



Facility Design Guidelines & Standards for City Buildings and Parks

City of San Antonio

Version Date: October 12, 2017

**Transportation & Capital Improvements – Project Delivery-
Vertical Projects**

**114 W. Commerce St. Municipal Plaza Building 4th Floor
San Antonio, Texas 78205**

In collaboration with:

**Office of Sustainability
Building and Equipment Services Department**

TABLE OF CONTENTS

SECTION I - OVERVIEW	11
INTRODUCTION.....	11
Purpose and Scope	11
Organization of the FDGS.....	11
Control Procedures	12
GENERAL	12
Codes and Ordinances	12
Commissioning.....	12
Context	13
Cost Effectiveness	13
Creativity.....	13
Daylighting.....	13
Design	14
Design Objectives	14
Durability	14
Energy Performance	14
Flexibility	14
Function.....	15
Indoor Air Quality	15
Life Cycle Cost Analysis.....	15
Maintainability	16
Quality.....	16
Record Information	16
Space Standards.....	17
Sustainable Practices	17
Water	18
DESIGN CONSIDERATIONS.....	19
GENERAL	19
Accessibility	19
Construction Materials	20
Finishes	20

Internal Circulation	20
Safety and Security.....	20
Siting	20
Structural Considerations	21
CORE ELEMENTS	21
Audio/Visual Closets.....	21
Bicycle Facilities – Indoor Storage, Lockers, Showers	21
Custodial and Janitor’s Closets	22
Data/Communication Closets.....	22
General Storage Rooms/Closets.....	23
Mechanical and HVAC	23
Roofs	23
Stairs.....	24
Waste Management	24
Departmental Design Standards.....	24
SECTION 1 APPENDIX.....	26
SECTION II - SPECIFICS	27
Division 0	27
Division 1	27
GENERAL	27
Core Elements.....	27
Survey	27
Geotechnical Investigations	27
Demolition.....	27
Department Specific Requirements	28
Division 2 Appendix.....	28
1. Obtain the COSA “Soil Policy” document from the COSA Project Manager/Representative.	28
Division 3 – Concrete	28
GENERAL	28
Finished Concrete Floors.....	30
Patching of Damaged/Inferior Newly Placed Concrete.....	30
Core Elements.....	31
Concrete Reinforcing	31

Department Specific Requirements	31
Division 3 Appendix.....	31
1. Concrete Driveway Standards	31
2. Wheelchair Ramp Standards.....	31
3. Concrete Bus Pad	31
Division 4 – Masonry	32
GENERAL	32
Brick.....	32
Mortar Bedding and Jointing.....	33
Core Elements.....	33
Clay Unit Masonry (Brick).....	33
Concrete Masonry Unit (CMU).....	33
Insulated Concrete Block (ICB).....	33
Stone Assemblies	34
Department Specific Requirements	34
Division 4 Appendix.....	34
Division 5 – Metals.....	34
GENERAL	34
Welding	34
Core Elements.....	34
Structural Steel	34
Department Specific Requirements	35
Division 5 Appendix.....	35
Division 6 – Wood, Plastics, and Composites	35
GENERAL	35
Core Elements.....	36
Millwork.....	36
Department Specific Requirements	36
Division 6 Appendix.....	36
Division 7 – Thermal and Moisture Protection.....	36
GENERAL	36
Building Insulation	36
Roofing.....	37

Core Elements.....	37
Damp-proofing and Waterproofing.....	38
Smoke Seals	39
Department Specific Requirements	39
Division 7 Appendix.....	39
Division 8 – Openings	39
GENERAL	39
Core Elements.....	40
Doors and Frames.....	40
Entrances, Storefronts, and Curtain Walls.....	40
Glazing	41
Hardware	41
Tubular Daylighting Devices, Roof Windows and Skylights.....	42
Windows	42
Department Specific Requirements	43
Division 8 Appendix.....	43
Division 9 – Finishes	43
GENERAL	43
Core Elements.....	44
Carpeting	44
Ceilings	44
Painting and Coating	45
Plaster and Gypsum Board	45
Tiling.....	45
Department Specific Requirements	46
Division 9 Appendix.....	46
Division 10 – Specialties	46
Requirements	46
Core Elements.....	46
Corner Guards	46
Flagpoles	46
Mirrors.....	46
Toilet, Bath, and Laundry Accessories.....	47

Department Specific Requirements	47
Division 10 Appendix.....	47
Division 11 – Equipment	47
GENERAL	47
Core Elements.....	47
Department Specific Requirements	47
Division 11 Appendix.....	47
Division 12 – Furnishings.....	47
GENERAL	47
Core Elements.....	47
Department Specific Requirements	47
Division 12 Appendix.....	47
Division 13 – Special Construction	48
GENERAL	48
Core Elements.....	48
Department Specific Requirements	48
Division 13 Appendix.....	48
Division 14 – Conveying Equipment.....	48
GENERAL	48
Core Elements.....	48
Department Specific Requirements	48
Division 14 Appendix.....	48
DIVISIONS 15-20	49
Division 21 – Fire Suppression.....	49
GENERAL	49
Portable Fire Extinguishers and Cabinets.....	63
Department Specific Requirements	63
Division 21 Appendix.....	63
Division 22 – Plumbing.....	63
GENERAL	63
CORE ELEMENTS	63
Basic Design Requirements.....	65
Plumbing Basis of Design	71

Plumbing Drawings.....	71
Soil Corrosivity Information	72
Water Analysis	73
Water Service	73
Department Specific Requirements	73
Division 22 Appendix.....	73
Division 23 – Heating, Ventilating, and Air Conditioning	79
GENERAL	79
Core Elements.....	80
Access Panels	81
Air Vents	83
Balance Dampers.....	83
Balance Valves	83
Cold Water Make-up	83
Drain Lines	83
Ductwork Testing.....	84
Equipment Supports	84
Flow and Slope Arrows	85
Guides for Piping	85
Kitchen Hood Diagram	85
Mechanical Drawings.....	86
Pressure Gauges	87
Roof Fans	88
Department Specific Requirements	88
Division 23 Appendix.....	88
1. Appendix 1: System Performance, General Installation, Validation, Operating-Conditions, and Training Requirements.....	88
2. Appendix 2: Example and Minimum Screen Display	88
3. Appendix 3: Submittals	88
4. Appendix 4: Equipment Selection	88
5. Appendix 5: Example of Coordination with Other Project Documents	88
Division 24	88
Division 25 – Integrated Automation	88
GENERAL	88

Core Elements.....	89
Department Specific Requirements	92
Division 25 Appendix.....	92
Division 26 – Electrical	92
GENERAL	92
Core Elements.....	92
Division 27 – Communications	121
GENERAL	121
CORE ELEMENTS.....	121
Department Specific Requirements	122
Division 27 Appendix.....	122
Division 28 – Electronic Safety and Security	122
GENERAL	122
Core Elements.....	122
Department Specific Requirements	122
Division 28 Appendix.....	122
DIVISION 29	122
DIVISION 30	122
Division 31 – Earthwork.....	122
GENERAL	122
Core Elements.....	123
Clearing and Grubbing	123
Excavation and Trenching.....	123
Grading.....	123
Site Clearing/Tree Preservation.....	124
Topsoil.....	124
Department Specific Requirements	124
Division 31 Appendix.....	125
Division 32 – Exterior Improvements	125
GENERAL	125
Landscape Irrigation.....	125
Low Impact Development	128
Core Elements.....	128

Concrete Mow Strip	128
Curbs, Gutters, Paving and Driveways and Sidewalks.....	128
Landscape Planting	132
Landscape Seeding.....	132
Planting Mixture.....	133
Shrubs.....	133
Turf and Grasses.....	134
Trees.....	134
Department Specific Requirements	136
Division 32 Appendix.....	136
Division 33 – Utilities.....	136
GENERAL	136
Core Elements.....	136
Domestic Water.....	136
Sanitary Sewer.....	137
Department Specific Requirements	138
Division 33 Appendix.....	138
SECTION III – General Appendix.....	139

SECTION I - OVERVIEW

INTRODUCTION

Purpose and Scope

The purpose of the City of San Antonio (COSA) Facilities Design Guidelines & Standards (FDGS) is to provide guidance to architects and engineers designing new and renovated facilities for the City of San Antonio. It is intended to summarize information on what is minimally expected by the City, either by choice or by the specialized nature of the facility, and provide facilities that meet or exceed expectations of the users, operators, and maintainers of the facilities.

The FDGS includes some information of a repetitive nature that is generally common to most City facilities and projects. In addition, it provides department-centric guidelines, as there are a number of COSA departments that have unique functions.

It is recognized that any specific standards indicated herein may not be universally applicable to every project. Further, these standards are not to be used in place of professional design analyses.

This document is not intended to prohibit the use of alternative methods, systems, products, or devices not covered or mentioned within the guidelines. However, consultants are expected to conduct independent evaluations of the requirements and to discuss with the COSA Project Manager/Representative any difficulty, cost, or schedule impacts of complying with the FDGS.

It is not intended for these standards to be used as contract specifications, nor does this document replace or over-ride existing codes. The FDGS may “expand” the code requirements in order to meet the needs of the end-users, operators and maintainers of the facility, whose needs are not necessarily presented through codes.

Organization of the FDGS

The format of the FDGS document provides information in increasing detail. Overall, the document follows the CSI (Construction Specifications Institute) Master Format division breakdown. The chapters include four distinct groupings of design information, as follows:

Each chapter (CSI Division) begins with an over-arching design philosophy which will provide general information and guidance regarding preferences or concerns. That will be followed by guidelines and/or standards for building elements (equipment, materials, installation, and testing requirements) that will apply City-wide. The City-wide guidelines/standards will be followed by any department-specific guidelines and/or standards. Both the City-wide and department standards sections may also include specifications (numbered according to CSI format).

Lastly, each chapter contains Appendix items that provide additional information.

Control Procedures

The Transportation and Capital Improvements – Facilities section is primarily responsible for the development, maintenance, revision and distribution of the FDGS. Periodically, the FDGS will be updated; however, code and contract requirements will take precedence on all projects.

The COSA Project Manager/Representative manages distribution of the FDGS to Design Consultants to suit the specific requirements of the Consultant Agreement for each project. Consultants must work with a COSA Project Manager/Representative to assure that their project meets FDGS requirements.

Changes to the FDGS will be reviewed by COSA before incorporation into the document. Comments, suggestions and recommended changes for this FDGS are welcome and should be submitted through a Criteria Modification Request (CMR).

A brief summary of the changes will be included with each revision transmittal.

Refer to Section III for the Criteria Modification Request Form.

GENERAL

Codes and Ordinances

Design Consultants are required to make themselves aware of all applicable codes and ordinances and assure compliance thereto. Deviations must be agreed to in writing by the COSA Project Manager/Representative with written concurrence from the related regulatory agency. If a conflict arises between program requirements, codes, and ordinances, such conflict must be resolved to the satisfaction of all interested parties prior to completion of the Design Development Phase.

Commissioning

The City will determine the level of commissioning for each project. The City will hire an independent Commissioning Authority (CxA) to lead the commissioning process. The design consultant must coordinate with the CxA to carry out the commissioning process.

The following building systems may be commissioned when applicable to a project: Mechanical Systems, Plumbing Systems, Electrical Systems, Building Envelope/Enclosure or Building Assembly.

Commissioning is essential to achieve efficient operations and long-term functionality of buildings and systems. Newer and more complex mechanical, lighting, plumbing, and other energy and water-intensive systems necessitate thorough commissioning in order to ensure they operate appropriately. Commissioning should be treated as a process rather than an event and be based on a whole-building approach rather than a system-by-system

basis. Commissioning processes should adhere to NEBB, ASHRAE, and other applicable industry standards.

The latest revision of the following references should be used to assist with the commissioning of a project:

ASHRAE Guideline 0: The Commissioning Process

ASHRAE Standard 202: The Commissioning Process for Buildings and Systems

ASHRAE Guideline 1.1: HVAC&R Technical Requirements for the Commissioning Process
NIBS Guidelines (various)

Context

The designer must be familiar with the project's architectural and environmental context to achieve an appropriate sense of scale, tradition, and compatibility.

Cost Effectiveness

All selections must reflect the "best value" for COSA in terms of aesthetic value, quality, initial costs and life-cycle costs. Inexpensive, short-term solutions do not necessarily produce cost savings over time.

Creativity

Budget constraints place increased importance on design creativity. Proper planning and research of innovative design features will help the designer provide quality facility interiors within restricted budgets.

Daylighting

All occupied rooms (offices, workstations, etc.) should be provided with access to natural daylight to the greatest extent possible.

If daylighting systems (beyond windows) are included in the design for daylight harvesting, the project team must take special care to ensure adequate illumination levels in the occupied space are achieved for a significant portion of the occupied year. The daylighting system should be designed so as to reduce and avoid glare and excessive illumination resulting from annual direct sunlight exposure, and should limit solar heat gain to the occupied space.

Additionally, the daylighting system should allow for user adjustability through user-controlled daylight modulation, with its control functions fully integrated with the lighting system controls for ease of occupant use and to ensure maximum energy savings through daylight harvesting functionality. The resulting daylighting solution should integrate and harmonize with the building's electric lighting, mechanical, and interior architectural systems. The anticipated interior daylight illumination achieved by the daylighting solution must be documented and/or supported through hourly interior daylight calculations using San Antonio, Texas TMY2/TMY3 weather data.

The daylighting solution's average interior daylight illumination levels should be shown to achieve a minimum Daylighting Autonomy threshold of 40% for daytime occupied hours.

Windows must be provided with blinds or shades to control natural light.

Design

The design team's responsibility is to provide a facility which fosters productivity and job satisfaction. Well-designed interiors can provide an environment that contributes to achievement at work and enhances pleasure and relaxation in recreational facilities. A sense of timelessness in COSA facility design will extend the life and usefulness of design projects. Structural expression, suitability of materials, harmonious visual and tactile features, and classic furnishings will always remain the foundation of good design. The selection of trendy or dated finishes or design features is contrary to the COSA design philosophy. Interiors should be creative but not extreme, reflect quality but not opulence, and be capable of being updated without requiring major changes to materials, spaces, or functions.

Design Objectives

Integrate engineering, architectural, and interior design. The goal is to create a fully integrated environment where the occupant loses sight of "how" and "why" the facility works and simply enjoys being there.

Durability

Durable designs and finishes help facilities withstand the test of time. The designer must be concerned with material durability and wear along with the cost. Select quality materials and products appropriate to the function and level of use. Extra consideration must be given to products specified in heavy-use areas and specific functional areas.

Energy Performance

The energy performance of a building should strive to exceed code requirements, with a goal to meet the CPS Energy's new construction prescriptive or performance incentive where feasible, based on building type.

For projects with a construction budget over \$3 million dollars, energy efficiency will be determined through the use of an energy model.

A review of possible on-site renewable energy systems including solar PV, solar thermal, wind power, fuel cells, or other sources is encouraged.

Flexibility

Flexible designs are essential to meet the dynamic requirements of the City's constantly changing needs and demographics. While the primary function of each facility must be the priority, the designer must keep in mind that functions evolve, and facilities may require future modifications. Flexibility within building systems will reduce the amount of time and money required for future alterations.

Rapid technological advancements often demand upgraded equipment, power, and communication requirements. These advancements in technology should enhance, rather than outpace, the usefulness of COSA facilities.

Function

Functional design ensures that each aspect of the project environment performs efficiently for the user. A good working relationship between the user and designer will help accomplish this goal. Each facility type presents unique functional requirements that will ultimately affect the selection of materials and products. It is important for the designer to investigate all aspects of these requirements through the user.

General Drawing Requirements

Provide north arrows on all building and site plans in the same location on all drawings. The orientation of drawings must be arranged with the north arrow toward the top of the plotted sheets, unless overriding circumstances dictate otherwise.

The orientation of all partial building or site plans must be identical to that of the larger plan from which it is derived or referenced. Consistency in drawing orientation must be maintained with all disciplines.

Enlarged plans must be drawn at no less than 1:50 ($\frac{1}{4}" = 1'-0"$). Exercise judgment to avoid overly congested drawings.

All plans, elevations, and building sections must include a graphic scale and title.

Indoor Air Quality

Products incorporated into the design should have minimal or no VOC off-gassing or noxious odors. All indoor carpets, flooring tiles, adhesives, paints, wood, fiberboard and other interior finishing products should meet Green Guard, Green Seal, KCMA, or another approved certification for indoor air quality.

