end of line resistor.
    - 1) If the measures "as built" voltage drop exceeds 10%, make corrections before acceptance.
  - d. Specify to measure the final loop resistance of speaker circuits at the fire alarm control panel.
    - 1) If the maximum resistance is more than 20 ohms, make corrections before final acceptance.
2. Audible Signal Appliances
  - a. Do not locate audible devices in stairwells.
  - b. Specify fire resistant, moisture repellent, paper cone type speakers.
    - 1) Ceiling speakers are acceptable.
  - c. Specify strict compliance with NFPA 72 audibility requirements.
    - 1) Specify the standard temporal-three pattern for the general alarm evacuation signal.
  - d. Visual Signal Appliances
    - 1) Do not locate strobes or other visual devices in stairwells.
    - 2) Locate strobes per NFPA 72, NFPA 101 and ADA requirements.
    - 3) Specify synchronized strobes where possible.

**K. END OF LINE DEVICES:**

1. Install inside the last device on the circuit and mark with a ¼" diameter blue dot on the outside of the device.
2. Show locations on the as-built drawings.

**L. ANNUNCIATORS**

1. Specify a liquid crystal display (LCD) type located at fire department attack entrances as determined by discussion with the Owner's Representative.
  - a. Do not specify graphic annunciator panels.
2. Locate to prevent sunlight from washing out the LCD display.
3. Specify operating controls such as reset, acknowledge and smoke control are accessible by key only.

**M. HVAC FAN SHUTDOWN:**

1. Locate fan shutdowns where required by current code.
  - a. Consult with Owner's Representative.
2. Where the alarm system is addressable, specify HVAC fan shutdown using addressable relay modules.

**N. FIRE-RATED HINGED DOORS**

1. Where fire rated doors are held open and released when in alarm, specify electromagnetic door holders or closer/holders.
2. Where there is a wall to locate a door holder, do so.
3. Where there is no wall to locate a door holder, use a closer/holder.

4. Specify 24 VDC or 120VAC as determined by discussion with Owner's Representative.

## O. ELEVATORS

1. Specify relay(s) for recall, shunt trip, and fire fighter's visual indicator as required by ASME A17.1 and NFPA 72.
  - a. Specify means to monitor shunt trip power.
  - b. Locate relays and monitor modules in the elevator equipment room for connection to elevator equipment.
2. Elevator recall and/or shunt trip functions
  - a. In new addressable systems, specify to initiate from the fire alarm control panel; no exceptions.
  - b. In existing buildings, see the Owner's Representative for fire alarm system capabilities and details.
  - c. For smoke and heat detectors at the top of the hoistway, provide access from the top of the car.
    - 1) For non-addressable alarm systems, locate a remote indicator at the top of the elevator lobby.
  - d. Specify addressable relays for recall.
    - 1) Do not specify base relays in the detector.
    - 2) For non-addressable alarm systems, discuss alternatives with the Owner's Representative.
  - e. Where the fire alarm system is addressable, specify elevator shutdown using addressable relay modules.
  - f. Elevator shaft vents control details

## 28 1000 ELECTRIFIED ACCESS SYSTEMS

### A. GENERAL

1. In design development, determine which if any locations will require access control. If any interior doors have been identified to receive electrified access; the primary building entrance shall also receive electrified access and video surveillance.
2. Preparations for electrified access shall be considered at all primary entrance exterior door locations.
3. Controller equipment may only be located in wiring closets.
  - a. Alternate locations shall be discussed with Facilities and Services.
  - b. For wiring closet information reference Division 27.
4. All new construction and major remodels shall include preparations at interior room doors for electrified access even if the card access system is not included in the project.
  - a. Doors shall be cross bored
  - b. Junction boxes, back boxes and conduit shall be provided
  - c. Conduit, chase or raceway must be included between floors and through masonry or fire rated walls
5. Do not specify magnetic locks for primary door security

### B. SYSTEM REQUIREMENTS

1. Card access system must be interconnected with all door operators to ensure that:
  - a. During occupied hours both interior and exterior operator buttons will open doors of the building.
  - b. During unoccupied hours exterior operator button will only open the door if an approved card has been presented to the card reader and interior button will allow egress at all times.
  - c. *In the past we have experienced problems during unoccupied hours with the interior controller button trying to open the door but door hardware not releasing. Occupants have had to push controller button and activate exit device. This is not acceptable.*
2. All materials, supplies and hardware must be compatible with campus Blackboard system.
3. Wireless systems are available. Generally wireless hardware is not preferred on high-frequency use doors and exterior applications. Wireless options should be discussed with Facilities and Services during

design development.

4. When hardwired electronic access is required, the following shall be specified.
  - a. Contractor will provide 1 data drop to each master controller location.
  - b. Specify fail-secure locksets.
  - c. Discuss the need for battery back-up on access system.
  - d. Control equipment and reader shall be provided by owner, installed by contractor.
  - e. Low voltage wiring will be installed and labeled by the contractor.
  - f. Lockset, latch, hinge shall be provided by contractor.
  - g. Must maintain 7 pin small format interchangeable core capability.
  - h. Must be specified to closely match non-electrified hardware in style, color and appearance.
  - i. The power supply is integral to the Blackboard Equipment. 120V power receptacles shall be specified as necessary in room where card access will be mounted. Specify the contractor shall supply and install power chords for the blackboard equipment.
  - j. Owner will make Low Voltage terminations at control equipment.
  - k. Contractor will make Low Voltage terminations at door hardware.
  - l. Contractor is responsible for excise and use tax for the value of owner supplied equipment.
  - m. Visit : [Blackboard SA3000 installation Guide](#) for connection to Blackboard systems.

END OF DIVISION 28 ELECTRONIC SAFETY AND SECURITY

# Division 31 EARTHWORK

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# Division 31 EARTHWORK

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*This design standard is directed to the Design Professional to be incorporated into the Project specifications.*

*The Owner encourages improved concept, method and products by the Design Professional; however Project compatibility with existing campus systems, processes and procedures is most desirable.*

## **31 1000 GENERAL**

### **A. RELATED DIVISIONS**

1. Division 01 – GENERAL REQUIREMENTS
2. Division 02 - EXISTING CONDITIONS
3. Division 32 - EXTERIOR IMPROVEMENTS
4. Division 33 - UTILITIES

### **B. VARIATIONS**

1. It is recognized that project conditions and requirements may vary and all items identified herein may not apply in all cases.

## **31 1100 CLEARING AND GRUBBING**

### **A. GENERAL**

1. During design, develop a site demolition plan. Determine project boundaries; discuss vegetation to remain and vegetation to be removed. Facilities and Services will review current [Grounds Management Plan](#) and provide written approval for any trees to be removed.
2. Require contractor to implement temporary erosion and sedimentation control measures prior to any site disturbance.
3. During construction, the contractor shall:
  - a. Protect and maintain benchmarks and survey control points from disturbance;
  - b. Locate and clearly flag trees and vegetation to remain or be relocated;
  - c. Protect property, trees, or vegetation inside and outside of the limits of construction. Any damage shall be repaired to the original condition at the contractor's sole expense, as acceptable to the Owner, per SDSU Grounds Management Plan.

### **B. TREE AND PLANT PROTECTION**

1. All new construction and exterior renovation projects shall address tree and plant protection. Refer to SDSU Grounds Management Plan. Construction documents shall specifically address tree protection, including:
  - a. Protection of critical root zone, which at a minimum extends past the trees dripline; and
  - b. Protective barriers.

## **31 2000 EARTH WORK**

### **A. GENERAL**

1. During design:
  - a. Discuss ownership of excess materials including stripped topsoil and other excavated soil.
  - b. Discuss availability of fill or topsoil if needed and if the Owner will provide the additional material.
  - c. Clearly identify materials to remain property of the Owner. All other cleared materials including but not limited to surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, shall become Contractor's property and shall be removed from project site and be legally disposed of.
    - 1) Recycle appropriate materials produced during site clearing.

2. The Contractor is contacting South Dakota One Call for utility locates before any excavation work.
3. Items of historic or archeological nature discovered during earthwork operations shall remain the property of SDSU.
  - a. The Contractor shall cease excavation activity and notify the Project Manager immediately upon discovery.
4. All excavations, including trenches, shall comply with the current edition of OSHA Excavation Safety standards.

#### **B. QUALITY CONTROL**

1. Facilities and Services will arrange for the services of an independent Testing Agency and/or Geotechnical Engineer to perform field observations and laboratory/field testing.

#### **C. DEWATERING**

1. If construction dewatering is needed, contractor shall obtain approval from Facilities and Services for discharge location.
2. Sedimentation control measures shall be employed.