If allowed by the end user, live, interior plants are recommended. If included, select plants for their air quality benefits based on the NASA Clean Air Study, or other best practices.

For a visual guide: <http://visual.ly/nasa-guide-air-filtering-houseplants>

Practices such as demand-control ventilation that balance energy efficiency with the need to properly ventilate occupied spaces are encouraged.

Life Cycle Cost Analysis

When appropriate or as stipulated in the architectural agreement or by COSA representative, the Project Architect/Engineer shall perform a Life Cycle Cost Analysis (LCCA). Cost effectiveness is a key component of a building design, and Life Cycle Cost Analysis (LCCA) is an essential design process for controlling the initial and future cost of building ownership. Life Cycle Cost (LCC) is defined by the National Institute of

Standards and Technology (NIST) Handbook 135 as the total discounted dollar cost of owning, operating, maintaining, and disposing of a building or building system over a period of time. LCCA is based on the premise that multiple building design options can meet programmatic needs and achieve acceptable performance, and that these options have differing initial costs, operating costs, maintenance costs, as well as different life cycle costs. By comparing the life cycle costs, LCCA can show the trade-offs between low initial first cost and long-term cost savings. Thus, the most cost-effective system for a given use can be identified, and the length of time it will take to “pay back” the incremental cost for this system can also be determined.

Maintainability

The use of easily maintained systems and finishes is critical. While certain finishes may provide excellent durability, the designer must give serious consideration to maintenance and the effort required to maintain the appeal of certain products. It is critical to be familiar with finishes that wear well with low maintenance requirements.

Operations and Maintenance

Consider the day-to-day operations and functions in the design of all COSA facilities. The design should be based on ease of use for operations and ease of accessibility and/or replacement for maintenance. Systems and materials incorporated into all buildings should be selected on the basis of long-term operations, impact to indoor environmental quality, and maintenance costs supported by a life cycle cost analysis. The design consultant and the COSA Project Manager/Representative should obtain feedback from the Building & Equipment Services Department (BESD) throughout the design process.

Quality

The Transportation and Capital Improvements (TCI) Department is committed to quality in aesthetics, sustainability, operations and maintenance of COSA facilities and meeting the requirements of COSA departments. TCI is committed to deliver projects that are cost effective to operate and maintain while also providing healthful and productive environment throughout their useful lives.

Record Information

The City has various types of documentation for older facilities. The City retains digital and hard copies of all recent design and operational documents in a centralized location for the useful life of the building or property. Consultants are expected to fully utilize these resources, in conjunction with thorough hands-on review of existing conditions. COSA Project Manager/Representative will provide assistance as available to allow Consultants to obtain all necessary information germane to the project.

To the greatest extent possible, Consultants should field-verify all reference information and “as-built” conditions since the City cannot guarantee that all conditions have remained static since last altered or documented.

The Consultant should provide a copy of the field-verified conditions to the COSA Project Manager/Representative.

Space Standards

Refer to Administrative Directive (AD) 1.10 “Space Standards for Office Space, Furniture, and Equipment”.

Sustainable Practices

The design of all COSA buildings should incorporate principles of sustainable design and energy efficiency with the health and wellness of the building occupants in mind. Designs following these principles improve the buildings’ performance while enhancing the occupants’ health, satisfaction, and effectiveness. Sustainable design is an integrated approach that considers all phases of the building life cycle and the materials used to construct and maintain it.

Buildings should be designed and built to incorporate the best energy efficiency and sustainability practices and technologies available at the time of construction but also with future improvements in mind.

According to a City Council Resolution effective April 2007 (2007R- 04-19-0416), all new buildings, funded and constructed by the City of San Antonio, for its uses, are to adopt the “Green Building Policy.” This policy guideline should utilize, as its basis, the standards and requirements of the Silver Certification as outlined by the Leadership in Energy and Environmental Design (LEED) Green Building Rating System.

On August 11, 2016, the City of San Antonio City Council adopted the SA Tomorrow Plans that include a Comprehensive Plan, Multi-Modal Transportation Plan, and a Sustainability Plan. The Sustainability Plan is a long-term community plan, as well as a plan to improve COSA’s sustainability through “Leading by Example” actions and performance measures.

Specific municipal strategies from the adopted SA Tomorrow Sustainability Plan that are related to COSA facilities include:

1. Explore renewable energy distributed generation and battery storage opportunities at critical municipal facilities.
2. Update FDGS to require new construction and significant renovations to meet and receive EPA Energy Star Certification within the 80th percentile.
3. Develop a building and facility energy management system for real-time data and operational control.
4. Require all appropriate City-funded infrastructure projects be designed to deliver no net runoff/or provide for an increase in net natural areas.
5. Assess City-owned buildings and install “green” or “cool” roofs to reduce building energy consumption and mitigate urban heat island impact.

6. Ensure all essential City assets and systems are assessed for their preparedness and ability to recover from current and future extreme weather events.
7. Provide incentive programs and shower and storage facilities for all COSA employees who commute to work utilizing clean sources (bike, walk, carpool, transit, alternative fueled vehicle).
8. Green the City fleet to reduce fuel use (EV's, efficient vehicles, rightsizing, telematics, and behavior change).
9. Expand incentives and essential infrastructure for employees to regularly engage in physical activity and make healthy choices.

Sustainable practices and technologies should be incorporated into all new construction and major renovations. Evaluation of each practice and technology is required to ensure feasibility and constructability. The evaluation method should consider items such as conservation of natural resources, energy efficiency, renewable energy, use of day lighting and indoor air quality (IAQ). Consultants must evaluate the appropriateness of electric vehicle outlets/accommodations.

Typically, most projects will NOT be LEED certified unless the design team is otherwise notified in writing by the City. However, the design team should apply the LEED checklist to all projects.

Facilities are required to be Energy Star certified.

Water

All projects should incorporate interior and exterior water efficiency practices. Interior water fixtures and equipment should meet or exceed EPA Water Sense standards or otherwise demonstrate water efficient operations. Outdoor plants should be selected for drought tolerance and native, non-invasive species are preferred. If irrigation is necessary it should be drip-style or another approved high efficiency technology. Additional water efficiency enhancements, such as rainwater harvesting or condensate capture for landscape irrigation, should be used when feasible.

Wellness

Facilities should be designed to promote healthy activity and regular usage, according to the International Building Institute by Green Business Certification Inc. (GBCI). Building design should have strategies for promoting active lifestyles through the placement and design of stairs, elevators, indoor and outdoor spaces.

DESIGN CONSIDERATIONS

GENERAL

Accessibility

Facilities and improvements must be accessible to the physically handicapped and must comply with Texas Accessibility Standards (TAS) and the Americans with Disability Act (ADA) Guidelines.

Using the TAS and ADA Standards as a starting point, develop the facility design to follow the principles of Universal Design. Refer to SECTION I APPENDIX

Ceiling Heights

General office space should have a uniform ceiling height to provide flexibility for future floor plan changes.

In historic buildings, original ceilings in significant spaces should remain exposed to view. New suspended ceilings in standard office space within historic buildings should maintain the original ceiling height to the greatest extent possible, maintaining full clearance at windows and grouping systems, as necessary, to minimize the reduction of ceiling height. In office space containing vaulted ceilings, oversized windows or similar features, consideration should be given to thoughtfully designed, exposed system solutions that maintain full ceiling clearance and allow ornamental surfaces to remain exposed to view.

The clear ceiling height for office spaces is a minimum of nine (9) feet for spaces that are larger than one hundred-fifty (150) square feet.

Rooms designed for video teleconferencing or training should have a minimum clear ceiling height of ten (10) feet.

Enclosed offices should have the same ceiling height as adjacent open office spaces to allow future reconfiguration flexibility.

Closed Offices Versus Open Plan

The City of San Antonio prefers a ninety (90) % to ten (10) % ratio of open to closed offices. Per AD 1.1.0, the open plan approach (with a very limited number of ceiling height partitions for offices) is the default. It has a higher degree of efficiency and flexibility, and provides easier distribution of natural light and daylighting techniques, heating and cooling to the working areas. This approach can be adapted to a larger building depth and still present an open and airy atmosphere. It also encourages interaction between individuals and work groups.

Construction Materials, Means and Methods

COSA encourages the exploration of alternative, or innovative materials, means and methods that may not be expressly discussed in the FDGS, especially if it improves on energy usage, environmental sustainability, or the health of COSA citizens or visitors.

Finishes

Finishes shall be selected to provide for ease of care using common cleaning agents and procedures.

Internal Circulation

Provide chair rails and corner guards in hallways and corridors to minimize the amount of wear and tear on the interior building finishes.

Doorways should have a minimum clear opening of thirty-two (32) inches, as measured between the face of the door and the opposite stop when the door is open ninety (90) degrees. Doors should be located within a space so as to minimize congestion.

Pests & Varmints

Facility designs need to take into consideration the need to discourage the roosting of bats, birds, etc. Ensure all penetrations are properly sealed, secured, or screened to prevent pests and varmints from entering.

Safety and Security

For security purposes, all occupied rooms (offices, workstations, etc.) and associated workspaces are required to be provided with visual access from the building corridors or adjacent spaces with a window, side lite, or vision lite in the door. Window coverings shall not be installed over the lites.

No one department will maintain master keys for all City Facilities. Each facility will maintain its own master key.

Serviceability

All building components must be designed to provide adequate maneuvering room for servicing of equipment.

Siting

As often as possible, orient building(s) to capture and make use of prevailing breeze and sun angles. Consider the incorporation of overhangs, awnings, and other shade elements as both functional and architectural building elements.

Use topography to an advantage to minimize the need for cut / fill operations while integrating the building(s) within the existing landscape.

Integrate building(s) into surrounding landscape and utilize new landscape and site features which enhance building and site appearance from the public view shed.

As possible, service vehicle parking should be screened from public viewing areas.

Structural Considerations

A structural system which minimizes the use of interior columns and allows for large, open spaces that maximize interior flexibility and efficiency is preferred. Where applicable, orient/configure layout of space so that views of the projection screen, whiteboard and / or teaching area in the training room will not be obstructed by building structural elements.

Water

EXTERIOR - The goal is to manage all rainwater onsite to minimize or eliminate run-off into watershed and City storm water system. Low Impact Design (LID), Xeriscaping and any other techniques to lower water use and improve water quality are to be utilized as much as possible.

Consider:

- Condensate capture
- Rainwater harvesting

INTERIOR - Utilize low or ultra-low flow fixtures.

CORE ELEMENTS

Audio/Visual Closets

A/V closets must be separate from IT room(s).

Bicycle Facilities – Indoor Storage, Lockers, Showers

Depending on the use and location of the facility these amenities should be considered during the design process.

Building Entrances, Lobbies and Vestibules

The main entrance must be conveniently located for vehicular and pedestrian traffic. Ensure an accessible pathway is provided from the street and/or public transportation to the main entrance.

The use of automated sliding entry doors is required for public access.

A canopy, portico, or arcade should be used for weather protection, and to emphasize the main entrance or enhance the building design.

Approaches must be well-lighted and designed to direct the visitor to the entrance. Grade level approaches are preferred over elevated approaches that require steps, but need to be coordinated with overall approach to provide building security.

The lobby should be clearly visible from the outside, both day and night. Design considerations should be given to building energy efficiency, pedestrian safety and security.

Vestibules are recommended for energy conservation.

Consider designing main entrances with built-in walk off mats.

Signage

Clear and attractive graphics and way-finding signage should be provided to assist visitors.

Include fire escape/exiting plans at building entrances, readily visible, and well designed and installed.

Building plaques are required for all City buildings. Use the COSA standard design template.

Depending upon the use of the building, security checkpoints, metal detectors, and/or control gates are to be a consideration during the programming phase and/or design.

Custodial and Janitor's Closets

Consult with COSA to evaluate the number of closets needed; minimum of one (1) per floor and one (1) per approximately ten thousand (10,000) square feet of building floor plate.

Closets should be centrally located on each floor near the toilet facilities and be directly accessed from the corridor, not by going through the restrooms. They should accommodate all the equipment and supplies needed to service the area worked from the closet.

All available space within the closet can be put to use to store gear and supplies. As a minimum, the service closet shall have a twenty-four (24) inch square mop basin, a wall-mounted mop rack, and three (3) feet of ten (10) inch wide wall shelving; the floor area should be a minimum of eighteen (18) square feet.

Data/Communication Closets

Refer to the latest COSA Structured Cabling Infrastructure Guidelines.

General Storage Rooms/Closets

Provide general building storage areas adjacent to service entrance(s). Size should be a minimum of one-hundred (100) square feet, but must be considered during the programming and/or schematic design phases.

Provide access-controlled (key or card) double doors.

Provide a minimum of one (1) twenty (20) amp dedicated circuit with duplex receptacle.

Mechanical and HVAC

Mechanical rooms are to be designed to provide access for maintenance and repair of equipment, units, and should be on the first floor with exterior access. Refer to Division 23 in this document for details.

Condensing units should be located and/or screened in a manner which minimizes visual impact.

Consider the use of passive heating and cooling methods to increase energy conservation. Spaces should be ventilated in accordance with the International Mechanical Code. An interior environment with variable temperature range between 68° to 75° Fahrenheit is typically desired. Design the heating, ventilation, and air conditioning (HVAC) system accordingly to achieve this temperature range, especially in areas which contain a large number of heat-producing equipment or computer workstations.

The system should have a master set point that can be used, as well as individual set points that can be used to override an individual room as needed. Design the HVAC system so that excessive air flow or equipment noise within one space should not intrude into adjacent spaces.

Roofs

Pitched roofs are preferred over low-slope roofs. Roofs and collection systems should be designed to accommodate rain water harvesting.

Cool roofs

Required for new construction and should be considered on all major renovations. A cool roof is one that has been designed to reflect more sunlight and absorb less heat than a standard roof. Cool roofs can be made of a highly reflective type of paint, a sheet covering, or highly reflective tiles or shingles. REFER TO SECTION I APPENDIX.

Green Roofs

Green roofs should be considered.

Green/Living Walls

The trellis system should add to the aesthetic character of the building or site that it is being used on. When done well, the trellis can become an integral element of the architectural ornamentation on a building.

Interior usage should also be considered.

Stairs

To encourage health and wellness, the use of stairs over elevators is encouraged. As possible, provide at least one prominent and attractive stairway, possibly near the elevators and/or main entrance.

Waste Management

Provide ample space for recyclables separate from trash. Consider providing organics trash management.

Provide visual screening around dumpster enclosures.

Ensure adequate drive and enclosure area for trash pickup. Obtain specifications from COSA.

DEPARTMENTAL DESIGN STANDARDS

1. The San Antonio Fire Department, (SAFD), maintains their own design standards.
2. The Information Technology Systems Department (ITSD) maintains the COSA standards for IT/communications and security for all COSA facilities: “Structured Cabling Infrastructure Guidelines”
3. DHS has specific requirements, see below list:

Department of Human Services (DHS)

All DHS Facilities should have the following:

Roof

No flat roof systems.

Landscaping

Use only native and drought resistant plants, grass, and trees in landscape design.

No crushed granite to be used on walkways or trails.

All facilities are to have a lighted flagpole.

Restrooms

No VCT in restrooms, ceramic flooring should be used.

Toilets and urinals should be auto flush. Hard wired design (no batteries).

All counter tops are to be solid surfacing. Intrusion / fire alarm panels should be non-proprietary in terms of their ability to be monitored by any company.

HVAC

Any centralized control system should not be complex. It needs to be simple enough for staff to work with. It should not be a proprietary system.

Audio Visual

Use of flat screens for viewing is preferred to projectors/projector screens when possible. If projector screens are used they should be ceiling mounted and recessed.

Department of Human Services (DHS) Senior Centers:

Arts & Crafts Room

Requires a small sink.

Audio Visual

Facility shall have a paging system.

Provide a sound system in the Fitness and Dining Rooms.

Dumpster Pad

Dumpster pad should be located in close proximity to kitchen/loading dock.

Dumpster pad should be concrete and have a large enough design to fully accommodate large trucks.

Entry / Exit Doors

All entry /exit doors should have at least one (1) sliding, automatic (ADA) opener. (Not emergency exits.)

Fitness Room

Requires a low impact floor material.

Kitchens

Require a three (3) compartment sink.

Kitchen design should reflect a warming kitchen, not a cooking kitchen.

Each kitchen requires a loading dock off of the kitchen.