#### **D. EROSION CONTROL AND STORMWATER POLLUTION PREVENTION**

1. Contractor shall implement temporary erosion and sedimentation control measures prior to any site disturbance.
2. Storm Water Pollution Prevention Plans (SWPPP) may be required per Clean Water Act. Refer to Sec 07 – DESIGN DEVELOPMENT for specific requirements.
  - a. If required, SWPPP shall be approved and on-site prior to beginning construction activities.

END OF DIVISION 31 EARTHWORK

# Division 32 EXTERIOR IMPROVEMENTS

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## Appendix

### Standard Details

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- 32-020 Splash Block Detail
- 32-030 Curb and Gutter Detail
- 32-040 Sidewalk Joint Detail
- 32-050 Valley Gutter
- 32-060 SDDOT PCC Fillet Section
- 32-070 Inset Square Curb Ramp Detail
- 32-075 ADA Corner Curb Detail

## Division 32 EXTERIOR IMPROVEMENTS

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*This design standard is directed to the Design Professional to be incorporated into the Project.*

*The Owner encourages improved concept, method and products by the Design Professional; however, project compatibility with existing campus systems, processes and procedures is most desirable.*

### **32 1000 GENERAL**

#### **A. Related Divisions:**

1. Division 01 8100 - SUSTAINABLE DESIGN REQUIREMENTS
2. Division 03 - CONCRETE
3. Division 11 - EQUIPMENT
4. Division 12 - FURNISHINGS
5. Division 23 - HVAC
6. Division 33 – UTILITIES

#### **B. DEFINITIONS**

1. MUTCD – [Manual of Uniform Traffic Control Devices](#)

### **32 1200 EXTERIOR FACILITIES**

#### **A. GROUNDS MANAGEMENT PLAN**

1. Refer to the [Grounds Management Plan](#) for additional guidance on exterior facilities as well as
  - a. Turf installation and preparation of topsoil
  - b. Tree and shrub removals, and new plantings
  - c. Landscape design

#### **B. DUMPSTERS AND RECYCLING CONTAINERS**

1. Shall be screened from public view
2. Specify 5" thick Concrete pad shall be provided
3. Discuss project specific requirements with Project Manager
  - a. Container sizes and quantities
  - b. Location and access
  - c. Screening material, construction and requirements for doors or gates
4. Campus waste is a contracted service and managed by Facilities and Services Senior Accountant

#### **C. BIKE RACKS**

1. Rack are Owner provided
2. Coordinate location and quantity with the Project Manager
3. Bike racks shall be placed on colored concrete pad. Color should be "Salmon" by Solomon Colors

#### **D. SMOKING POSTS AND TRASH RECEPTACLES**

1. Smoking posts are Owner provided
2. Locations and any special requirements should be discussed early in design

### **32 1216 ASPHALT PAVING**

- A.** Asphalt paved areas shall be bounded by concrete curb, valley gutter or concrete paving.

### **32 1313 CONCRETE PAVING**

- A.** See Division 03 - CONCRETE

- B. Specify sidewalks to be a minimum 5" thick and 7'-0" wide. Walks shall be over a minimum of 5" compacted base course meeting SDDOT Specification 882.
  - 1. Specify a concrete form of no less than 5" in height shall be used.
- C. ADA detectable warning panels shall be of plastic insert design and color approved by owner. [Detail 32-070](#)
- D. Concrete curbs shall be roll-over type. [Detail 32-020](#)
- E. Areas that shall be concrete rather than asphalt:
  - 1. Driveway approaches and aprons
  - 2. Loading dock areas
  - 3. Vehicle building entrances

### **32 723 PAVEMENT MARKINGS**

- A. ADA and other parking designations shall be provided by signs not pavement markings
- B. Pavement markings shall follow [MUTCD](#) guidelines for color, dimension and layout.

### **32 3113 SCREENING AND FENCING**

#### **A. SCREENING**

- 1. Required screening locations:
  - a. All building mechanical and electrical equipment, See Divisions 23 and 33 for equipment clearance requirements
  - b. Dumpster and recycling
  - c. Review needs at highly visible building service access areas
- 2. Acceptable materials
  - a. Shall be durable and low maintenance
  - b. Plantings may be considered acceptable in some locations

#### **B. FENCING**

- 1. Manufacturer and contractor logos are not allowed to remain on fencing.

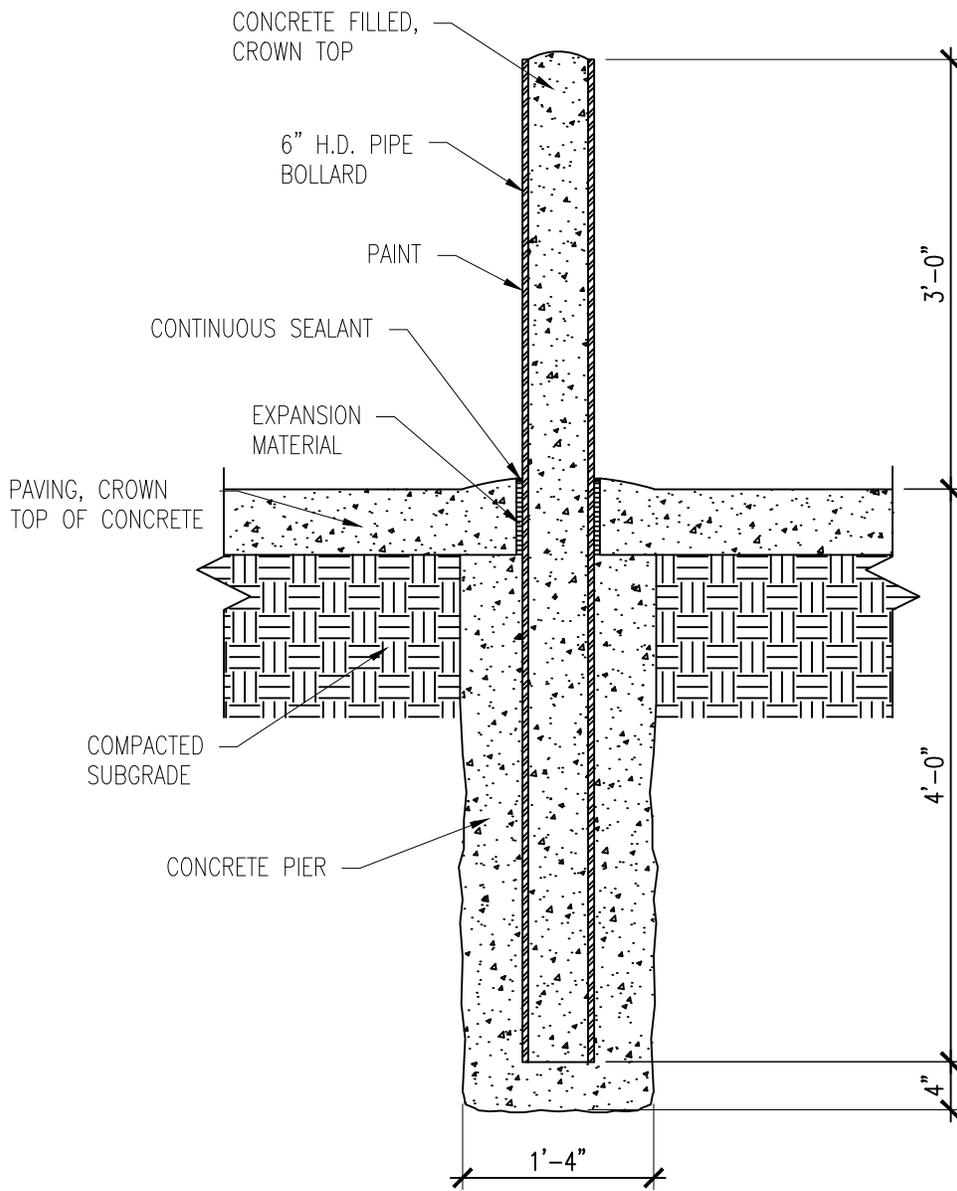
### **32 8400 PLANTING IRRIGATION**

- A. Control equipment shall be located inside a building mechanical room
- B. Irrigation system shall be metered separately from domestic water.
  - 1. See Division 33 5000 – UTILITIES/DOMESTIC WATER
- C. Valve Boxes
  - 1. Provide 4" pea rock base below valve boxes
  - 2. Avoid locating in low areas or drainage lanes.
  - 3. Size and location shall allow for ease of access for maintenance
- D. Locate back-flow prevention device inside building mechanical room when possible.
- E. Provide exterior location for connection of winterizing equipment.
  - 1. Provide a hose bib connected to the irrigation system for connection o air compressor.
    - a. A standard exterior freezeless hose bib.
- F. Irrigation piping shall not be run inside utility tunnels. If necessary to enter a tunnel, piping must be sleeved
- G. Provide as-built drawings for all irrigation system installations
  - 1. Minimum as-built requirements
    - a. Computer generated
    - b. Valve box locations
    - c. Indicate zones

- d. Controller, building exit point and winterizing connection point

END OF DIVISION 32 EXTERIOR IMPROVEMENTS

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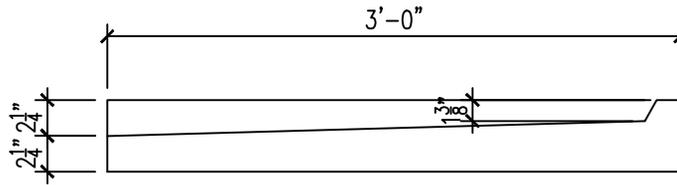
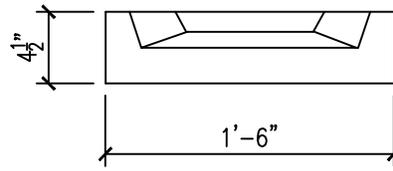
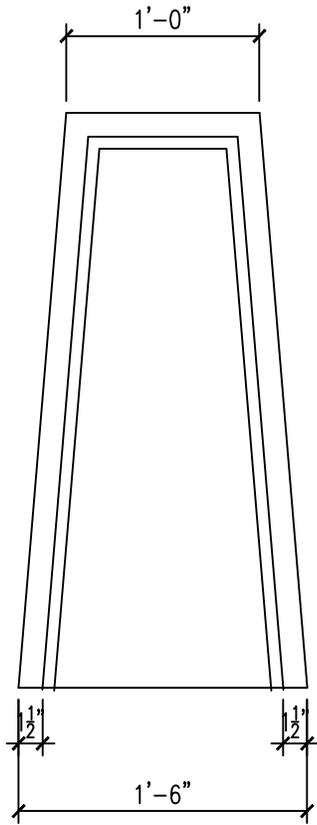
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**BOLLARD DETAIL**  
 $\frac{3}{4}'' = 1'-0''$



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32-010



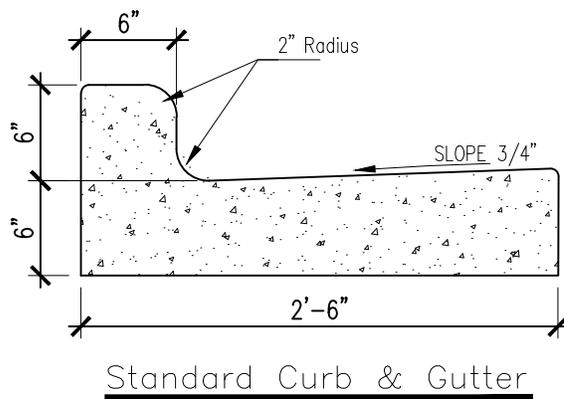
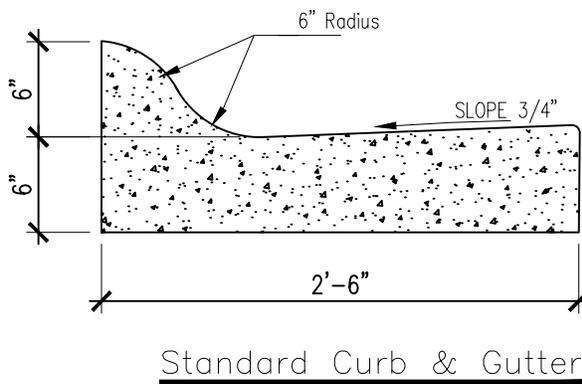
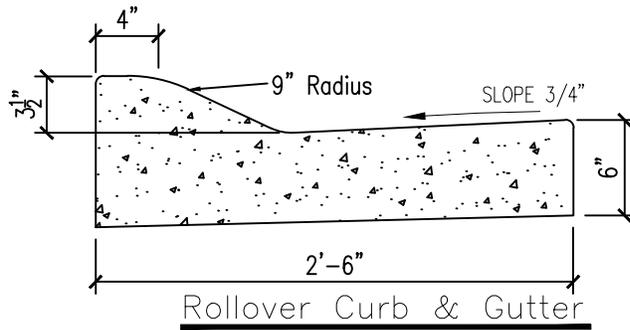
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SPLASHBLOCK DETAIL  
1" = 1'-0"



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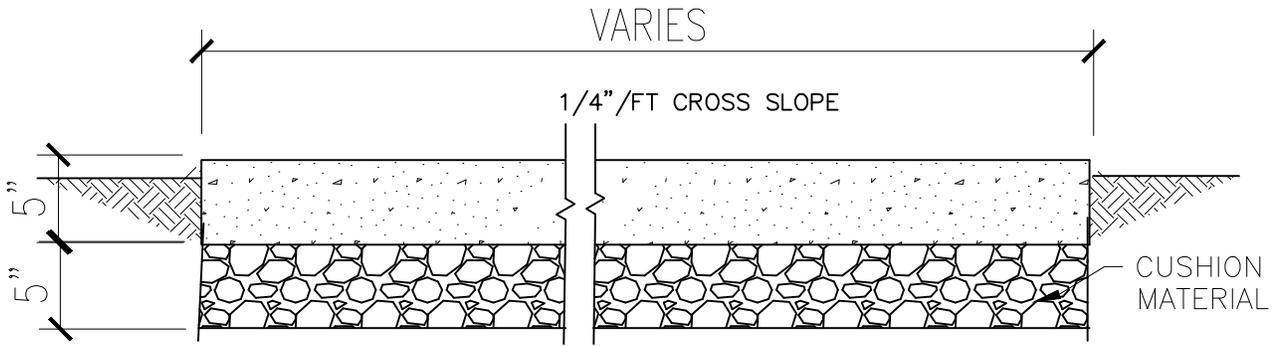


General Note:  
When removing concrete, sawcut concrete at  
nearest joint.

No.	Revision/Issue	Date

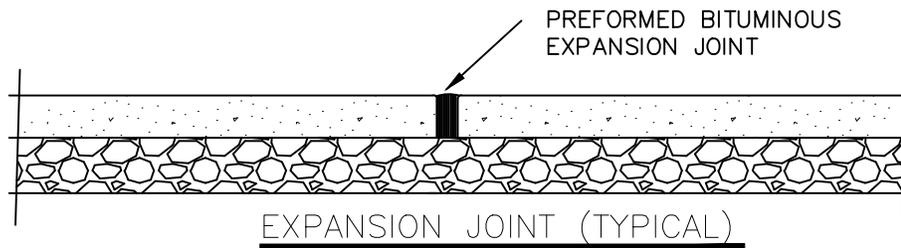
CURB DETAILS  
1" = 1'-0"

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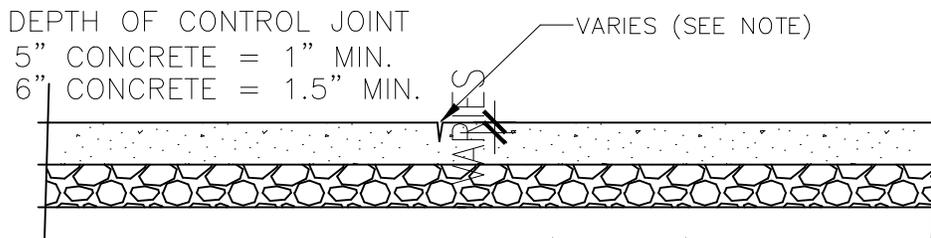


1/2" PREFORMED EXPANSION JOINT FILLER SHALL BE PLACED AT LOCATIONS SHOWN ON PLAN SHEETS, IN GENERAL AT 100' SPACING. SIDEWALKS SHALL HAVE LIGHT BROOM FINISH

CONCRETE SIDEWALK



EXPANSION JOINT (TYPICAL)



DEPTH OF CONTROL JOINT  
 5" CONCRETE = 1" MIN.  
 6" CONCRETE = 1.5" MIN.