Design should include a staging area off of the loading dock for food commodities. It should be located next to the kitchen but be a separate space with access to kitchen. Loading dock should have a concrete pad that is designed to handle both the weight and size of large delivery trucks.

Offices

One (1) office should be located next to dining room/kitchen for the site nutritionist. Provide window to the dining room.

Parking

Additional ADA parking spaces are required above the minimum code. Regular parking spaces should be slightly larger. Design should include a drop off / loading area in the front of the building. This area should not impede the flow of traffic in the parking lot. The area should be landscaped as well.

Restrooms

Additional ADA stalls are required, above code requirements. “Regular” size stalls need to be over-sized. Design should include at least one (1) family restroom.

Traffic Flow/Design

Careful consideration should be given to the location of approaches and design of traffic flow due to the senior population. Facility location next to a VIA Bus stop is important

SECTION 1 APPENDIX

1. Center for Excellence in Universal Design for the 7 Principles of Universal Design: <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/>
2. Cool Roofs: <https://energy.gov/energysaver/cool-roofs>

SECTION II - SPECIFICS

DIVISION 0

Not used

DIVISION 1

Not used

DIVISION 2 – EXISTING CONDITIONS

GENERAL

A/E is to verify existing conditions.

The preference is to have a balanced cut and fill on each project site so that soil does not need to be moved. If soil does need to be moved, the contractor must follow COSA's strict Soil Policy (refer to Appendix).

CORE ELEMENTS

Survey

A topographic survey will be performed for each project involving new construction and for renovation projects where necessary by a surveyor licensed in the State of Texas.

Hazardous material surveys and remediation are provided by the City.

Natural resources/archeology surveys are also provided by the City.

Environmental studies, as appropriate, are provided by the city.

Abatement reports (as applicable) are provided by the City.

Geotechnical Investigations

The City provides the geotechnical survey. Drilling and sampling methods should be in accordance with current applicable ASTM standards.

Demolition

All site demolition should be indicated on a separate demolition plan. Indicate any items to be turned over to COSA as well as all trees and vegetation that are to remain and must be protected during construction.

Perform all demolition of existing surface and underground facilities/improvements as required to construct the project. Demolition plans/details should be included in the design drawings.

Underground facilities are to be removed as required to clear construction and consider potential future construction. As a minimum, all structures must be removed to a point three (3) feet below natural ground. All cavities left below ground must be filled with compacted native material or a flow-able fill material.

Any portions of piping systems remaining in place should be neatly cut and capped/plugged. Where partial demolition occurs, the remaining portions should be left in a functional condition.

Coordinate with COSA Project Manager/Representative to determine any items to be salvaged and turned over to the City, and clearly indicate these in the plans and specifications.

Fill all voids left by clearing and demolition operations with native material compacted in maximum eight inch lifts to a density equal to that of the surrounding undisturbed soil.

See Division 31 for Site Clearing and Tree Protection.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 2 APPENDIX

1. Obtain the COSA “Soil Policy” document from the COSA Project Manager/Representative.

DIVISION 3 – CONCRETE

GENERAL

All cast-in-place concrete must be designed, transported, placed, finished and cured in accordance with American Concrete Institute (ACI) requirements.

Components of the concrete mix must meet applicable ANSI/ASTM requirements.

Mix requirements and strength should be specified by the design professional for each item of construction. Limit the number of mix strengths specified as much as practical.

Concrete form work must meet applicable ACI requirements.

Concrete reinforcement material, design and placement must meet the applicable requirements of ACI and the Concrete Reinforcing Steel Institute (CRSI) along with associated ASTM requirements.

Welded wire fabric reinforcing is to be kept to a minimum and is not approved for use on pavements or slab-on-grade foundations.

Admixtures to the concrete mix meeting applicable ANSI/ASTM specifications may be used as recommended by the structural engineer to improve concrete workability, wear/weather resistance characteristics, etc., to better meet project conditions. Pozzolan Admixtures should be used only within the limits recommended by the structural engineer and approved by the Owner.

The project specifications should clearly establish finish measurement tolerances/standards suitable for the intended use of the surface and its exposure along with any other quality control requirements needed to verify the concrete meets the project specifications.

All cold joints that are exposed to the weather or subject to hydrostatic water pressure must be water stopped. All below grade walls and slabs subject to hydrostatic water pressure must also be protected with a two (2) to three (3) ply layer of membrane waterproofing, otherwise damp-proof. All slabs-on grade must include a below-slab gravel capillary break and a foundation ground water collection and drainage system.

- Expansion joints or contraction joints will be provided at periodic intervals and at all changes in concrete section to offset member restraint, and should be continuous throughout the breadth and depth of the effected member. Interrupt all exposed slab-on grade and other thin wall sections at 30 feet or less - a simple construction joint with a suitable delay in adjacent placements will suffice for interior work. All others must be full depth separations with appropriate clearances and means for shear transfer. Fully locate and detail on the drawings.
- Seismic joints closely parallel expansion joints, with the notable exception of providing total structural freedom across the joint.
- Construction joints should be uniformly spaced at forty foot intervals throughout the structure to facilitate the work and limit shrinkage, and should be located and detailed on the drawing. Key for shear transfer and carry reinforcing through the joint. Always provide sufficient temperature/ shrinkage reinforcing to uniformly distribute shrinkage cracks. Waterstop as dictated by the presence of ground water.

Locate joints perpendicular to beam centerlines whenever possible and carry through into walls and footings with minimum offsets.

Concrete Forming

Form all vertical footing surfaces. Remove all water from form work by pumping from an outside pump, if necessary. Forms should be true, rigid, tight and clean.

Wood forms should be oiled and, except in freezing weather, wetted immediately prior to concrete placement.

Forms should be removed at such times and in such a manner as will guarantee the safety of the structure.

Forms sufficiently free from damage may be reused after being cleaned.

Concrete Reinforcing

Reinforcing bars should typically be Grade 60, main reinforcing bars to be minimum No. 4 in size. Limit No. 3 bars (Grade 40) to ties and dowels.

In lieu of placing reinforcement bars, the consultant has the option to specify welded wire reinforcement (WWR).

Finished Concrete Floors

Generally, concrete finished floors are to receive hardener/sealant. Constant protection is to be provided to prevent staining and chipping during construction work. Slick finishes must be avoided.

A floor flatness test must be specified to be done on all interior floor slabs.

General Floor Loading

Design floor live loads on all major buildings to carry a minimum of one hundred (100) lbs./sq. ft. unless greater is required by Code and/or use for a particular space such as library shelving. This allows flexibility of future design when the building is renovated.

Floors must be designed sufficiently rigid to prevent objectionable vibration.

Patching of Damaged/Inferior Newly Placed Concrete

COSA requires that all design professionals incorporate into their specifications a limit on the amount of concrete repairs that can occur in any given cast-in-place application. The amount of acceptable repairs/patches should be limited to no more than 2% of the total/overall area before total replacement is necessary.

Porches and Steps

All stoops, porches, ramps, docks and steps, both exterior and interior, should have non-slip surfaces and nosings, where applicable. Slope exterior porches and treads to drain water where allowed by TEXAS Accessibility Standards (TAS).

Exposed concrete finished work should be accomplished in two pours: the first structural and the second being a two inch minimum finish topping poured near the completion of project.

Primary entry floors may not be constructed using brick or pavers since these surfaces are excessively noisy when carts are rolled across them.

Use of Recycled Materials

The use of recycled/recovered materials in cement/concrete, when available, is allowed by the specifications outlined by the American Society for Testing and Materials (ASTM)

Void Space Below Grade Beams

Provide soil retainers at face of grade beams below grade to form a void of sufficient depth to prevent expansion of earth to cause pressure on the bottom of the beams.

CORE ELEMENTS

Concrete Reinforcing

No welded wire reinforcement should be used in lieu of deformed steel reinforcement bars.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 3 APPENDIX

1. Concrete Driveway Standards

Refer to:

<http://www.sanantonio.gov/Portals/0/Files/CIMS/StandardDetails/PDF/CONCRETEDRIVEWAY.pdf>

2. Wheelchair Ramp Standards

Refer to:

<http://www.sanantonio.gov/Portals/0/Files/CIMS/StandardDetails/PDF/WHEELCHAIRRAM.Pdf>

3. Concrete Bus Pad

Refer to:

<http://www.sanantonio.gov/Portals/0/Files/CIMS/StandardDetails/PDF/CONCBUSSTOPPAD.pdf>

DIVISION 4 – MASONRY

GENERAL

During the Design Development phase of new buildings, an overall scheme/theory should be presented. This scheme should anticipate locations of horizontal, vertical and seismic expansion, contraction, control, and building movement joints. In addition, it should anticipate through-wall flashing and the protection of parapet masonry. All masonry units must be above grade.

Ensure the specifications include requirements for masonry inspection per IBC.

Anti-graffiti coating should be applied to all exterior masonry to a height of twelve (12) feet. (Refer to Division 9).

Brick

Select and specify ASTM (American Society for Testing and Materials) C62, Grade SW brick. Grade MW does not offer sufficient weathering characteristics and should be avoided. Specify that brick masonry be coated with a water-repellent coating.

Building foundations should extend six (6) inches above grade in areas with brick to prevent staining from contact with earth.

Control and Expansion Joints

Design masonry to allow provisions for expansion, contraction, and other movements typical of masonry to prevent cracking. Show all joints on the construction of drawings.

Flashings and Weeps

Masonry flashing should be composite copper/asphalt/kraft paper.

Polyvinyl chloride (PVC) flashing is prohibited.

Weeps should be cotton sash cord.

Plastic tubes, open head joints, and weep vent systems are prohibited.

Masonry Reinforcing

As a minimum, all masonry reinforcing should be hot-dipped galvanized to comply with ASTM A 153, Class B2 (1.5 ounces per square foot). Stainless steel may be appropriate in some situations.

Corrugated wall ties are prohibited.

Horizontal reinforcing with crimps that serve as a drip are prohibited.

Stone anchors should be stainless steel and should comply with the recommendations of the Marble Institute of America, or National Building Granite Quarries Association, as appropriate. Aluminum anchors are prohibited.

Masonry Cleaning and Protection

Specify that brick masonry should be cleaned with proprietary, general-purpose acidic cleaners designed for removing mortar/grout stains' efflorescence and other new construction stains without discoloring or damaging masonry surfaces. Products used should always be the least intrusive product that will adequately clean the masonry. Use of muriatic acid is prohibited.

Masonry (brick, concrete masonry, and stone) should be coated with an anti-graffiti coating from grade up to at least eight (8) feet (or beyond any accessible location). Because these coatings may slightly darken the masonry, the coating should be applied up to a building change or offset. Anti-graffiti coating should be compatible with water-repellent coatings.

Mortar Bedding and Jointing

Specify that horizontal and vertical mortar joints receive full coverage. Furrowing bed joints is prohibited.

Tool exposed joints slightly concave when they are thumb print-hard, using a jointer larger than joint thickness. Raked joints are prohibited.

CORE ELEMENTS

Clay Unit Masonry (Brick)

Brick masonry is to be designed and constructed per the standards of the Brick Industry Association.

Brick will be selected during project design and should be specified in the bid documents.

Face Brick should be ASTM C216; Type FBS grade SW.

Concrete Masonry Unit (CMU)

Concrete masonry units should be used wherever feasible for back up to exterior face-brick.

Concrete masonry units must comply with ASTM C90.

Use bullnose-type concrete masonry units at all edges and exterior corners.

Insulated Concrete Block (ICB)

Fabricated from a combination of concrete and foam insulation. Block should be fire rated and meet 2015 IECC energy codes. Concrete must comply with ASTM C94.

To be faced with Brick or Stucco as per project requirements.

Stone Assemblies

Limestone should be no closer than four (4) inches to grade when adjacent to lawns and planting areas.

Marble and granite should be domestic.

Anchors, dowels and other accessories used in setting stone should be stainless steel.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 4 APPENDIX

1. See: http://www.uc.edu/architect/documents/design/masonry_final_june2004.pdf

DIVISION 5 – METALS

GENERAL

Welding

All welding work should be executed by certified welders only following American Welding Society (AWS) standards for procedures and materials.

The design professional needs to address corrosion of metal surfaces in the specifications.

Wherever dissimilar metals come in contact with each other, they must be separated with a layer of appropriate coating, material, or mechanical fastener.

Galvanized metal or zinc plated fasteners should not be used to anchor aluminum or copper. Instead, use aluminum or copper fasteners.

CORE ELEMENTS

Structural Steel

Structural Steel certified as “Made in America” is preferred. The contractor should be required to provide an affidavit at the completion of the project, which states the structural steel framing is plumb and level within the normal tolerances specified in the AISC Code of Standard Practice.

Select standard grades of steel for the appropriate applications as per the AISC Steel Construction Manual. Avoid the use of all high strength steels in corrosive atmospheres.

Recommendation - to make sure you get domestically made stainless steel that will meet USA standards is by using the following DFARS (Defense Federal Acquisition Regulation Supplement) standards. Please include the following language in your specifications:

Stainless Steel -Type 304, ASTM A240. Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009.

Architectural Exposed Structural Steel (AESS) – Refer to APPENDIX for an example specification. Generally, utilize the "Standard" spec per AISC Code of Standard Practice.

- Do NOT specify an AESS finish on galvanized materials, as it often is not done correctly. Rather, specify an epoxy three-coat system with SP6 blast.
- Remember that steel produced in a mill will have imperfections that can't simply be fixed with filler. That mainly applies to wide flange materials, angles, etc. You have better luck with tubing and pipe as it's rolled out of plate and they seem to look much better than wide flange surfaces.
- Note that when calling for tapered outriggers and beams, the forces and stresses in rolling the materials cause them to "move" drastically sometimes to the extent where tubing will spread wider and wide flange beams will twist especially when the taper is over two (2) feet long. Tapered plate assemblies are much better than beams.
- Attachment of any threaded nuts, couplers, or any other hardware should be applied in the field, by the trade sub.
- Show exactly what structural pieces are to be AESS. Stay away from the "10 -20 feet from view," type of catch-all phrases.
- Stay away from blended and contoured welds and use ground smooth welds where absolutely necessary.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 5 APPENDIX

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

GENERAL

Consider specifying products from sustainable sources such as FSC Certified Wood or regionally available from abundant sources. Avoid use of imported or exotic species of woods.

All plywood used within the weatherproofing/waterproof membrane (interior) of the building should contain no added urea-formaldehyde. This requirement applies to plywood roof and wall sheathing.

Wood Treatment

Wood used in conjunction with roofing installations and wood which is installed in contact with concrete or masonry must be pressure treated with an approved preservative to meet AWPS Standards. Other installations should receive prime coats suitable for finishes specified as soon as installation is complete. Back prime where dampness or warping is anticipated.

CORE ELEMENTS

Millwork

Materials and fabrication should conform to Architectural Woodwork Institute's "Quality Standards" specifications. Use "Custom Grade" for standard millwork and "Premium Grade" for unique and special features.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 6 APPENDIX

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

GENERAL

At the Programming and Schematic Design phase the design consultant should formalize plans for positive drainage of water from roofing surfaces, decks, plaza areas, building periphery, etc. prior to the investigation of thermal and moisture protection materials.

Building envelope must comply with State Energy Code, ASHRAE 90.1.

Building Insulation

Maximize insulation value of the building envelope to conserve energy and incorporate an air barrier. Avoid insulation material containing formaldehyde and consider insulations with recycled content.

Roofing

Roofing system must be recommended by the Design Team and confirmed by the City's Project Manager/Representative.

Specify service walkways (minimum two feet (2'0") in width) appropriately located to service all roof top equipment from the roof access.

Carefully detail roof expansion joints and flashing.

Completely detail all parapet walls, caps, coping and scuppers. Top of coping should slope toward roofs.

Detail roof edges sufficiently high to prevent water from spilling over and spotting walls and fascia's where roof drains are used.

Provide drips on overhangs, ledges, window stools and coping to prevent discolorations of fascia's, soffits and walls.

Ensure that sealants specified are to be used within their limitations. When pre-cast concrete wall panels are used, ensure proper compatibility between the surface sealant and the concrete panel when caulking a joint.

Flashing materials for permanent type buildings should be aluminum, stainless or copper (not galvanized metal).

Slope roof adequately to drain (minimum 1/4"/ft. slope). Design primary roof slopes for new buildings into structural frame and not by roof insulation.