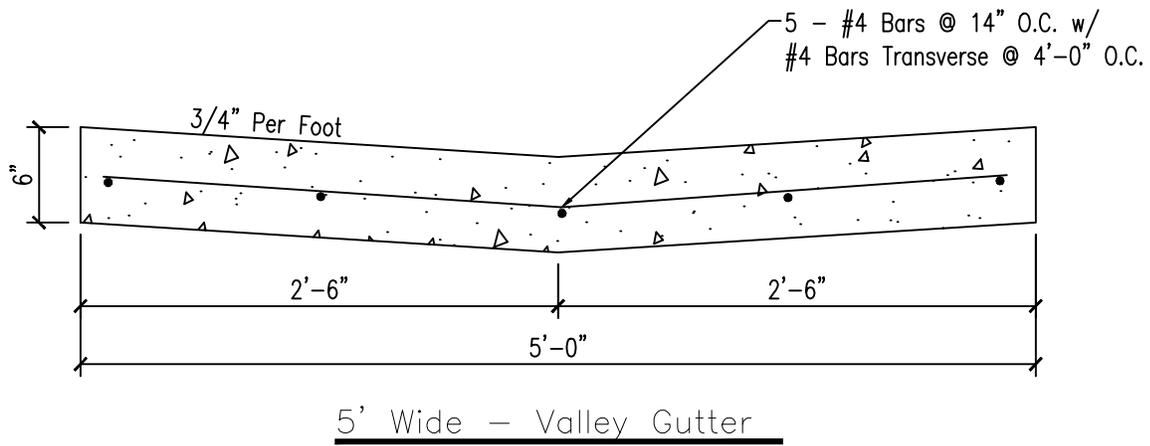
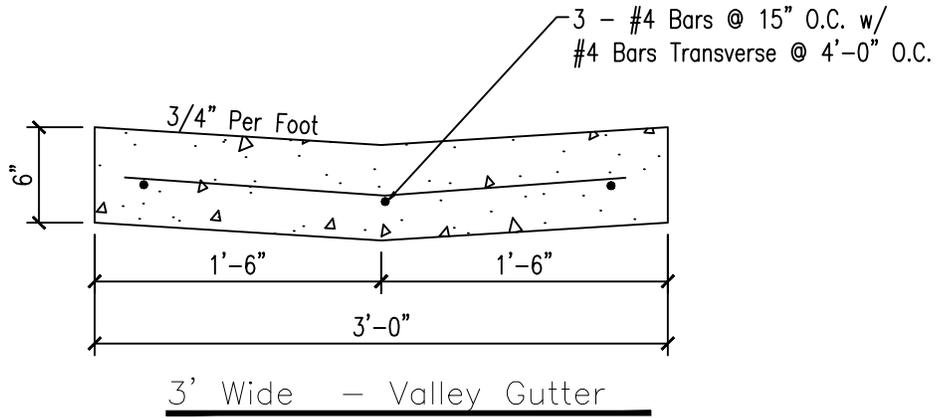
CONTROL JOINT (TYPICAL)

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No.	Revision/Issue	Date

SIDEWALK-JOINT DETAILS  
 NOT TO SCALE

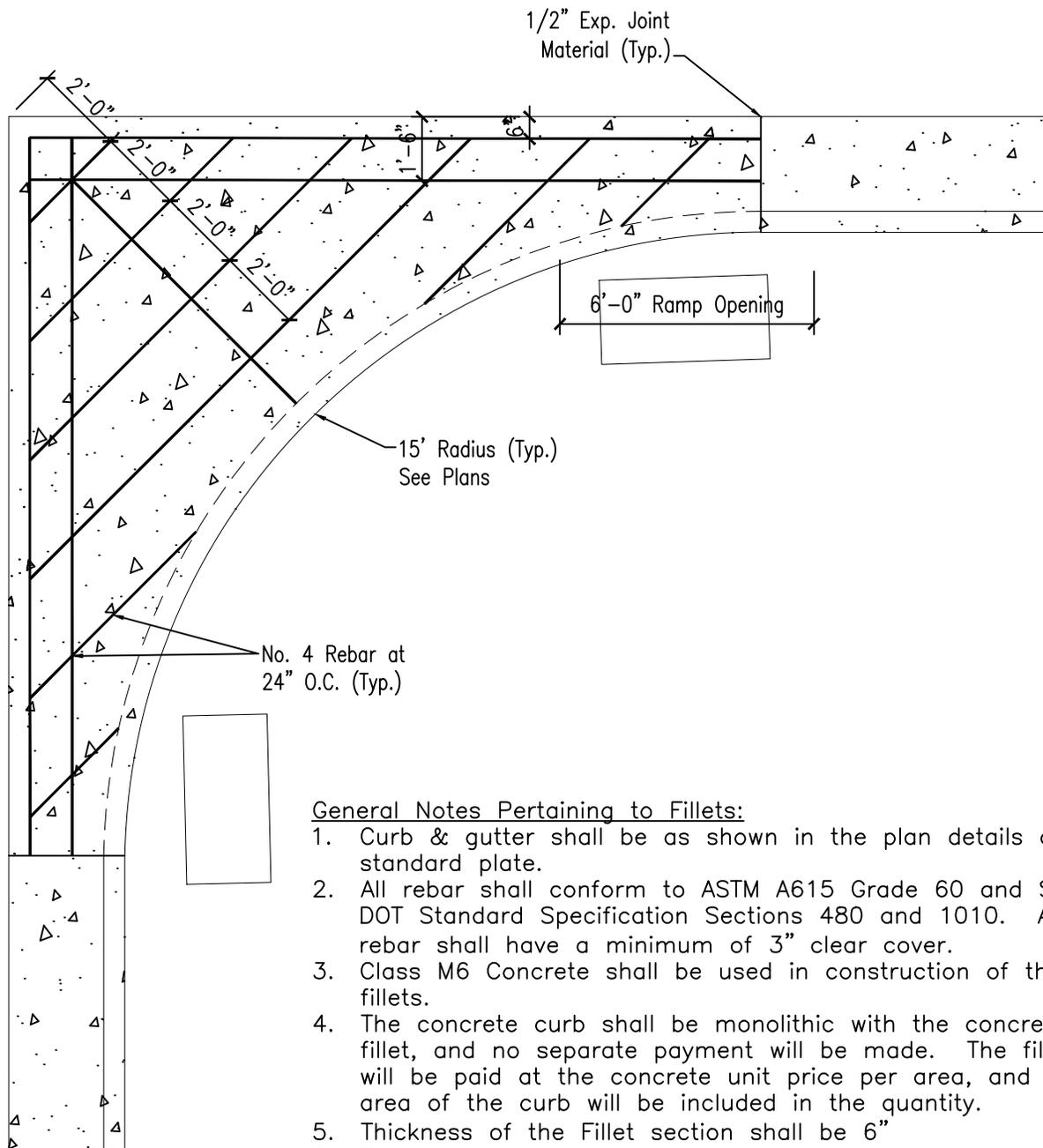
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No.	Revision/Issue	Date

VALLEY GUTTER  
1" = 1'-0"

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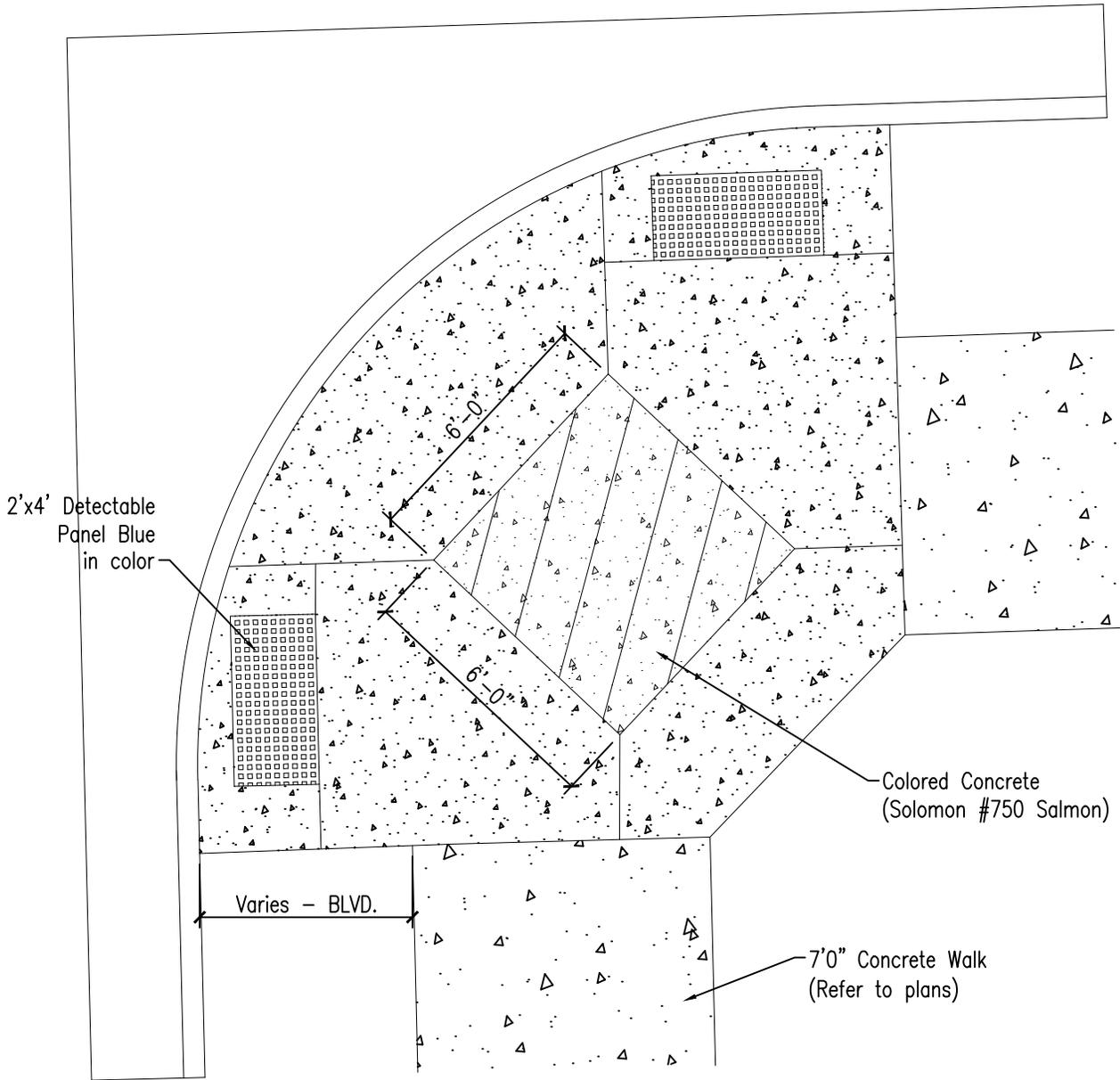
General Notes Pertaining to Fillets:

1. Curb & gutter shall be as shown in the plan details or standard plate.
2. All rebar shall conform to ASTM A615 Grade 60 and SD DOT Standard Specification Sections 480 and 1010. All rebar shall have a minimum of 3" clear cover.
3. Class M6 Concrete shall be used in construction of the fillets.
4. The concrete curb shall be monolithic with the concrete fillet, and no separate payment will be made. The fillet will be paid at the concrete unit price per area, and the area of the curb will be included in the quantity.
5. Thickness of the Fillet section shall be 6"
6. The ramp opening shall be the same width as the adjacent detectable warning panel, with the curb tapering from full height in four feet (4'). Locate opening as indicated on plans. Verify location with Engineer if needed.

No.	Revision/Issue	Date

SD DOT-PCC Fillet Section  
1/4" - 1'-0"

	CAD File STND-DTL	Sheet
	Date 5/1/2012	32-060
	Scale As Noted	



2'x4' Detectable Panel Blue in color

Colored Concrete (Solomon #750 Salmon)

7'0" Concrete Walk (Refer to plans)

Varies - BLVD.

6'-0"

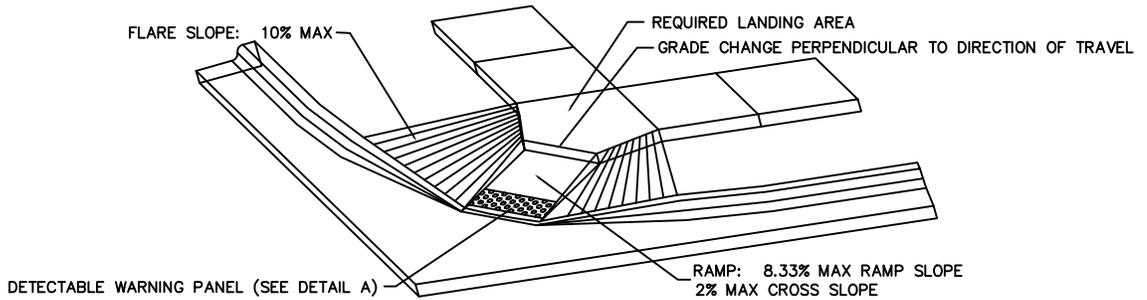
6'-0"

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Corner Detail  
1/4" = 1'-0"

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	STND-DTL	
	Date	5/1/2012
	Scale	As Noted
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THE FOLLOWING PERSPECTIVE VIEWS ARE ILLUSTRATIONS OF DIFFERENT TYPES OF INSTALLATIONS INCORPORATING THE MANDATORY REQUIREMENTS.



PERSPECTIVE VIEW - BOULEVARD SIDEWALK RAMP

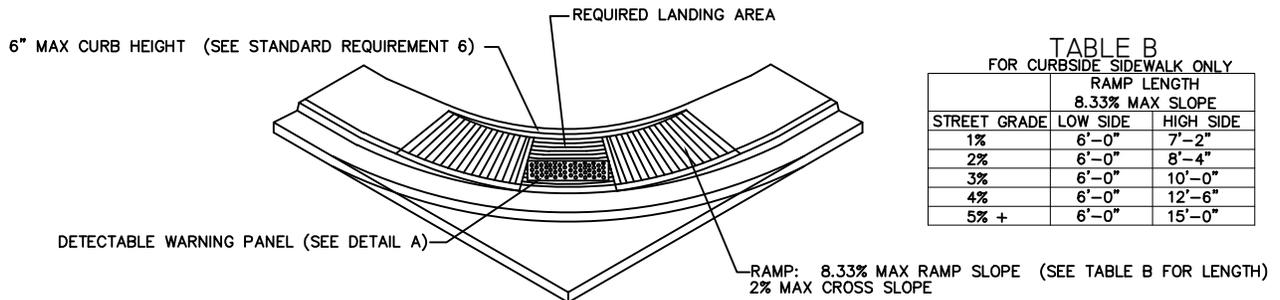
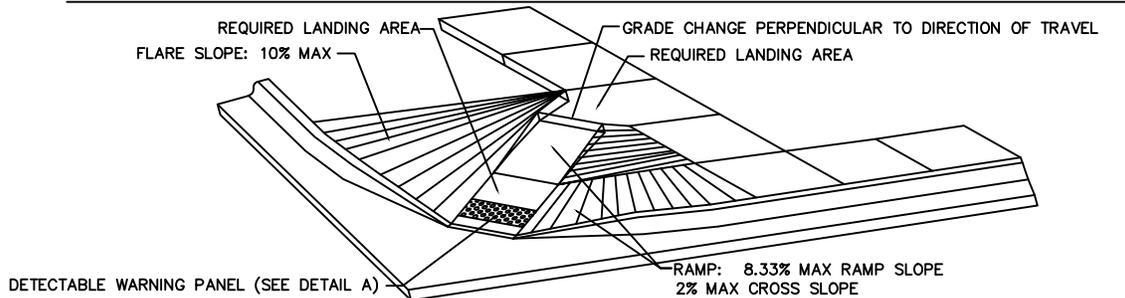


TABLE B  
FOR CURBSIDE SIDEWALK ONLY

STREET GRADE	RAMP LENGTH 8.33% MAX SLOPE	
	LOW SIDE	HIGH SIDE
1%	6'-0"	7'-2"
2%	6'-0"	8'-4"
3%	6'-0"	10'-0"
4%	6'-0"	12'-6"
5% +	6'-0"	15'-0"

PERSPECTIVE VIEW - CURBSIDE SIDEWALK RAMP



PERSPECTIVE VIEW - BOULEVARD AND CURBSIDE COMBO SIDEWALK RAMP

ADA Ramp Details

Not to Scale



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As Noted

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# Division 33 UTILITIES

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## Division 33 UTILITIES

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*This design standard is directed to the Design Professional to be incorporated into the Project.*

*The Owner encourages improved concept, method and products by the Design Professional; however Project compatibility with existing campus systems, processes and procedures is most desirable.*

### 33 1000 GENERAL

#### A. RELATED DIVISIONS

1. Division 01 - GENERAL CONDITIONS
2. Division 07 - THERMAL AND MOISTURE PROTECTION
3. Division 32 - EXTERIOR IMPROVEMENTS
4. Division 23 - MECHANICAL SYSTEMS

#### B. DEFINITIONS

1. For purposes of defining "Utilities" as discussed in Division 33, Utilities are defined as public or private services to a facility up to and including penetration of the facility. Utilities covered in this division include:
  - a. Tunnels: Utility tunnels used across campus to route steam, condensate, and other utilities
  - b. Steam & Condensate: Up to the Pressure Reducing Valve in the Building (for Steam) and up to the Condensate Meter (for Condensate)
  - c. Chilled Water: Up to the Meter
  - d. Electrical: Up to and including the Transformer
  - e. Domestic Water: Up to Foundation
  - f. Sanitary Sewer: Up to the Foundation
  - g. Storm Water: Up to the Foundation
  - h. Natural Gas: Up to and including the Meter
  - i. Communications: Up to the Building Distribution Panel
  - j. Central Air for Pneumatic Controls: Phasing out these systems [special permission required]
  - k. Specialty Utilities: Coordinate with F&S

#### C. GENERAL

1. Utility services to new buildings / additions / large remodeling projects should be provided as part of the construction project and should be addressed in the initial programming and budgeting phase.
2. Prior to starting the design of utility extensions a meeting should be held with the Facilities representative to determine matters such as connection point, routing, sizing, and future needs.
3. Unless otherwise directed, any required additional heating plant capacity will be the Facility and Services responsibility and not billed to the project. The A/E shall be responsible for providing anticipated loads to the SDSU project manager to help determine impact to the existing distribution system and plant capacity.
4. Responsibilities for additional chilled water plant capacity needs are to be determined at the onset of the project.
5. Location for switches, valves, bypass and temporary service shall be coordinated with Facilities & Services
6. Utility Outages
  - a. Specify utility outages will not be authorized for any purpose during the week of final exams.
  - b. Specify a planned outage schedule be submitted by the contractor
  - c. Extent and duration of steam and chilled water shutdowns shall be scheduled through Facilities & Services.
  - d. Visit: <http://www.sdstate.edu/facserv/about/service-guide/upload/Chapter-7.pdf> for utility outage standard.