Crickets to roof drains may be sloped with insulation. Metal building roofs need a minimum 1/4"/ft. slope.

Lightweight concrete insulating fill roof decks will not be used in conjunction with urethane roof system. Lightweight structural concrete is allowed.

If roof gutters are selected for the facilities, some quality type leave guard should be considered.

Specifications should include a requirement for water testing by the Contractor.

Interior roof drains are to be avoided or kept to a minimum.

CORE ELEMENTS

Anti-Graffiti Coatings

All of these coatings need to be “washed off” after the graffiti is tagged on to the substrate. The less expensive technologies require a recoat after washing, the higher end technologies with excellent chemistry may be able to go two to three (2-3) up to ten (10) washings before re-application is required. Due to the high cost of the long term anti-graffiti materials it is suggested that they be used on the first ten (10) foot height of the wall with the rest of the wall being done with a material that meets your performance, budget and warranty needs.

Specify 100% penetrating, VOC compliant coatings that can be used in new and retrofit construction. In the case of retrofit they need not mask off the windows, they are warrantable from five (5) to twenty (20) years up to and including sixty (60) to eighty (80) mph wind driven rains.

Damp-proofing and Waterproofing

Coordinate installation of the fluid-applied membrane waterproofing and associated work to provide a complete system complying with the recommendations of manufacturers and installers involved in work. Minimize period of exposure of fluid-applied membrane waterproofing materials.

Water repellents can and should be incorporated for use in existing and new construction for the COSA. The use of the proper material can lead to an extension of mortar life by as much as eight (8) years thus greatly reducing the maintenance cycle and cost to the city and greatly reduce the opportunity for water to enter the building for up to 20 years. There are several types of technologies on today’s market and they are film formers, penetrants and anti-graffiti materials.

Film Formers

Form a film on the surface of the substrate; they also add a matte or slightly glossy finish to the substrate and generally speaking last about five (5) years and in retrofits they require all windows to be masked off. Film formers may adversely affect the breathability of the wall.

Manufacturer’s Warranties

Required: Written fifteen (15)-year Manufacturer's Warranty, agreeing to furnish labor and materials to repair or replace waterproofing materials that fail within the specified warranty period.

Penetrants

Penetrants are generally silane based and they penetrate the substrate to a maximum depth of ¼” and are completely transparent with no change to surface color, sheen/gloss and are warrantable up to twenty (20) years. These one- hundred (100)% penetrating silanes have no effect on the breathability of the wall and are designed for brick, block, limestone, tilt-up and non-painted stucco.

Smoke Seals

Provide fire-stopping at all penetrations and juncture joints of fire-rated walls, floors and ceilings in accordance with the requirements of the Building Code.

Fire-stopping and Smoke Seals should be provided, but not limited to the following specific locations:

- Penetrations for the passage of duct, cable, cable tray, conduit, piping and electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor slabs and floor/ceiling assemblies), and vertical service shafts.
- Openings between floor slabs and curtain walls and fire rated walls and curtain walls.
- Openings between structurally separate sections of walls or floors.
- Construction joints between the top of walls and floor or roof slab and steel deck assemblies, or concrete floor or roof slab.
- Vertical service shafts at each floor level.
- Expansion joints in walls and floors.
- Openings and penetrations in fire-rated partitions or walls containing fire doors.
- Locations shown specifically on the drawings.

Fire-stopping materials must be UL Classified as "Fill, Void or Cavity Material" for use in Through-Penetration Firestop Systems.

Firestop systems should provide a fire resistance rating at least equal to the hourly resistance rating of the fire-rated barrier and resist passage of smoke and other gases.

Provide documentation for each sealer to be used on site, indicating that the sealers comply with low V.O.C. requirements.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 7 APPENDIX

DIVISION 8 – OPENINGS

GENERAL

Building fenestration must comply with State Energy Code, ASHRAE 90.1, including assembly U values, assembly SHGC and percentage of glass.

Ensure that windows, doors, and louvers are designed for adequate wind loading and velocity pressures as per International Building Code and Texas Windstorm requirements as applicable.

All general use building entrances should have a vestibule. At least one door at primary entrances should be a power operated, automatic sensor sliding door.

Doors may be sliding or swinging, as appropriate to the building use and design, with safeguards and handicapped accessibility as necessary. One-way or two-way types may be used, depending upon traffic.

Door types, materials, hardware, and sensors should be established designs with proven field experience under similar usage. Consideration should be given to availability of trained service technicians and spare parts.

One or more entrance doors may require card key access. These entrances should be selected by the User. The door frames should be prepped as a part of the design and construction of the building. The card key devices should be acquired by the City and delivered to the Contractor for installation or installed by the Building and Equipment Service Department (BESD).

Warning bars or cross mullions should extend across all full height glazed areas. Meet requirements of "Model Safety Glazing Code" and "Consumer Product Safety Commission."

CORE ELEMENTS

Doors and Frames

Care should be taken on what type of door is used for any facility. It is advisable to avoid knock-down frames on new construction.

Exterior and interior personnel doors should not be taller than seven (7) feet high unless approved by the COSA Project Manager/Representative.

All entrance doors and frames should be hinge and strike reinforced for "High Frequency" use.

Entrances, Storefronts, and Curtain Walls

Metal framed glazed entrance assemblies should have stiles of sufficient width to receive mortise locksets and/or panic hardware. Custom styled doors with vision panels may be used. Locksets should be at conventional height and should not be permitted in bottom rails.

Wherever possible utilize curtain wall systems instead of storefront systems on exterior of buildings.

Include in specifications, steel reinforcing inserts in the hinge jamb section of doors in aluminum storefront systems.

Storefront, curtain wall and window frames should have a color to match the COSA/department standard.

Glazing

High performance glazing is strongly encouraged with a tint to match surrounding buildings. Highly reflective (mirror) glass and dark tinted glass are not allowed.

Partial shading of insulated glass can cause stress breakage. Manufacturers consider this to be a design error and will not replace glass broken by temperature differential stresses. Avoid partial shading of large panes.

Provide manufacturer's written guarantee/warranty, that for ten (10) years from date of Substantial Completion, a replacement will be provided for any insulated glass unit which develops edge separation or other defects which materially obstruct vision through the glass or safety or affects the insulating qualities.

Hardware

A minimum of one (1) pair of exterior double doors should have a keyed, removable mullion for equipment access.

Use thresholds and weather stripping at exterior doors to prevent air and water infiltration.

Specify all finish hardware. Locksets for the most part should be heavy duty mortise type with key removable core cylinders.

All doors leading into hazardous spaces, mechanical, electrical and telecommunication rooms should have a textured surface on the door lever.

Satin chrome plated finish is generally used.

Specify plated hinges only for doors receiving a natural or transparent finish; specify prime coated hinges for painted doors.

Specify ball bearing or oilite bearing hinges only on doors which receive closers. Non-removable pin hinges for out swinging exterior doors and other "secured" areas. Specify closers generally for exterior doors, doors in fire-rated walls, and toilet room doors.

Special laboratory conditions or other special room function may require use of closers on doors.

All doors having closers should be protected from wear of wheelchairs by a minimum of ten (10)" high kick plates.

Do not specify pivot hinges or concealed closers.

Door closer will have a heavy duty cast iron cylinder with all-weather hydraulic fluid, ten (10) year warranty, painted aluminum finish, UL listed for use on fire-rated doors, separate back check, sweep speed, and latch speed regulating valves, fully adjustable.

The A/E should investigate the security requirements for the project and develop an appropriate keying system. The specifications should call for two (2) keys for each lock set, One (1) control key along with an appropriate quantity of grandmaster, master and sub-master keys to be provided. A Bitting Schedule and set number of key blanks will also be required. Final keying functions should be established during a key conference conducted by the COSA Project Manager/Representative, with the design professional, user, contractor, and successful hardware supplier.

Metal Doors and Frames

Hollow Metal Exterior Doors should not be less than 16 gauge with 14 gauge or heavier one piece welded frame.

Interior Hollow Metal Doors should not be less than 18 gauge with 16 gauge one piece welded frame.

Tubular Daylighting Devices, Roof Windows and Skylights

The use of daylighting in the building design is required.

When top-lighting is required, Tubular Daylighting Devices, or TDDs, should be considered as the preferred daylighting solution due to their enhanced daylighting and thermal performance, ability to provide user-based control, ease of architectural integration and long-term architectural adaptability.

Skylights are not preferred.

Use of protected vertical clerestory glazing is allowed if facing North or South with adequate eaves to prevent direct sunlight penetration all year around.

Windows

Heads, jambs, and sills of windows in walls should be flashed and should be caulked or sealed during the window installation, prior to the placement of Snap-On moldings or covers, to ensure that concealed surfaces are properly sealed against the penetration of wind and water. All windows should have drips at heads and sills.

Projected and casement type windows, and flush mounted windows are difficult to maintain watertight and their use is discouraged.

Design windows with maintenance in mind and include provisions for cleaning windows above third floor.

Wood Doors

Interior wood doors should be at least 1-3/4" thick to accommodate mortise locks.

Interior wood doors are generally flush type, solid core, hardwood with lifetime warranty. Wood doors can be either wood veneer or plastic laminate faced. Exotic wood veneers are prohibited.

DEPARTMENT SPECIFIC REQUIREMENTS

San Antonio Police Department

Refer to SAPD Guidelines for all door hardware.

DIVISION 8 APPENDIX

DIVISION 9 – FINISHES

GENERAL

The preliminary selection of interior finish materials should take place during the schematic design phase. During the design development phase the design professional should present a minimum of two distinct color schemes to the client and COSA Project Manager/Representative. A final color scheme will be selected and incorporated into the specifications.

Interior finish materials should be high quality, durable materials that are easily maintained and manufactured regionally. Particular attention should be given to finishes in public spaces. The use of materials with recycled content is encouraged.

Avoid the use of imported, costly or high maintenance materials. Finishes or detailing that have minimal tolerances and place unrealistic expectations on the installing contractor(s) should be avoided.

Sequence the installation of finishes to allow adequate time in the construction schedule to ventilate gas-containing materials prior to the installation of absorptive materials (carpet, acoustical tiles, and upholstered furniture). Allow the maximum feasible time of one month and no less than one week to off-gas.

Consider the following:

- Recycled content materials, following EPA's Comprehensive Procurement Guidelines (CPG), where possible.

- Locally manufactured materials, where possible, including locally mined or harvested raw materials and/or locally manufactured end products, to reduce transportation impacts.
- FSC-certified sustainable harvested wood for minimum fifty (50) % of all wood materials, including temporary formwork as well as permanent building components.
- Rapidly renewable, bio-based materials (such as fiberboards made from non-wood agricultural materials).
- Materials whose components have zero ozone-depleting potential.
- Zero- or low-VOC adhesives, sealants, paints and coatings, CRI Green Label carpeting and formaldehyde-free composite wood or agrifiber products, where applicable.
- Low-maintenance materials, requiring minimal use of cleaning products or equipment.
- Materials that are likely to have a long life expectancy.
- Materials that can be recycled or are biodegradable after their useful life

CORE ELEMENTS

Carpeting

Specify carpets that are solution dyed and have an anti-microbial finish in medical, lodging and food service facilities.

All carpeting and carpeting systems used are to:

- Comply with LEED V 4
- Be PVC-free
- Fully recyclable
- Prefer cradle-to-cradle
- Contain zero volatile organic compounds (VOC)

Carpet tiles are preferred.

Fixed carpet over a large area is not recommended since carpets can retain dust and other allergens. The recommended backing system should be bonded permanently with a permanent moisture barrier and installed with factory-applied adhesive with seams sealed on-site.

The design professional also should consider using a carpet with subtle flecks, patterns, or color variations that do not accentuate wear.

Ceilings

All ceilings should be designed to be easily accessible for maintenance and other access needs. A single type of ceiling tile such as two (2) ft. x two (2) ft. or two (2) ft. x four (4) ft., minimum 5/8" thick, non-directional pattern tiles with a high recycled content should

be used throughout a building to minimize maintenance and repair costs. Exceptions to this are special areas that are identified in the Department-specific sections or Appendix. Painted gypsum board is appropriate in areas with soffits, ceiling height changes, vaults, or wet areas. Gypsum board is not recommended for ceiling areas where ceiling access is required for plumbing, air conditioning, or other equipment.

Ceiling suspension assemblies should be supported directly from the building structure and should be supported at all four corners of fluorescent light fixtures.

Location of hangers should not interfere with access to variable air-volume filters, valves, dampers and other items requiring maintenance.

Ceiling tiles should have high recycled content varying by manufacturer and style. Ceiling tiles should be of high (eighty (80) % minimum) light reflectance to enhance the lighting quality of interior spaces.

Painting and Coating

Paint should be non-toxic, lead and chromate free, and should not contain any of the EPA seventeen (17) chemicals. The selection of zero or low VOC products is required to eliminate problems with off-gassing.

Satin or semi-gloss enamel paint should be used on all surfaces and items normally painted. Flat finish paint is not acceptable.

Inside surface of wood cabinet drawers are to receive two (2) coats of clear sealer.

Top and bottom edges of wood doors should receive two coats of tinted sealer to aid visual inspection.

Plaster and Gypsum Board

All interior gypsum wallboard should be mold resistant.

All gypsum wallboard, regardless of location, should be not less than 5/8".

Tiling

The use of ceramic tile is encouraged for high profile/high use public areas, restrooms, shower and locker rooms or other spaces where a durable material is appropriate. Avoid dark colors and extremely light colors for tiles. Avoid white or light colored grout for floor applications.

All floor tiles should be non-slip and rated for heavy duty use.

Designs where floor and wall tile indicate a pattern of colors or a "mosaic" should be detailed in the drawings using specific tile sizes dimensions and notes to clearly indicate the extent and complexity of the pattern or "mosaic". Ceramic mosaic slip-resistant tile is appropriate and decorative for wet areas.

Design team needs to do adequate research for all tile or mosaic work on all open access walkways.

All floor tile grout should be sealed. In frequently wet areas such as showers, floor and wall grout should be sealed.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 9 APPENDIX

DIVISION 10 – SPECIALTIES

REQUIREMENTS

Take into consideration the need to design features to discourage roosting of bats, birds, etc. Should there be areas where roosting is a problem, deterrents need to be provided.

It is suggested that sloping roofs and leaf guards in gutters be used.

CORE ELEMENTS

Corner Guards

Provide corner guards on corners of corridor walls with heavy pedestrian traffic.

Flagpoles

Design team shall review with specific users/department whether a flagpole is desired and how that department will manage daily flag placement.

Due to maintenance issues, in-ground lighting should **not** be used unless no other solution is viable.

Mirrors

Mirrors shall have tamper-resistant mounting(s).

Specify 1/4-inch tempered flat glass with silver coating, copper protective coating and non-metallic paint coating.

Signage – Provide at a Minimum

Building Plaques – Obtain the standard Building Plaque template from the COSA Project Manager/Representative

Room Signage

Fire Exiting Signs

Building Signage

Exterior Monument Sign(s)

Toilet, Bath, and Laundry Accessories

Exposed materials shall be Type 304 satin finish stainless steel. Concealed material should be galvanized or stainless steel.

Water Bottle Refilling Stations

All facilities and parks shall include at least one water bottle refilling station. This may be a part of a water cooler/fountain, or stand-alone.

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 10 APPENDIX

DIVISION 11 – EQUIPMENT

GENERAL

CORE ELEMENTS

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 11 APPENDIX

DIVISION 12 – FURNISHINGS

GENERAL

Items such as blinds, shades, whiteboards, blackboards, bulletin boards and electronic boards should be specified by the design team and installed by a general contractor.

Furnishings must comply with COSA requirements in AD 1.10.

CORE ELEMENTS

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 12 APPENDIX

DIVISION 13 – SPECIAL CONSTRUCTION

GENERAL

Division 13 is intended for the AE to prepare construction documents and design requirements for special construction items and systems not specifically addressed in these Standards. This could include, but are not limited to: audio-metric rooms, clean rooms, isolation rooms, animal facilities, environmental structures, vaults, pools, green houses, and pre-engineered buildings.

The design requirements included in these sections address various elements of each individual project type that must be considered for the project as a whole. Other Divisions in these Standards must also be reviewed to provide a complete design.

CORE ELEMENTS

DEPARTMENT SPECIFIC REQUIREMENTS

Animal Care Services

Utilize most recent best practices for design of kennels and animal shelters.

San Antonio Police Department

Consider special design and construction requirements to accommodate service animals.

DIVISION 13 APPENDIX

DIVISION 14 – CONVEYING EQUIPMENT

GENERAL

CORE ELEMENTS

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 14 APPENDIX

DIVISIONS 15-20

Not used

DIVISION 21 – FIRE SUPPRESSION

GENERAL

The A/E is fully responsible for fire protection systems to include but not limited to: life safety, finishing rating, fire detection, fire suppression, location of fire extinguisher, means of egress, egress capacity, location of fire hydrants, fire mains, fire access to the facility, mass notification, evacuation plans, etc.. The system shall be designed by a qualified and experienced fire protection engineer (FPE).

All systems must be in compliance with the Texas Insurance Code and NFPA.

All new City buildings, regardless of minimum code requirements, must be provided with wet-pipe sprinkler fire protection systems throughout, except where disallowed by code or dry-pipe type is required for freeze or equipment protection reasons. All systems should be light hazard or greater, as may be required by code.

- Rated doors on hold-open devices must fail-safe to closed position when alarm system is activated.
- Monitoring and security system shall be linked with the alarm system where possible.
- Electrical equipment rooms are not required to be sprinkled when the room and equipment conforms to the requirements of NFPA 13. All materials shall be approved or listed by Underwriters Laboratories and/or Factory Mutual Laboratories.
- Compliance with Article 5.43.3 of the Texas Insurance Code and NFPA 13 is required.
- Hoses need not be installed unless specifically required by other NFPA Chapters.
- Grooved pipe is acceptable for fire protection systems.
- Provide insulation and heat tracing for fire protection piping in the crawl space.
- Specify galvanized or cad plated rods for sprinkler piping. Do not allow black iron rods or shot anchors for hanging sprinkler piping.
- Provide a cleaning specification for sprinkler piping.
- All sprinkler piping shall be schedule 40 pipe and fully reamed

CORE ELEMENTS

Designers, installers, and operation and maintenance (O&M) staff have struggled with the complexities and incompatibilities of multi-vendor fire systems. Therefore, COSA

requires fire systems that are characterized by the ability for any qualified entity to readily modify, operate, upgrade, and perform retrofits on the fire systems. The fire systems shall meet the following objectives:

- Permits multiple devices from multiple vendors to readily exchange information
- Provide the capability to easily replace any device with another device procured from multiple sources.
- May have proprietary components within devices, but these proprietary components must be a small percentage of the overall devices.
- The systems integrate multi-vendor.
- The fire system is one (integrated, multi-vendor) system where there is no future dependence on any one contraction/user interface that provides for or controls vendor.
- A user interface that provides for the same look and feel for monitoring and control regardless of which vendor's system or sub-system an operator is viewing. As a result, system operators need only become proficient with one user interface.
- The systems shall be inspected, tested, repaired, and maintained buy any contractor.

Fire Protection Basis of Design

The Basis of design is critical to the understanding of the designer's intent and methodology of design. Certain preliminary design information is critical to ensure the final documents are properly coordinated. The following is a guide to the minimum design analyses required at the earliest possible stage in design.

Provide a brief summary of the project scope of work.

Specific Hazards

Identify all hazardous areas (chemicals, fuels, ordnance, etc.), processes, and special hazards requiring special fire protection considerations such as Radio Frequency (R-F) Shielded Rooms, Secured Rooms, Computer Rooms, commercial kitchen appliances, etc. Provide any relevant information pertaining to the hazards and how they are protected. Include the information on the drawings.

Summary of Fire Protection Features

Provide a brief summary of the active and passive features of fire protection. Description and location of all new and existing fire extinguishing and/or detection systems, fire alarm systems, fire pumps to be provided or existing to remain or modified.

Summary of Existing Conditions

Provide a brief summary of existing conditions impacting the project, such as existing detection/suppression systems or existing building construction features.

Summary of Other Design Features

Provide a brief summary of the other features of the design relevant to the fire protection of the project. Examples of “other features” include methodology for foam waste containment for foam systems, structural engineering evaluation of existing floor systems supporting gaseous agent or foam concentrate storage tanks, etc.

Building Code Analysis

Include the following information: occupancy classification; height and area calculations (area per floor & total); type of construction; required building separation or exposure protection; rating of structural components; classification of interior finishes; location of fire-rated walls and partitions; description of construction; whether rated floor and roof assemblies are restrain or unrestrained; interior fire and/or smoke rated wall/partition requirements, fire rating of each floor, ceiling system, roofing system when applicable. Discuss if, and how the proximity to, and classification of adjacent structures factored into the analysis. Include the information on the drawings.

Life Safety Code Analysis

Identify egress information, including the occupancy classification, number of exits, type of exits, exit travel distance, total exit width, total occupant load, common path of travel, etc. Include the information on the drawings.

Water Supply Analysis

Provide a summary of the data obtained from the water flow test and determination of the adequacy of the water supply (even for facilities without sprinkler protection), along with sketches of the water distribution system. If fire flow demands cannot be met, cite the deficiencies and recommend design alternatives/solutions to correct the problem of an insufficient water supply (e.g., fire pump(s), and/or water storage tank(s), etc.). Include the information on the drawings and show the tested fire hydrant(s)

Hydraulic Supply Analysis

Evaluating the available water supply is critical for buildings with and without sprinkler protection. Documents cannot be released for advertisement with expectations of the contractor determining the available water supply. The capability of the water supply to support the required fire flow demand must be confirmed. The Fire Protection Designer of Record (FPDOR) is responsible for obtaining water distribution maps, establishing flow testing procedures and coordinating flow testing with the utility provider. The DOR must not, under any circumstance, rely on data from flow tests not supervised by an FPE. The FPDOR will be responsible for conducting the actual flow testing for facilities. The FPDOR must graph the results for comparison with the anticipated hydraulic demand. This analysis is required for both sprinklered and non-sprinklered facilities.

The A/E shall perform a fire hydrant test and the test shall be observed by FEP. The test cannot be more than six month old. Information from the test shall be provided to other disciplines to support the basis of design.

Water flow testing of the existing water supply system(s) is required to determine the capability of the available water supply to support the expected demands. Perform testing in accordance with FM Global Property Loss Prevention Data Sheet 3-0. Provide a fire protection water flow test report in the Basis of Design.

The A/E shall consider water surge as part of the design of the fire system

Minimum size for main piping supplying fire sprinkler systems must be 6 inches in diameter.

The design professional shall identify on the drawings all areas that may be classified as hazardous in accordance with the latest edition of the NFPA Codes or that may pose a health hazard due to noise levels, radiation, chemical fumes, etc. The A/E shall describe how each such area will be treated in the building design.

- Provide Battery Calculations
- Provide notification appliance circuit voltage drop calculations
- Provide other required calculation, such as line resistance calculation, where required

The design professional shall include in the Construction Documents the Fire Sprinkler System–Sprinkler Head and main header location, plans, riser locations and diagrams. Risers shall include sprinkler header take-offs with Fire Alarm points located. Drawing shall be laid out to allow for the addition at completion of construction as all as built header and branch piping to each sprinkler head.

Drawing Requirements (see NFPA standards and City Code for additional requirements)

The Code Compliance Summary Sheet must be prepared by the FPDOR and must immediately follow the title sheets.

Use legend and symbols in NFPA 170 for drawings and diagrams.

Provide symbols in accordance with NFPA 170 for fire prevention and visual alerting requirements.

Scale the floor plans so the entire footprint fits on a single sheet provided that all information is clearly legible and the scale is no smaller than 1/16-inch (1:200) with the exception of the Site Plan.

- Name of the protected premise, owner, and occupant
- Name of installer or contractor
- Date of issue and any revision dates
- Identification of any ceiling over 10 feet

Building Code Site Plan Sheet shall include but not limited to the following:

- Provide the information that is required by City of San Antonio Chapter 11 Fire Prevention Section 501.3.1 The Fire Protection Site plan shall be drawn to scale (no less than 1:60)
- Compass reading
- Property and/or lot lines
- Street frontages
- Line of encroachment identifying minimum separation distances from adjacent buildings and assumed property lines
- Building perimeter used for frontage increases
- Fire Department vehicle access to building
- Fire staff access to the building
- Location of all buildings (existing and proposed)
- Fire apparatus access roads (i.e., fire lanes) to buildings
- Fire lanes shall be highlighted and shall include dimensions (width, turning radii, clearance to overhead obstructions, etc.)
- Fences, gates walls, streams and other obstructions to firefighter access
- Location of all fire hydrants (existing and proposed). This shall include the direction and the distance to all hydrants not shown on the site plan, but within one thousand (1000) feet of the building to be protected
- Size (diameter and length) and locations of all fire main piping (proposed and existing). The pressure class and type of new pipe to be installed shall be identified
- The location, type, and size, of backflow prevention device, where installed
- Location of all automatic sprinkler and standpipe risers
- Location of Fire Department connection(s)
- Size, type, and location of valves including post indicator valve (if they are located in a pit), control room automatic sprinkler system shut-off, etc.
- Other water supplies
- Where required, type of protection from collision that may cause physical damage to fire protection equipment
- Fuel tanks and separation requirements
- Fire hydrant used for design to include the test information

Building Code Summary Sheet shall include but not limited to the following:

- Classification of occupancy
- Allowed vs. provided type of construction
- Basic allowable heights & areas vs. actual heights & areas
- Allowable vs. provided height and/or area increases per floor and total
- Calculations supporting height and area modifications/increases
- Required vs. provided exterior exposure protection
- Required vs. provided interior fire rated occupancy separations
- Required vs. provided internal fire area separations

Life Safety Code Sheet shall include but not limited to the following:

- Classification of occupancy - Building areas having different occupancy and hazard classifications
- Occupant load factor(s) and total calculated load. Required vs. provided load.
- Required vs. provided number of exits
- Required vs. provided capacity of means of egress
- Required vs. provided arrangement of means of egress including remoteness of exits, horizontal exits, travel distance, common path of travel, dead-end corridor lengths
 - Egress travel requirements (travel distances, common paths of travel, dead-end corridors, etc)
- Required vs. provided discharge from exits
- Required vs. provided fire rated separation of exits and exit access
- Flam spread/smoke development ratings of interior finishes
- Requirements (if any) for smoke control systems based on the specific occupancy chapter and building design considerations
- Requirements (if any) for smoke control systems based on the specific occupancy chapter and building design considerations
- Coordination with electrical engineer to determine type of electrical systems that need to be installed for hazardous location and other locations
- Partition locations with fire rated partitions and horizontal exits identified
- Room numbers, corresponding occupancy classification and calculated occupant load
- Rooms and/or areas requiring special life safety and/or fire protection features
- Fire Extinguisher cabinet and surface-mounted fire extinguisher locations
- Fire Extinguisher type/quantity table identifying the total number and type of extinguishers required
- Location of primary fire alarm control panel
- Storage shall be identify and the limitation for the storage areas

Fire Suppression Plan Sheet shall include but not limited to the following:

- Hazard classifications. Where a facility has multiple hazard classifications, differentiate each classification area by border and/or hatching
- Areas protected with special fire suppression systems
- Locations of sprinkler riser room
- Show the maintenance working area for the fire system – riser room and alarm room
- Fire department connections
- Post indicator valves
- Isolation control valves
- Sprinkler branch lines or feed main piping if a specific routing is required, i.e., single feed to computer room or elevator equipment room and hoist way
- Location of control panels used for release fire suppression systems
- Fire pump and associated equipment

- Hydraulic information

Fire Suppression Detail Sheet shall include but not limited to the following:

- Enlarged plan view of sprinkler riser room showing sprinkler risers, control valves, backflow prevention device and service entrance (supply) manifold drawn to scale
- Cross-sectional elevations of sprinkler and standpipe risers
- Enlarged plan view of fire pumps and piping arrangement, jockey pump, and associated controllers and equipment drawn to scale
- Releasing system riser diagram for pre-action or deluge sprinkler systems.
- Identify all zones, circuit inputs and circuit outputs necessary for controls, including interconnection with building fire alarm control panel
- Work service areas for all fire protection equipment
- Provide marking and labeling information

Fire Alarm Sheet shall include but not limited to the following:

- Provide floor plans identifying location of field installed components and interconnected devices. Plans may identify fire suppression control/release system information identified in the Fire Suppression Sheets.
- Control panel(s)
- NAC extender panels
- Radio transmitter or master box
- Line and low voltage surge arrestors
- All initiating devices (including duct smoke detectors)
- All notification appliances
- Supplemental equipment interfaced with the fire alarm system such as voice evacuation panels, electromagnetic door holders, delayed-egress or access-controlled doors, elevator system components, etc.
- Single station smoke detectors
- Supplemental fire suppression equipment control panels such as fire pump controllers, fire suppression control/release panels
- Interconnection to the Emergency and Standby Power System
- Classification of the Emergency Power Supply Systems. Coordinate information with the electrical Sheets

Fire Alarm Detail Sheet shall include but not limited to the following:

- Provide a riser diagram showing hierarchy, arrangement and zoning of the system.
- Do not identify every field device individually, such as smoke and heat detectors.
- Identify all typical circuits, interconnections and interlocks necessary for associated controls.
- Identify required line and low voltage surge arrestors.

- Interface with security systems for required delayed-egress or access-controlled doors.
- Identify interface with fire suppression control/release panels.

Specification and Other Requirements

Address installer and technician requirements:

Qualifications of the Installer: Prior to installation, submit data showing the Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a contractual agreement with a subcontractor having such experience. Include names and locations of at least two installations where the Contractor, or subcontractor, has installed such systems. Indicate type and design of each system and certify that each has performed satisfactorily as intended for not less than eighteen (18) months.

Qualifications of the System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in the fire protection certification program applicable to the work being performed. Submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings

Construction Surveillance: The FPE shall visit the construction site as necessary to ensure life safety and fire protection systems are being constructed, applied, and installed in accordance with the approved design documents, approved construction submittals, and manufacturer's requirements. Frequency and duration of the field visits are dependent upon particular system components, system complexity, and phase of construction. At a minimum, field visits shall occur just prior to installation of suspended ceiling system to inspect the integrity of passive fire protection features and fire suppression system piping, preliminary inspections of mass notification, fire alarm/detection and suppression systems, and final acceptance testing of mass notification (if applicable), fire alarm/detection and suppression systems.

Preliminary and Final Inspections and Acceptance Testing: FPE shall personally witness all preliminary inspections and testing of mass notification (if required), fire alarm/detection and suppression systems. Once preliminary inspections and testing have been successfully completed, the FPE shall submit a signed certificate to the City of San Antonio that systems are fully compliant and ready for final inspection and acceptance testing. The Contractor shall provide a minimum of 14 working days advance notice to the City of San Antonio to schedule the final inspection and acceptance testing with the activity Fire Inspection Office and the Fire Protection Engineer.

Final Life Safety/Fire Protection Certification Documentation

The FPE shall provide certification that all life safety and fire protection features and systems have been installed in accordance with applicable criteria, the contract

documents, approved submittals, and manufacturer's requirements. This certification shall summarize all life safety and fire protection features, and shall bear the professional seal of the fire protection engineer.

Piping & Drainage

Clean, pretreat, and prime all piping. Paint all sprinkler piping with one coat of red alkyd gloss enamel. Identify piping every 10 feet (Fire Riser or Fire Branch).

Piping in finished areas that do not have sprinklers directly connected them may be painted to match adjacent surfaces, provided piping is identified by painting two (2)-inch wide red alkyd gloss enamel bands every ten (10) feet and on both sides of wall, ceiling, or floor penetrations.

Subject to approval by the City of San Antonio, painting all pipe fittings in finished areas with red alkyd gloss enamel may be considered an acceptable alternative to painting bands.

Hydraulic calculations must include a minimum pressure drop across backflow preventers of 12 psi, or the actual pressure drop, whichever is greater, regardless of type or size.

Secure all post indicator valves (PIVs) with a lock. Do not supervise PIVs with tamper switches.

Locate backflow preventers in the building or within a heated enclosure if freeze protection is necessary. Heat trace must not be used. Provide a low temperature supervisory alarm connected to the building FACP for heated enclosures.

Locate backflow preventer assemblies no greater than thirty-six (36)-inches and no less than thirty (30) inches, measured from the bottom of the assembly, above finished floor.

Terminate all drainage piping or test piping from the fire pump or associated appurtenances (i.e., circulation relief valve, bowl drains, etc.), including backflow preventers, to the exterior of the building so it will not cause damage. The discharge shall not create an erosion problem. Discharge to the exterior must not interfere with exiting from the building. Water discharge must not cross an exit or exit discharge.