7. Utility distribution valves and switches will only be operated under supervision of Facilities & Services personnel.
  - a. Specify lock-out/tag-out by contractor
8. As-Built drawings shall dimensionally show utility locations as constructed to a horizontal accuracy of three (3) inches. Vertical accuracy shall be one and a half (1-1/2) inches at penetrations or points of termination.
9. Utilities shall be installed with a system that allows locating the utility according to the requirements of SD One Call System.
10. Removal of existing utilities that will be or are currently abandoned.
  - a. Services shall be disconnected at the main.
  - b. Complete removal is preferred if practical.
11. Any project that requires new, additional or upgraded service shall include replacement of building isolation valves for gas, chilled water, steam and steam condensate, domestic water and fire sprinkler service.
12. Refer to Division 1 for protection or screening requirements of new and existing above ground features, ie. pedestals, transformers, meters, etc.
13. Develop a pedestrian and vehicle traffic control plan for review and approval by Facilities & Services

### **33 0030 TUNNELS**

#### **A. GENERAL**

1. The goal should be to keep the tunnel dry or remove any moisture that enters quickly before it can cause damage. Refer to Division 7.
2. All penetrations through tunnels shall be water tight; use of "Link Seal" or similar products is encouraged.
3. Tunnels shall have fully enclosed water resistant industrial fluorescent light fixtures with high impact lens and electronic ballasts, either ceiling or wall mounted depending on tunnel layout. Use three way switching of lighting.
4. Service outlets every 50 feet on separate circuit from lighting.
5. Tunnel dimensions
  - a. Walking tunnels are preferred for main corridors.
  - b. Shallow tunnels may be adequate for minor branches with prior approval.
  - c. Preferred minimum interior dimensions are 6' wide x 7' tall or 6' clear headspace.
    - 1) Dimensions of tunnels may vary
6. Provide reasonable egress points for maintenance and ventilation, consult Facilities & Services on access spacing and locations.
  - a. Use Bilco doors or equivalent for access.
  - b. Minimum door size 36" by 36".
  - c. Specify stainless steel hinges and hardware.
    - 1) Doors shall have a perimeter drain piped to a sump hole or floor installed so it cannot hold water.
    - 2) Select door based on application and consider vehicle traffic on sidewalks. Trucks and Skid loaders are used for snow removal. Door shall have ventilation.
    - 3) Access shall have a ladder and "Ladder Up" safety post located on either side; not in the center.
    - 4) Access into buildings shall be reasonably air tight to maintain building air pressures.
    - 5) Design access points to prevent runoff from entering tunnels. Both during construction and normal operation.
    - 6) Do not locate access doors above tunnel utilities
  - d. Provide sump pumps in low spots. Some locations may require redundant pumps fed with separate electrical circuits. All sump pumps shall be tied into JCI Metasys control system, to alarm during a

- power failure or high water event. If pump redundancy is required a second alarm must also be provided to indicate power failure on the second pump.
- e. Cable tray shall be flex wire basket cable tray system. Size tray to have a minimum of 50% additional capacity at the end of project for future projects.
  - f. All metal in tunnel shall be primed and painted, galvanized or stainless steel. Any metal in contact with the floor shall be elevated and grouted. Use of epoxy paint is encouraged.
  - g. Consider how we will replace pipe in the future as the tunnel is designed.
  - h. Utilities allowed in tunnels include:
    - 1) Steam & Condensate
    - 2) Chilled Water
    - 3) Heating Water
    - 4) Fiber optic cable
    - 5) Low voltage controls wiring.
    - 6) Communications
    - 7) Consult Facilities & Services Utility Engineer before considering other utilities in tunnels.
    - 8) All utilities within a tunnel must be clearly labeled every 50ft.
  - i. [Detail 33-010](#)

### 33 0100 STEAM AND CONDENSATE RETURN

#### A. GENERAL

1. New buildings or additions should be connected to the centralized steam distribution system. Approval to deviate must come from Facilities & Services prior to first design submittal
2. Steam piping should be distributed through either walk-through tunnels or with prior approval shallow concrete trench. Never direct bury!!!
3. For steam and condensate pipe requirements, see [SDSU Standard Pipe Schedule](#).
4. Steam line reducers shall be eccentric, not concentric. Install eccentric reducers with the flat side down to prevent condensate from building up at the reducer.
5. Specifications shall include nondestructive testing of welded joints, See SDSU Standard Pipe Schedule for details.
6. Steam and condensate return systems shall be insulated and jacketed with aluminum or PVC jacketing to prevent moisture and other physical damage to the insulation.
7. The condensate from the building shall be metered with a flow meter mounted downstream of the condensate return pump in a flooded section of the condensate line. Flow meter shall be a high temperature nutating disc type meter capable of a pulse contact output for connection to our JCI Metasys building automation system (Niagra model MTX or equal). Type of flow meter must be pre-approved with the Owner prior to writing specifications. *We typically do not meter steam because our steam loads vary dramatically from season to season, and steam meters capable of accurately reading down to 5% of design flowrate don't seem to exist within reasonable price ranges.*
8. Insulation shall meet or exceed ASHRAE 90.1. Use mineral wool insulation in tunnels and shallow trenches and in areas that may be exposed to moisture. [Fiberglass is not allowed since it loses its insulation value if it gets wet; mineral wool retains more of its insulating value once it is dried out and is less susceptible to crushing.]
9. Insulation on expansion joints, valves, pressure reducing stations and other hot equipment requiring service shall be the removable blanket type designed for simple removal and reattachment.
10. Steam distribution piping system designs must include plan and profile drawings that clearly indicate pitch of pipe, condensate drainage, trap locations, isolation valves, expansion joints, pipe alignment guides, pipe anchors, clearance for trap piping at drip legs, etc. Details need to be provided for pipe supports and stanchions.

11. See Division 23 for additional information on pipe, drip legs, traps, condensate mixers, expansion compensation and other steam and chilled water specialties. Standard Details

### **33 3000 CHILLED WATER**

#### **A. GENERAL**

1. Use of existing tunnels or shallow trench is encouraged but direct bury is acceptable where no trench or tunnel exist
2. New buildings or additions should be connected to central chilled water system where practical. Discuss alternatives with Facilities & Services.
3. See division 23 for detailed standard on Chilled water systems
4. Leak detection is generally not required on chilled water systems but may be discussed with Facilities and Services.
5. For chilled water distribution pipe requirements, see [SDSU Standard Pipe Schedule](#).

### **33 400 ELECTRICAL SYSTEM**

#### **A. GENERAL**

The Campus Electrical Distribution System is owned by South Dakota State University. Operating assistance is provided by Brookings Municipal Utilities (BMU). When designing system expansions and improvements, BMU shall be consulted during the process.

These standards are intended as minimum requirements. Systems can be designed to exceed these requirements; however consideration shall be given to any substantial cost increases as a result of exceeding these standards.

As a general philosophy, design as many loops into the system as economically feasible. All main grid circuits shall be looped, and where possible, consideration should also be given to looping transformer circuits.