Drainage piping of less than $\frac{3}{4}$ -inch may discharge to a floor drain. The line discharging to the floor drain shall be center to the floor drain and a minimum clearance of three (3) inches from the outside of the pipe to the inside edge of the floor drain shall be provided.

Provide concrete splash blocks at main drain and inspector test connection discharge locations if not discharging to a paved surface. Protect outside ground and foundation from erosion.

Provide all equipment, i.e., control valves, backflow preventer, check valves, floor control valve assemblies with a minimum clearance of three (3) feet.

Do not provide side outlet tees using rubber gasket fittings.

Thrust rod and sleeve all pipe penetrations of grade floor slab.

Any drains, test connection pipe, etc that penetrate the exterior wall must do so not greater than two (2) feet above finished grade.

The drain/test connection must be piped to a location that will accept full flow and will not cause property damage when water is discharging. Discharge to any sink is not acceptable.

To facilitate testing, provide a permanently piped drain/test connection for each flow switch.

System Valves

Provide floor control assemblies at each respective floor.
Identify valves through the facility.

Provide valve operation during normal condition and emergency condition.

The floor control valve assembly must consist of a control valve, check valve, water flow switch, drain/test connection, gauges, and must be electrically supervised.

Provide a separately zoned control valve assembly for piping serving Elevator Machine Rooms, Computer Rooms, Laboratories, and similar rooms that require shunt-tripping of equipment simultaneously to the application of water. Locate the zoned control valve assembly outside of the area it serves in an easily accessible identified location.

Provide valve tamper switches (with tamper proof covers) for all normally open sprinkler system control valves, including isolation valves on backflow preventers.

Fire Alarm Control Panel

Provide addressable, site programmable fire alarm systems. At a minimum, provide the fire alarm control panel (FACP) with the following features:

The ability to store at least four-hundred (400) events in the history log. These events must be stored in a non-volatile memory and remain in the memory until the memory is downloaded or cleared manually.

Resetting of the control panel must not clear the memory from being retrieved on the integral LCD display.

An integral LCD 80 character (minimum) alphanumeric display.

Provide all smoke detectors connected to the FACP with an adjustable alarm verification feature. Initially set the alarm verification at twenty (20) seconds.

FACP cabinets located in public spaces must be recessed and not be aesthetically obtrusive.

Locate the FACP and supplemental control panels in a year-round conditioned space within the building.

Locate Notification Appliance Circuit (NAC) extender panels in electrical rooms on each floor.

Locate panels less than five (5) feet above the finished floor, measured to the centerline of the panel.

Each extender panel must be individually addressed.

Provide a remote annunciator at the designated primary entrance unless directed otherwise.

Control functions must be accessible only by user code or secured behind a locked panel.

Provide panel in the manufacturer's NEMA 4 enclosure for panels subject to water spray/runoff under normal operating conditions and/or located in damp/dirty locations or, relocate to a suitable dry location.

Conduit must not enter the top of a control panel cabinet for enclosures requiring a NEMA 4 designation.

Wiring, Circuits and Conduit

Paint all fire alarm junction boxes and covers red in unfinished areas (i.e., above ceilings, mechanical rooms, etc). In finished areas, conduit and junction boxes can be painted to match the room finish, the inside cover of the junction box must be identified as "Fire Alarm" and the conduit must have painted red bands $\frac{3}{4}$ -inch wide at ten (10) foot centers and at each side of a floor, wall, or ceiling penetration.

All terminations must be at a terminal strip.

All devices must have screw terminals.

Pull all conductors splice free. Where splices are unavoidable provide insulated barrier type terminal strips at junction points. The use of wire nuts, crimped connectors, or twisting of conductors is prohibited.

Run all wiring to control panels in the vertical or horizontal plane, make all turns at 90 degree angles, and tightly bundle and wrap all wire.

Identify all conductors individually with permanent markings.

Install all wiring in metallic conduit.

All wiring must be solid copper, except for speaker circuits or circuits requiring shielding.

All signaling line and initiating device circuits must be minimum sixteen (16) gauge wire.

Initiating device circuits used for flame detection devices must use shielded cable.

Air Handling Equipment

Provide access doors in finished ceilings at all fire damper locations. Size the access door to allow physical access to the duct.

Protect duct through-penetrations of fire rated partitions having a fire resistive rating of less than two (2) hours with fire stop systems listed/approved for the particular opening size and duct assembly. If a listed/approved fire stop system is not available for the particular assembly, protect the opening with a fire damper.

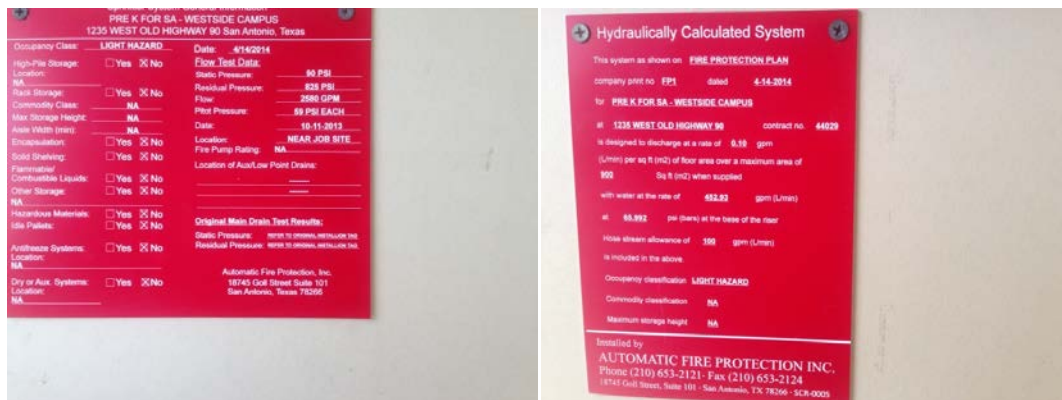
Fire Wall Identification

Identify all fire rated walls with signs stating the following: "Fire Wall Do Not Penetrate." For aesthetic reasons, this requirement does not apply to walls inside stairwells or public areas such as offices, lobbies, corridors, etc., that do not have drop ceilings. In areas with drop ceilings, paint notification on the wall above the drop/finished ceiling. In mechanical, electrical and other similar rooms, place signs at eight (8) feet above finished floor level. Space signs at a maximum of ten (10)-foot intervals. In rooms with raised flooring, place signs on fire walls under the floor with spacing of signage reduced to five (5) foot intervals. Apply signs using florescent red or orange paint over stencils. Letters must be a minimum of four (4) inches in height. Metal, plastic or paper decal signs are not acceptable. Take care when applying signage to prevent over-spray onto adjacent finishes.

Spray Applied Fire Proofing

Obtain the rating of the floor/ceiling and roof/ceiling assembly without the underside of the deck having spray-applied fireproofing. Only columns, beams, and trusses may receive spray-applied fireproofing.

Label all fire equipment and other fire protection information. Below are acceptable methods of labeling fire equipment and other fire protection information.







Unacceptable labeling for equipment. Information shall not be erasable and it shall be readable.



Fire Department Lock Box

Key Boxes shall be installed on all new buildings or buildings being renovated that do not currently have a key box. The key box shall be located at or near the primary fire department access at eight feet (8') above the finish elevation. The approved San Antonio Fire Department key box shall be a "Knox Box."

Portable Fire Extinguishers and Cabinets

Portable fire extinguishers and cabinets shall be installed in accordance with the requirements in the IFC.

In office buildings protected throughout with quick response sprinklers, fire extinguishers shall only be installed in areas such as mechanical and elevator equipment areas, computer rooms, generators rooms, kitchen areas, special hazard areas, etc.

Final Life Safety/Fire Protection Certification Documentation

The Fire Protection Engineer (FPE) shall provide certification that all life safety and fire protection features and systems have been installed in accordance with applicable criteria, the contract documents, approved submittals, and manufacturer's requirements.

This certification shall summarize all life safety and fire protection features, and shall bear the professional seal of the fire protection engineer.

Portable Fire Extinguishers and Cabinets

Portable fire extinguishers and cabinets should be installed in accordance with the requirements in the IFC.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 21 APPENDIX

DIVISION 22 – PLUMBING

GENERAL

The City's goal in the design of plumbing systems serving their facilities is to select systems and equipment that are appropriate to the type of space served; give maximum value for their initial costs; and are cost-effective to operate, maintain, and repair; and support the sustainability policies of the City.

Plumbing systems must be designed and installed in accordance with the IPC. Inspection and testing of the plumbing system should be performed as prescribed in the IPC. The plumbing system should conform to the applicable rules of the IPC, governing back venting of plumbing fixtures, clean outs, sizing of waste, vents, drains, and water systems.

It is the designer's duty to coordinate all other specifications with plumbing systems and other equipment. Avoid conflicts with other disciplines and building features.

The consultant's documents should be complete for the specific project. References to other drawings and specifications are not acceptable except for nationally and locally accepted industry standards and codes.

CORE ELEMENTS

A/E should provide the following calculations:

Domestic Hot Water: Calculate the hot water storage and demand requirements of the facility. Indicate the basis for the calculations including the incoming and storage water temperatures, the facility type, fixture types, fixture quantities, and the demand and storage factors.

Domestic Water Pressure Calculation: Determine the sufficiency of the water pressure available at the building to meet the required minimum fixture outlet pressure. Provide detailed pressure loss calculations including losses attributed to meters, fittings, pipe, backflow preventers, and pipe risers.

Domestic Hot Water Recirculation: Reference the plumbing code by which the domestic hot water recirculation rate is calculated. Calculate the recirculation rate and recirculation pump head.

A/E should incorporate water conservation in the design.

The plumbing system should be designed around low water consumption fixtures. All specified fixtures, hardware, and trim must conform to the requirements of the International Plumbing Code (UPC).

No more than 0.5 gallons of water may be stored in any piping or manifold between the hot water source (i.e., water heater or recirculation loop) and any hot water fixture. To account for additional water that must be removed from the system before hot water can be delivered (i.e., water stored in the fixture itself or water that cools off while moving from the heater to the point of use), no more than 0.6 gallons of water may be delivered to a fixture before hot water arrives.

Recirculation systems must be demand-initiated. They may not be solely timer- or temperature-based.

A/E should include protection of building elements in the design:

No plumbing system components may be installed within any Air Handling Unit, ductwork, or room used as a plenum conveying supply air, return air, outside air, or mixed air. This should not prohibit connection of AHU components, such as humidifiers, to the water supply system, nor prohibit connection of trapped condensate pans and humidifier drains indirectly to the drainage system. This will also not prohibit plumbing system components in ceiling spaces used as return air plenums, nor prohibit drains in raised floor supply plenums.

Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation should be used.

Neither water nor drainage piping should be located over electrical wiring, computer, or equipment unless adequate protection against water (including condensation) damage has been provided. Insulation alone is not adequate protection against condensation. Chilled water piping, domestic water piping, sanitary drains, roof drains, gas lines, fuel lines, steam lines, water mains, and other utility lines not serving the electronic equipment area are prohibited from electronic equipment, kitchen area, and record storage areas.

Waterproof floor above each of the electronic, record storage, and kitchen rooms.

The A/E should limit the flow velocity in the design to reduce noise, prevent corrosion, and water hammer:

- Velocity for cold water should not exceed seven (7) feet per second.
- Velocity for hot water should not exceed five (5) feet per second for water temperature of 140 F and less.
- Velocity for hot water should not exceed three (3) feet per second for water temperature greater than 140 F.
- For pipes ½-inch and smaller, use lower velocities to guard against localized high velocities.

The A/E is responsible for providing a design that does not have cross connections. Identify any cross connection device preventers on drawings.

Select plumbing material based on soil and water analysis information.

The roof drain system should be designed per IPC. The size of the vertical conductors and leaders, building storm drain (if applicable), building storm sewer (if applicable), and any horizontal branches of such drains or sewers should be based on the one-hundred (100) year hourly rainfall rate. The gutter must meet Architectural Sheet Metal Manual by Sheet Metal and Air Conditioning Contractors' National Association. The roof drain must also meet the requirements of ASME A 112.21.

Basic Design Requirements

Identify piping and valves. Piping and valves should be located to minimize exposure of water and other listed hazards to a functional area of the facility to include computers, electrical systems, and others.

Concealed piping and valves should be accessible for maintenance and repairs.

Identify potable, non-potable water, natural gas, and other plumbing systems in the specification in accordance with ASME 13, ANSI 13, and ANSI Z 535 and safety regulations.

The City may allow proprietary components within plumbing equipment, but these proprietary components must be a small percentage of the overall devices.

The system should be designed to minimize interruption of services.

Design plumbing system to mitigate corrosion of materials. All connections between dissimilar materials in the piping system should be made with dielectric unions or couplings.

Valves and equipment must be accessible and have sufficient clearance from other equipment for maintenance.

The system should provide the capability to easily replace any valves and plumbing equipment with another device procured from multiple sources.

The plumbing system should be designed around low water consumption fixtures. As possible, provide automatic flush valves for water closets and urinals. Sinks must include automatic sensors.

Plumbing system components should not be installed within any Air Handling Unit, ductwork, or room used as a plenum conveying supply air, return air, outside air, or mixed air. This will not prohibit connection of AHU components, such as humidifiers, to the water supply system, nor prohibit connection of trapped condensate pans and humidifier drains indirectly to the drainage system. This will also not prohibit plumbing system components in ceiling spaces used as return air plenums, nor prohibit drains in raised floor supply plenums.

Easy access shall be provided to all working parts of all plumbing devices. Items of plumbing requiring periodic maintenance or repair should not be permanently sealed in masonry walls.

All toilet rooms are to be equipped with at least one floor drain. Drains are to be furnished with trap primers.

All janitors' closets should be arranged with the sink near the door and a floor drain in the room.

All mechanical rooms containing air conditioning equipment shall have a floor drain. Do not locate floor drains under machinery. Floor drains should be four (4) inches minimum in size, with a deep seal and connected with trap primers.

Pipes penetrating exterior walls below grade must be installed so as to prevent breakage due to building settlement and to maintain a watertight seal.

Drinking fountains are to be electric, wall type, surface mounted into a wall recess thirty (30) inches wide x fourteen (14) inches deep, except where ADA requirements dictate a different configuration. Do not construct fountains into the walls so that a building alteration is required in the event an exact duplicate is not available.

Gas lines should be of a welded black steel construction up to emergency shut-off valves within reach of occupants. Gas lines from emergency shut-off valves to lab tables or appliances may be screwed if not larger than 3/4 inch and if they are exposed. Gas lines should be installed as exposed below ceilings throughout a building.

Waste lines from lavatories or any other fixtures should not be on arms. The waste should discharge directly into a stack directly behind the fixture. Back to back lavatories are permitted if connected to sanitary taped crosses. Straight taped crosses will not be permitted.

Floor drains must be four (4) inches in size serving an eighty (80) or larger square foot area. Smaller areas should contain three (3) inch or two (2) inch floor drains as required.

Vent pipes should be carried up adjoining soil and waste pipes, and they should be connected into the main stack at top and bottom. Vents may be one size smaller than the traps they serve, except that no vent should be less than 1-1/2 inches. The size of vent lines accommodating more than one fixture must be sized in accordance with the International Plumbing Code.

Roof drains should be run separately from all other storm water sources to a manhole outside the building. Downstream from this manhole, the piping should be sized sufficiently large to prevent roof drain water from impeding the proper flow from area drains. All piping dropping more than fifty (50) feet should be welded construction.

Neither water nor drainage piping may be located over electrical wiring, computer, or equipment unless adequate protection against water (including condensation) damage has been provided. Insulation alone is not adequate protection against condensation.

Chilled water piping, domestic water piping, sanitary drains, roof drains, gas lines, fuel lines, steam lines, water mains, and other utility lines not serving the electronic equipment area are prohibited from electronic equipment, kitchen area, and record storage areas.

Pressure piping, including gas piping, should not be located under slabs within buildings. Where such placement is unavoidable, the piping must be run in a sleeve and vented at each end so that leakage can be channeled off without pressurizing the underside of the slab.

Piping should not be run in concrete floors. Piping should not be buried beneath the lowest floor level with the exception of soil pipe.

At every point where piping and ductwork penetrate a floor slab, except slabs on grade, a cast-in sleeve or other waterproof curbing at least two (2) inches high should be provided.