#### **B. SYSTEM REQUIREMENTS**

1. Underground Raceway – Duct bank
  - a. Main Loop – minimum 5” conduit
  - b. A minimum of 1 extra conduit is always necessary, and conduit shall be installed in groupings of two wide.
  - c. Concrete encasement shall be a minimum of 3” and a maximum of 6” on all sides of the outermost raceway.
  - d. Conduit spacers spaced no further than 8’ apart
  - e. Depth – minimum of 48” to top of pipe –
    - 1) Variations in depth shall be allowed to avoid conflicts. These must be approved by Facilities & Services (and A/E of record).
  - f. Restore trench surface to original condition
  - g. Dowel ductbank to switch vaults
  - h. Reinforce ductbank in locations that will be subjected to heavy overhead traffic
2. Manholes
  - a. Sectionalizing Switches shall be set on concrete vaults with personnel access
  - b. Minimum Size of 36” with 24” opening.
  - c. Include sump pump where practical
  - d. Cast iron has been a commonly used lid. A lighter lid with locking capability and durability to handle vehicle traffic would be preferred.
3. Switches
  - a. Use PMH Series Switches
  - b. Provide Load-Break Fuse holders
  - c. Switches shall be equipped to lock with owner provided padlock

- d. Fuses in Switches
  - 1) Transformers (single or combination) size 0KVA to 499KVA – 150A Standard E curve
  - 2) Transformers (single or combination) size 500KVA and up – 175A Standard E curve
- 4. Transformers
  - a. Size transformer to specific project requirements. Discuss with project manager potential future requirements.
  - b. All transformers shall be pad mounted, oil filled (non-PCB), Wye/Wye, with feed through primary.
  - c. See standard detail for transformer pad; [Detail 33-020](#)
  - d. Specify T-switch to isolate each primary section as well as turn off the secondary side of the transformer.
  - e. Primary Voltage – 7200/12,470Y
  - f. Secondary Voltage – Project Specific – either 120/208Y or 277/480Y
  - g. 65o C Rise, self-cooled, oil immersed (non-PCB)
  - h. Four taps at two 2-1/2% below rated and two 2-1/2% above rated with external no-load tap changer operating mechanism.
  - i. Load-break bayonet fusing in wells (specify extra set of fuses)
  - j. Load-break bushing wells with inserts
  - k. Minimum of 4-hole spade lugs with supports on secondary side.
  - l. Dead front primary connection, including wells and bushings
  - m. Pressure relief valve
  - n. Pressure Gauge
  - o. Liquid Level Gauge
  - p. Sampling Device
  - q. NEMA Accessory Group
  - r. Specify lightning arrestors on unused primary bushings
  - s. Transformer cabinet shall be equipped for a padlock.
  - t. Finish shall be dark green. The finish must be tolerant to SD weather extremes and not susceptible to fading by sun exposure.
  - u. Transformers shall come with name-plate indicating technical information, as well as warning labels indicating “Danger – High Voltage”
  - v. Place on concrete pad with foundation pilings (see standard detail)
  - w. Consideration must be given to placement of transformer away from entrances and/or primary building elements. At times, this may cause the need for longer secondary circuits.
- 5. Conductors and Terminations
  - a. Medium voltage conductor shall be 15KV rated, stranded copper, class B concentric stranded. The stranded conductors shall be shielded with an extruded conductor shield consisting of a semi-conducting layer before insulation. Insulation shall be ethylene propylene rubber. Thickness shall be .220” minimum with tensile strength of 2000psi minimum.
  - b. Loop Conductor one full time around all man-holes
  - c. Splices are only allowed with the approval of Facilities & Services allowed on new installation. If splicing is necessary due to existing circuit connections, this must be approved by Facilities & Services
  - d. Transformer Terminations – similar to Elastimold 165LR, 15KV, 200A load-break elbow. Must be compatible with bushing on transformer.
  - e. Switch Terminations – similar to 3M QT-III Series, outdoor rated, with skirted insulation
  - f. Lightning Arrestors should be included for unused bushings in transformers – 8.4KV (MCOV)
- 6. Conduit

- a. Typical ductbank conduit shall be schedule 40 PVC
  - b. If using Rigid conduit for any underground circumstances, it shall be PVC coated
  - c. Conduit exposed to any exterior elements shall be Rigid Steel
  - d. Bush all conduit ends where it stubs into the switch vaults, transformer pads, or any other penetration
  - e. Seal conduit on both ends if the conduit leads from exterior to interior
7. Grounding –
- a. Specify per NEC
  - b. If oversized ground grids are necessary, coordinate location with Owner
8. Labeling – Scheme and Materials
- a. Switches – (i.e. SD-SAA)
  - b. Transformers – (i.e. SD-S123)
  - c. Cables – by Facilities and Services
  - d. Use DOT signage quality stickers – 3" x 1-3/4" with 2-1/2" characters.
  - e. Final labels will be installed by Facilities & Services

### **33 5000 DOMESTIC WATER**

#### **A. GENERAL**

Domestic water main shall reference Brookings Municipal Utilities specifications "[Water Mains and Services](#)". Exceptions to the BMU specifications are listed below.

1. Delete all reference to City Furnished materials. Specify all materials shall furnished by the contractor.
2. Specify City of Sioux Falls section [900 Standard Plates](#)
  - a. Use of C900 gasketed pipe is recommended
  - b. Installation of a mechanical joint tee should be specified whenever possible.
  - c. A stainless steel band clamp may be used when necessary
3. On 2" pipe or smaller use quarter turn brass corp stops
4. Use of mechanical joint rubber wedge water main valve with square head is preferred
5. Only solid concrete is considered suitable thrust block material
6. All pipe insulation should be installed per manufacturers specifications
7. Manholes shall be at least 36" in diameter with no less than 24" opening
8. Fire Hydrants
  - a. Minimum bury depth of 6.5'
  - b. Should be painted yellow
  - c. Centerline of lowest nozzle must be between 18" – 24" above ground
  - d. Discuss placement with project manager
9. Minimum water main to sewer main separation should be a minimum of 12" horizontally and water main should be placed vertically higher than sewer main. Discuss deviation with Facilities & Services.
10. Facilities & Services must provide authorization for bury depth of less than 6.5

### **33 6000 SANITARY SEWER:**

#### **A. GENERAL**

Sanitary sewer main shall reference Brookings Municipal Utilities specifications "[Sewer Mains and Services](#)". Exceptions to the BMU specifications are listed below.

1. Specify City of Sioux Falls section [950 Standard Plates](#)
2. 3034 gasketed pipe should be specified when applicable
3. Force mains should be avoided when possible

4. 100% redundancy is required at all lift stations
5. Manholes shall be at least 36" in diameter with no less than 24" opening

### **33 7000 STORM WATER:**

#### **A. GENERAL**

South Dakota State University office of Facilities & Services encourages design compliance with the City of Brookings "[Storm Drainage Design and Technical Criteria Manual](#)". This manual provides the technical criteria for sizing storm drainage facilities.

1. SDSU is exempt from local building ordinances including the local storm drainage ordinance 21-10 but efforts should be made to compliment city drainage systems
2. Use of detention and retention to meet local design standards is encouraged
3. Specify reinforced concrete as piping material whenever possible
4. Specify City of Sioux Falls [section 450](#) and [650](#) Standard Plates

### **33 8000 NATURAL GAS**

#### **A. GENERAL**

1. Natural gas is supplied and installed by Northwestern Energy
  - a. Any natural gas concerns should be directed to the NWE Brookings office (<https://www.northwesternenergy.com/contactus/default.aspx> )

### **33 9000 COMMUNICATIONS**

#### **A. GENERAL**

1. Specify use of existing utility tunnels for raceway.
2. New conduit for direct bury raceway may be innerduct
3. Refer to IT standards document (Pending)
4. All fiber optic underground cabling should be in innerduct
5. Swiftel ([www.swiftel.net/](http://www.swiftel.net/)) is the local utility that provides copper/fiber voice communications to the University

### **34 3000 CENTRAL AIR FOR PNEUMATIC CONTROLS**

#### **A. GENERAL**

1. Central Air system is currently in use on campus but is being phased out. Special permission from Facilities & Services is required to add to or utilize this system for new projects

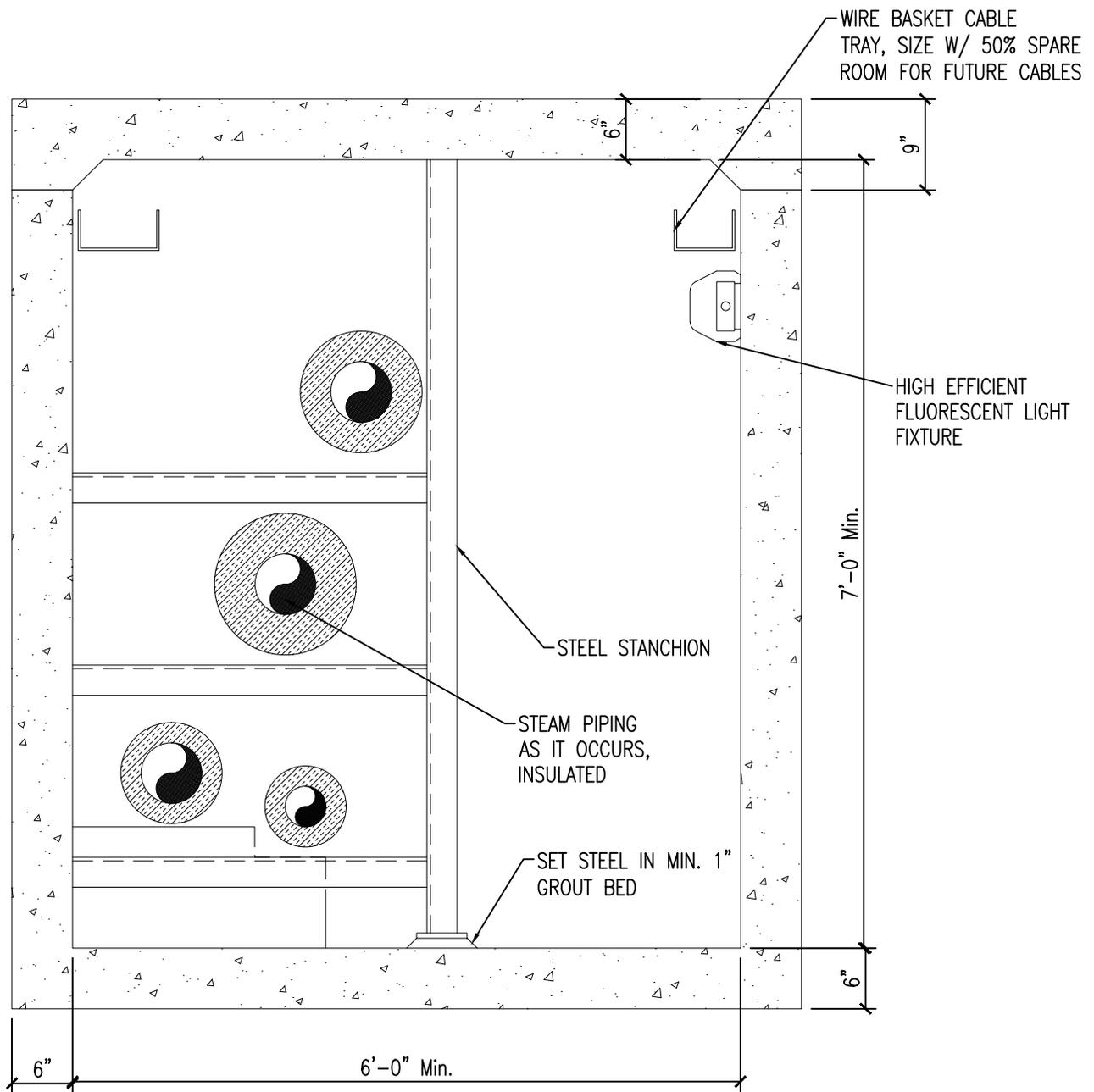
### **33 5000 METERING**

#### **A. GENERAL**

1. For each building, all utilities (water, irrigation, cooling tower/fluid cooler makeup and blowdown, electrical, steam condensate, chilled or heating water BTU's, and natural gas) in new construction or renovations shall be metered. All metering will either be hard-wired or integrated with the existing Johnson Controls Metasys building automation system to provide at a minimum:
  - a. Electrical: Instantaneous demand (KW) and consumption (KWH). Meters shall be installed at the main electrical switch or panel board in the building. Provide a meter capable of local reading of demand and consumption, power factor, phase to phase voltages, and current. The meter shall interface via hardwire or via BACnet to campus BAS. Through the BAS provide at a minimum the demand and consumption values. Any meters that are provided at transformers need to have their voltage reduced to 120 VAC or less.
  - b. Water, Irrigation, Cooling Tower/Fluid Cooler Makeup and Blowdown: Totalized consumption in cubic feet. Utilize utility grade meters with local readout and pulse contact for consumption values to be passed to BAS. Coordinate with the Plumbing specification

- c. Steam Condensate: Totalized consumption in gallons or pounds of condensate. See section “Steam and Condensate Return Systems” of this section for more requirements on meters for steam condensate.
  - d. Natural Gas: Totalized consumption in cubic feet or therms. Readings shall be temperature compensated.
  - e. Chilled or heating water BTU meter. Provide necessary temperature sensors and flow rate meters along with a processor to perform calculations of BTUs based on flow rate and temperature difference. Provide local BTU, temp and flow rate readings and pass the BTU, temps and flow rate values to the BAS either through BACnet or as an analog/pulse value as appropriate.
2. Discuss sub-metering with project manager at the beginning of each project. In some cases there may need to be sub-metering of some utilities. For example, lawn irrigation systems shall be sub-metered from the domestic building water supply. Cooling tower or fluid cooler makeup water and blowdown systems will need to be metered separately. The purpose of those meters is to calculate the quantity of water lost through evaporation so that we can get a credit for the sanitary sewer charges on our water/sewer bills. We may also request metering of electrical plug loads separate from lighting and also separate from HVAC loads in some cases.
  3. Discuss with SDSU’s project manager about possible connection of the meter data to the “Dashboard” system that is installed on campus.

END OF DIVISION 33 UTILITIES

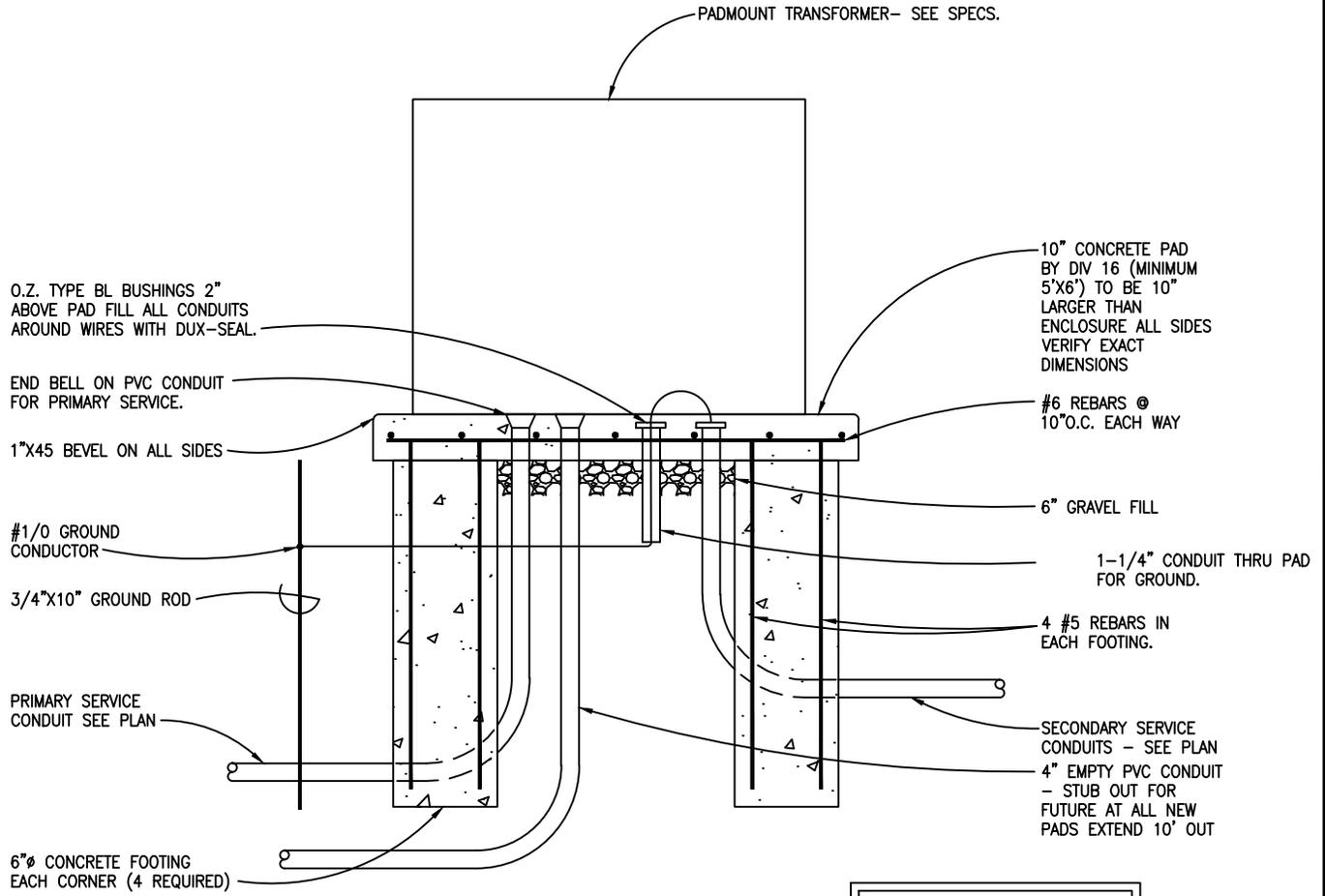


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### WALK THROUGH PIPE TUNNEL

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FULLY COORDINATE ALL TRANSFORMER PAD DETAILS WITH THE OWNERS REPRESENTATIVES.

Note: Screen around transformer shall be designed to meet NEC requirements

No.	Revision/Issue	Date

TRANSFORMER PAD DETAIL

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	Date	5/1/2012
	Scale	As Noted
		33-020