All air conditioning unit chilled water coils should be provided with control valves, either of the 3-way or 2-way type as required by the system. No wild coils will be permitted. 2-way valves are preferred except as required at the end of a main to maintain flow through the system and/or pumps.

All condensate piping should be designed to flow by gravity back to condensate receiver. Traps are not to kick or lift condensate up.

Gas regulator vent should be located a minimum of thirty-six (36) inches from electrical equipment. Locate in Utilities section

Fixtures, equipment, and piping: Fixtures, equipment, and piping material should be compatible with the life of the structure.

Piping and Valves arrangement: Piping and valves should be identified. Concealed piping and valves should be accessible for maintenance and repairs

Reliability: Systems should be designed to provide the greatest reliability as possible.

The plumbing system should be designed to mitigate corrosion of materials.

Valves and equipment should be accessible and should have sufficient clearance from other equipment for maintenance.

Number each valve and provide the function of the valve. Identify the location of the valve in the ceiling grid.

Provide a facility layout in the mechanical room that identifies all valves and plumbing equipment.

Equipment Schedules

Include equipment schedules on the drawings. The following are typical schedules and data provided on these schedules:

Hot water circulating pumps: (a) Capacity in gpm; (b) Total head in feet; (c) minimum horsepower; (d) Volts, phase, hertz; and (e) RPM.

Ejector or sump pump: (a) Capacity in gpm; (b) total dynamic head in feet; (c) Minimum horsepower (d) Volts, phase, hertz; and (e) RPM.

Water heater: (a) Heating capacity in gph; (b) Temperature rise in degrees Fahrenheit (F); (c) Storage capacity in gallons; (d) Energy Factor (defined by Gas Appliance Manufacturers Association (GAMA)); corrosion protection equipment; and type of heater.

Hot water storage tank: (a) Dimensions; (b) capacity in liters (gallons); and (c) minimum insulation.

Hot water generator: (a) Dimensions; (b) Storage capacity in liters (gallons); (c) Heating surface area; (d) Design pressure; (e) Heat source (i.e. steam, HTHW, natural gas,

electric); and (f) GPH @ entering water temperature and leaving water temperature. SEE DIVISION 22 APPENDIX.

Drinking water dispenser: (a) Cafeteria: Type, size; and (b) Electric drinking water cooler: Type, size. (Note: Water coolers must use HFC refrigerants.).

Grease interceptor: (a) Fat capacity in pounds; (b) Flow rating in gpm; and (c) Maximum leaving water grains (ppm).

Reverse osmosis water treatment equipment: (a) Minimum flow rating in gpm; (b) Design and operating temperature in ° F; and (c) maximum leaving water grains (ppm).

Water softening treatment equipment: (a) Minimum flow rating in gpm; (b) Grains (grams) hardness to which water is to be softened; (c) Amount of water metered in gallons to start automatic regeneration of a softener unit.

Booster pump (a) Capacity in gpm; (b) total head in feet; (c) minimum horsepower; (d) Volts, phase hertz; and (e) RPM.

Show calculation on the drawings to include roof areas, wall areas, and rainfall rate in inches per hours.

Location of drain pipes and floor drains should be detailed in the drawings. The drawing should include the information in the diagram (source 2009 National Standards Plumbing Code).

Include Hot water Volume Calculations in drawings for trunk and branch system Construction/Installation Requirements.

Access to all sections of the roof should be provided. The A/E should try to keep all roof sections at same elevation.

Place required expansion joints at a high point of the roof, with drainage diverted away from the joint.

Do not use an internal roof drainage system. Internal roof systems are susceptible to roof collapses due to rain water accumulation and system failure resulting in interior damage. A built-in gutter system where drainage passes through interior spaces or is concealed in the exterior wall cavity is prohibited.

The design should provide leave guard system for gutter.

Provide a clean-out for each downspout connection to underground collection system. Locate cleanout on the roof leader. Do not reduce the pipe size in the direction of flow. Rain water is coming out of the joint due to the reduction in side of the roof leader and obstruction on the line. The roof leaders do not have cleanouts.

Recommended transition from roof leader to the storm water collection system.

Provide cleanouts before going underground.

The roof leaders should discharge into the storm water system during all flow conditions. System should be designed for the required flow (collection grade is too small). The systems below do not meet the City of San Antonio standards.

Do not restrict the water flow from the roof leader. The roof should drain ten (10) feet from the building wall into the storm water system or the ground. The system below does not meet the City of San Antonio standards.

Center clean out on slab between joints. Provide additional steel reinforcing around plumbing opening.

Drain pipe and floor drains are unacceptable. Pipe is a walking hazard and most floors do not have sufficient slope in the direction of the floor drain.

Provide three (3) inches between the outside of the pipe group and the inside edge of the floor drain to prevent splashing of water

Drain pipe support should not cut into the wall.

Center Drain Pipe: This type of floor drain with cover should be used for all floor drains.

Use access panel or other method to cover cleanouts. Locate cleanout a minimum of thirty-six (36) inches from the wall. All penetration should be sealed to prevent potential pest problems.

Provide the correct size of the escutcheons.

Identify all piping as required by Code.

Grease Removal Equipment should be outside of the facility.

Provide temperature gauge on the return line. Provide pressure gauges in the suction and discharge side of pumps. Provide working space for backflow and pump.

Use pipe sleeve thru foundation walls and building walls.

Examples of Equipment and Fixtures:

- Koehler (and equivalent) for toilets, sinks and urinals
- Sloan (and equivalent) for flush valves for toilets and urinals
- Symmons (and equivalent) for shower valves
- Rheem or A.O.Smith (and equivalent) for water heaters - gas water heaters are preferred; faster recovery time and energy saving
- Sprinkler Controls Weathermatic or Rain Bird (and equivalent).

- T&S (and equivalent) for mop sink faucets

Plumbing Basis of Design

The design analysis should include at a minimum the following items:

- Plumbing fixture determination, listing quantity and types of fixtures
- Building population (number of males and number of females)
- Fixture units for drainage, venting, cold and hot water piping
- Roof areas used in determining storm drainage pipe sizes
- Capacities of all equipment and tanks

Show calculations clearly so that any changes that become necessary during construction or resisting are made efficiently. When tables used in the design are taken from publications, indicate the title, source, and date of the publication. Provide the model number and manufacturer of each major piece of equipment for which space was allocated.

Plumbing Drawings

Coordinate drawings with other disciplines. The drawings must be accurate and to scale, showing fixtures, equipment, and piping in their proper locations.

Provide large-scale details of congested areas on the drawings, with dimensions locating all work relative to structural features of the building.

Show riser diagrams of soil, waste, drain, and vent stacks and water risers for all buildings in excess of one story.

Plumbing riser diagrams must be drawn with one for each riser on the project. The risers must show all piping from the under-floor through the roof.

Cleanouts should be shown on plans and on riser diagrams.

Calculate the grade of drain lines and establish invert elevations.

Provide each set of drawings with a legend covering symbols and abbreviations as indicated in ASHRAE Handbook, Fundamentals. Where practical, group all notes, legends, and schedules at the right of the drawings above the title block.

Unless directed otherwise, graphic symbols must be in accordance with ASME Standard Y32.4, Graphic Symbols for Plumbing Fixtures for Diagrams Used in Architecture and Building Construction. SEE DIVISION 22 APPENDIX.

Sedimentation and Corrosion Material in a New Piping System

The A/E is responsible for checking the water quality and the plumbing equipment requirements. Several water heater manufactures would not provide a warranty if the water quality is outside of the manufacture's standards. For example:

Corrosion damage and heater failures resulting from pH levels of lower than six (6) or higher than eight (8) are not covered by the warranty.

Total dissolved solids in excess of two thousand (2,000) ppm will accelerate lime and scale formation in the heat exchanger. Heat exchanger failure due to total dissolved solids in excess of two-thousand (2,000) ppm is a non-warrantable condition.

If water hardness exceeds the maximum level of seven (7) grains per gallon (120) ppm, the water should be softened to a hardness level no lower than five (5) grains per gallon (85.5 ppm).

Water softened as low as zero (0) to one (1) grain per gallon (17.1 ppm) may be under saturated with respect to calcium carbonate, resulting in water that is aggressive and corrosive.

A/E must require the identification of potable, non-potable water, natural gas, and other plumbing systems in the specification in accordance with ASME 13, ANSI 13, and ANSI Z 535 and safety regulations. REFER TO DIVISION 22 APPENDIX.

Soil Corrosivity Information

Provide information on the water quality from the utility system and number of water quality complaints to the water utility company from facilities within one (1) to two (2) miles from the proposed building.

Information on the utility lines should include material and year of construction within one (1) to two (2) miles from the proposed building.

Use only dielectric union in all dissimilar metals and test all unions. A/E should include these requirements in the drawings.

The A/E is required to check the corrosivity and scale forming tendency of the water supply. Material selection should take into consideration corrosivity and scale forming tendency of the water supply and soil corrosivity.

This installation did not use a dielectric union between the backflow and the galvanize pipe:



Water Analysis

Water analysis should include the following parameters as minimum: Water Temperature (C), Total Alkalinity, Phenolphthalein (P) (as CaCO₃), Methyl Orange (M) (as CaCO₃), Aluminum (as Al), Calcium (as Ca), Dissolved Oxygen (as O₂), Dissolved Carbon Dioxide (CO₂), Chloride (as CL), Conductance (specific) (as micromhos at 25 C), Copper (as Cu), Hardness (Total) (as CaCO₃), Iron (as Fe), Magnesium (as Mg), Manganese (as Mn), Nitrate (as NO₃), pH (prior to any recarbonation), Phosphate, Orthophosphate (as PO₄), Polyphosphate (Metaphosphate) (as PO₄), Organic Phosphate (PO₄), Total dissolved solids on evaporation at 180 C, Suspended solids, non-filterable, Silica (as SiO₂), Sulfate (as SO₄), Zinc (as Zn), Water Temperature (C), pH, Chlorine, free (as CL₂), Chlorine, Total (as CL₂), Microbial testing.

Water Service

Unless directed otherwise, place the following note on the applicable drawing: "Water pipe sizes are based on a minimum working pressure of a ____ psig at a flow rate of ____ gpm at the location where the main service enters the building." When water pressure is not known, assume pressure to be the pressure that will not exceed the required minimum residual pressure, plus allowances for pressure due to friction and pressure required for elevation of the highest water outlet.

Provide pressure information, flow rates, water supply fixtures, piping material, valves, gauges, temperature, and other information in the riser diagrams.

DEPARTMENT SPECIFIC REQUIREMENTS

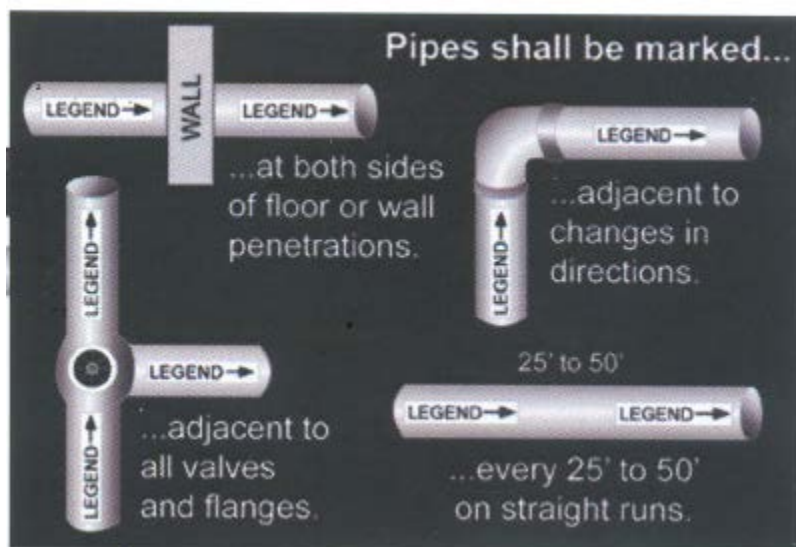
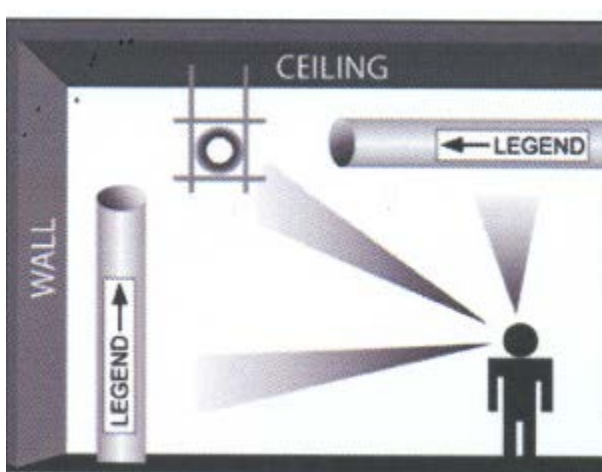
(None)

DIVISION 22 APPENDIX

1. Piping identification

Pipe Type	Color Field	Colors of Letters or Legend
Potable Water	Green	White
Non-Potable Water	See SAWS	
Cold Water	Green	White
Hot Water Supply	Yellow	Black
Hot Water Return	Yellow	Black
Sanitary Drain	Green	White
Plumbing Drain	Green	White
Plumbing Vent	Green	White
Waste	Green	White
Waste corrosive	Orange	Black
Storm Drain	Green	White
Roof Drain	Green	White
Compress Air	Purple	White
Fire Lines	Red	White

FLAMMABLE	<i>Black on Yellow</i>	→HYDROGEN→
Fluids which are a vapor or produce vapors that can ignite and continue to burn in air		
COMBUSTIBLE	<i>White on Brown</i>	→ACETIC ACID→
Fluids that may burn but are not flammable		
TOXIC & CORROSIVE	<i>Black on Orange</i>	→NITRIC ACID→
Fluids which are corrosive or toxic or will produce corrosive or toxic substances		
FIRE QUENCHING	<i>White on Red</i>	→HALON→
Water and other substances used in sprinkler fire-fighting piping systems		
OTHER WATER	<i>White on Green</i>	→BOILER WATER→
Any other water, except for water used in sprinkler and fire-fighting piping systems		
COMPRESSED AIR	<i>White on Blue</i>	→COMPRESSED AIR→
Any vapor or gas under pressure that does not fit a category above		



2. Recommended transition from roof leader to the storm water collection system.



3. Provide cleanouts before going underground.



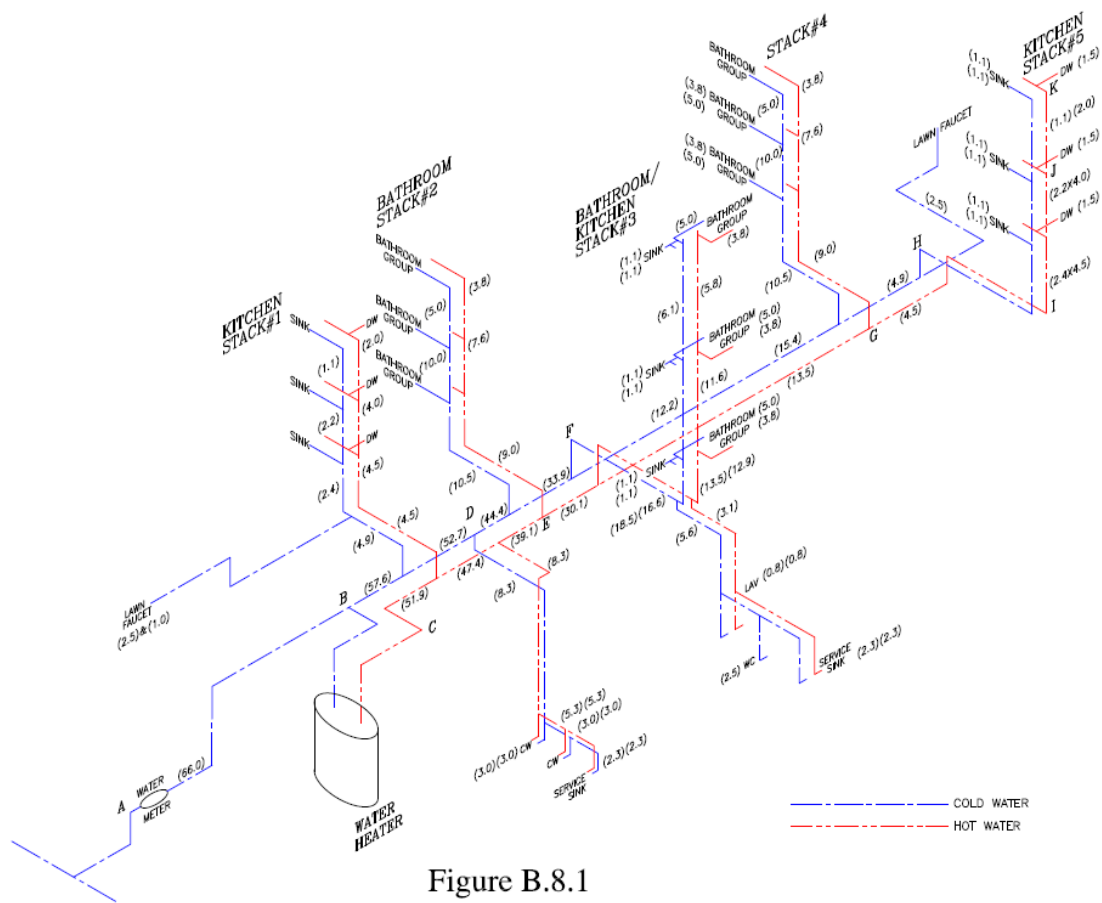
4. Use access panel or other method to cover cleanouts. Locate cleanout a minimum of thirty-six (36) inches from the wall. All penetration shall be sealed to prevent potential pest problems.



5. Provide all equipment, i.e., control valves, backflow preventer, check valves, floor control valve assemblies, with a minimum clearance of three (3) feet from all equipment, walls and structural elements.



6. Water Supply Fixture Units



7. Design Flow and Pipe Sizes

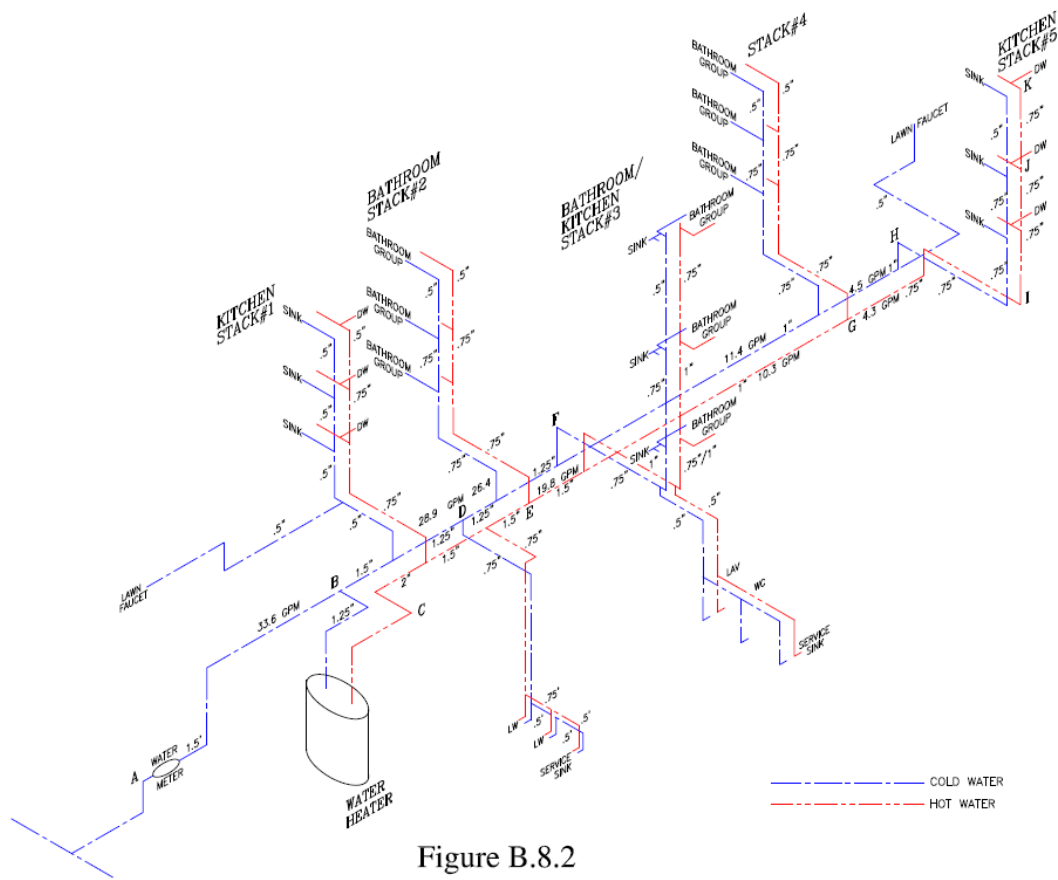


Figure B.8.2
DESIGN FLOW(GPM)AND PIPE SIZES

8. Hot Water Volume Calculation

Fixture	Pipe segment	Pipe Diameter (in)	Water Capacity in ounces per feet	Pipe length (ft)	Water Volume in gallons (gal)
Sink 1	1				
	2				
	3				
Total Hot Water Volume					
Shower	1				
	2				
	4				
	5				
Total Hot Water Volume					
Hot Water Wait Time					

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

GENERAL

The design of the mechanical system and other building components are to be integrated to produce a building that meets the project programmed functionality, sustainability and energy requirements. The equipment should be compatible with the life of the structure.

The design of HVAC systems to maintain noise levels below those recommended for the proposed occupancy in accordance with the ASHRAE Handbook and SMACNA guidelines. Preferably, locate sound sensitive rooms away from air handlers and mechanical equipment.

The system should be designed to minimize interruption of services.

Outdoor air intake openings must be located a minimum of ten (10) feet horizontally from any hazardous or noxious smells or exhausts to include sewer vents.

All HVAC equipment should be located to minimize exposure of water and other listed hazards to functional area of the facility to include computers, electrical systems, and others.

Condensing units should be located and/or screened in a manner which minimizes visual impact.

Consider the use of passive heating and cooling methods to increase energy conservation. Spaces should be ventilated in accordance with the International Mechanical Code.

An interior environment with a variable temperature range between 68° to 75° Fahrenheit is typically desired. Design the heating, ventilation, and air conditioning (HVAC) system accordingly to achieve this temperature range, especially in areas which contain a large number of heat-producing equipment or computer workstations.

The system should have a master set point that can be used, as well as individual set points that can be used to override an individual room as needed. Design the HVAC system so that excessive air flow or equipment noise within one space should not intrude into adjacent spaces.

The City may accept some proprietary HVAC components, but these proprietary components must be a small percentage of the overall devices. If there is equipment from multiple vendors, the equipment must be able to readily exchange information

through acceptable BACNet protocol. Specified and approved HVAC equipment vendors should have a “brick and mortar” store or distribution center within fifty (50) miles of Bexar County that carries normal replacement parts in stock.

The design of HVAC systems should be as such to maintain noise levels below those recommended for the proposed occupancy in accordance with the ASHRAE Fundamentals Handbook and SMACNA guidelines.

Use of air cooled chillers is recommended on units below two hundred and fifty (250) tons.

All coils must be ARI rated. Cooling coils should have copper fins; if spiral wound, they should be solder dipped. All strainers should have blow-down valves with 3/4” hose end connections.

All ductwork shown on plans should be indicated as clear air stream size. Ducts should be shown in two dimensions to scale with fittings, dampers, splitters, outlets and offsets clearly illustrated. Include large scale details of duct fabrication where necessary to show construction methods.

The City will contract for TAB (HVAC Testing and Balancing) and Commissioning services separately from the construction contract. The A/E Consultant should provide for the contractor coordination as required. All commissioning of HVAC equipment should utilize “real world” testing (example: pump failure, lead/lag switching) should be done through power interruption to equipment, not the BAS.

Combinations of mechanical rooms and janitor closets, or mechanical room with storage spaces, are not acceptable.

CORE ELEMENTS

Access and Serviceability

When locating equipment, consider ease of maintenance and provide minimum clearances as recommended by the equipment manufacturer.

Passageways around all sides of boilers, air handling units, and chillers must have an unobstructed width of not less than four (4) ft. and the floor is to be marked showing the required service working area.

Equipment rooms must be large enough to provide access to all equipment for maintenance and a means to remove and replace equipment. Adequate “pull spaces” should be provided for coils, shafts, filters, etc.

All air handling equipment shall be installed so that bearings can be replaced without equipment demolition and be serviced through hinged access doors.

Access should be provided to mechanical room spaces without going through any assigned area such as a janitor closet.

Each component of an air handling system should be spaced in the unit so that there is ample room on all sides for inspection and maintenance and man-sized, hinged access doors should be provided for ready access to these spaces.

Mechanical equipment should be ground mounted outside or located within the building. It is preferable that equipment be located in hallways, exterior mechanical closets, mezzanines, or a mechanical yard in order to facilitate servicing equipment without moving furniture or disrupting staff.

Roof-mounted equipment is not preferred, this should be evaluated on a project by project basis, specifically where cost is a major challenge, space limitations, etc.

Provide a level mechanical area/slab. On sloped roofs with a 3:12 pitch or more, a level platform and guards are to be installed (IMC 306.5.1).

Walkways shall be provided to roof-mounted equipment so it may be serviced without walking/traffic directly on roof.

Roof-mounted equipment should be accessible by a stair. Hatches without stairs or use of external ladders are not acceptable.

If equipment must be concealed it should be accessible for maintenance, repairs and replacement. Equipment located above a finished ceiling should have adequate ceiling access panels or other means of access to equipment for maintenance and removal.

Except for lift out ceiling installation, all access panels should be hinged.

Equipment located above ceiling must be identified on the ceiling grid. The identification tag must match what is on mechanical schedules. Provide removable tiles, panels, and doors as required for equipment and service panel access.

Minimum appliance access is thirty (30) inches by thirty (30) inches.

HVAC equipment operational information must be located within each mechanical room. Do not use mechanical rooms or air handling unit equipment rooms as return air plenums. Pumps, panel boxes, etc. should not be installed in a plenum.

Access Panels

Indicate location and size of access panels in floors, walls, and ceilings (except in lay-in tile applications) as required to access valves, smoke dampers, fire dampers, balancing dampers, balancing valves, air vents, drains, duct coils, filters, air flow monitoring

stations, equipment, etc. on drawings. The access panels must be painted to match adjacent surfaces.

Additional Requirements

Equipment requiring water must have auxiliary drain pans.

All mechanical rooms must be ventilated and have locks and a common key system not accessible to regular building personnel.

The design of mechanical room and equipment should allow for the removal of the largest piece of equipment without dismantling the entire unit.

Main electrical switch gear should be in a separate room; avoid liquid conveying pipes above the gear.

Penetrations within mechanical room floors should be made within three (3)' feet of housekeeping pads or perimeter curbs to avoid water damage into lower levels.

Exhaust fans should have walking platforms and railings when located on sloped roofs or must otherwise be of inline type no higher than 10 feet AFF.

All storage spaces and janitor's closets are to be ventilated and served with building exhaust air or a treated air supply.

Vibration isolation must be included on all equipment with rotating components such as air handlers, fans, and pumps. Lifting eyes or trolley rails should be provided for heavy equipment.

As much as possible, telecommunication rooms are to be located on an exterior wall or near a mechanical room. Equipment serving the telecommunication system shall drain to the exterior wall or into a mechanical room.

Toilet rooms shall have supply air, exhaust and transfer air.

Exhausts from adjacent toilet rooms should be arranged to prevent sound transmission between men's and women's areas.

Transformer vaults should have separate ventilating fan or fans connected to emergency power supply. Vault must be vented to outside in accordance with the National Electric Code.

The Engineer may be requested to provide equipment sizing calculations and psychometric calculations and charts, if applicable, to justify the selection of equipment (ex. AHUs, VAV boxes, pumps, chillers, boilers, control valves and dampers, etc.)

Include weather data used for design calculations and analysis in the design documentation.

Provide no more than a 1.25 safety factor for heating equipment and distribution sizing to account for morning warm-up.

Air distribution systems must be equipped with smoke detectors listed and labeled for installation in air distribution systems.

If possible, locate intakes and exhausts on different building faces, or at least thirty (30) feet apart.

Coordinate intake with the electrical plan for the location of generators.

Air Vents

Show location of air vents required in piping systems.

Balance Dampers

All dampers and their intended locations must be clearly delineated on the floor plans.

Balance Valves

Contract drawings must specify the valve size and flow for each application. When an existing system is modified, provide all information required for re-balancing in the construction documents. Detail installation of all flow control balancing valves.

Cold Water Make-up

Detail all accessories, to include pressure reducing valves (PRV), relief valves, and backflow preventers. Show pressure reducing and relief valve pressure settings.

Drain Lines

Show condensate drain lines from air handling units, fan coil units, etc. Indicate required depth of water trap. Show slope from drain pan.

Ductwork

There must be a minimum of three (3) diameters of straight rigid ductwork entering terminal units. A detail will be required to emphasize this requirement to the Contractor.

Ductwork taps to supply diffusers should be made using bellmouth or “boot” connections. Boot connections should be from the side of the duct, not the bottom. This will allow for a better location for the volume dampers.

Flexible ductwork should be limited to five (5) foot lengths or less. All other ducts are to be rigid.

No more than three (3) rooms of similar size, orientation, and function should be on the same zone. Director's offices, corner rooms, conference rooms, and other special purpose rooms should be on an individual zone. Note that a small corridor area or storeroom may be added to almost any small zone. Zones requiring large amounts of air (such as auditoriums or laboratories) may require more than one terminal unit, and may be controlled by a single thermostat. Terminal units are limited to two-thousand (2,000) cfm maximum.

Use short radius vaned elbows in lieu of square ninety (90) degree fittings with turning vanes. It is preferred that long radius sweeps be employed where space permits.

Show all ductwork on the same plan for each floor: high pressure, low pressure, exhaust, etc.

Ductwork Testing

Indicate those HVAC duct systems to be leak tested on the contract drawings. Specify the test type and test pressure for each duct system (supply air, return air, exhaust air, and outside air ductwork) subject to testing.

Indicate duct static pressure, seal and leakage classifications on the drawings in accordance with SMACNA-HVAC Air Duct Leakage Test Manual. Include a completed "Ductwork Construction and Leakage Testing Table" on the drawings.

Acoustical duct liner is not allowed. Use double wall acoustic duct where sound attenuation cannot be accomplished by other methods and the duct is not serving occupancies that are sensitive to particulates. Increase the outside duct dimensions as required to maintain adequate internal cross sections.

Do not use the following types of duct construction where the potential for subterranean termite infestation is high:

- Sub-slab or intra-slab HVAC ducts.
- Plenum-type, sub-floor HVAC systems, as currently defined in Federal Housing Administration minimum acceptable construction criteria guidance.
- HVAC ducts in enclosed crawl spaces that are exposed to the ground.
- HVAC systems where any part of the ducting is in contact with or exposed to the ground.

Nonmetallic ducts are prohibited.

Flexible air ducts must not exceed six (6) feet in length. Do not use flexible duct for offsets greater than forty-five (45) degrees or connections to diffusers registers or grilles greater than forty-five (45) degrees.

Equipment Supports

Show hanger rods and structural supports for all ceiling or roof-mounted air handling units, heating/ventilating units, fan coil units, exhaust or supply fans, expansion tanks, etc., in drawing details.

Flow and Slope Arrows

Show the flow direction of piping on the drawings. Show slope direction and rate of slope on all piping systems.

Guides for Piping

Show pipe guide locations on all aboveground anchored piping. Show anchor locations on plans. Provide anchor detail(s).

Kitchen Hood Diagram

Provide a detailed air balance diagram on the drawings for every kitchen/dining facility design to show compliance with the ventilation requirements. Indicate required capture velocities and capture distances for all hoods on the drawings. Provide notes and contractor instructions on plans indicating that fan airflows shown for hoods are approximate and requiring the contractor to balance the system to achieve the capture velocities indicated. The scheduled fan and motor size must allow for adjustment of the airflow.

Provide the minimum unit clearances or as recommended by the equipment manufacture, whichever is greater.

Drawings showing the different areas of the building and the unit controlling the each area should be included as part of the O&M manual and should be installed in the mechanical room- see O&M Manual section.

Labeling pipes, valves, mechanical equipment, and electrical conduits and equipment is required by codes and this standard. Labels provide critical information for the operation staff to facilitative operations and maintenance of building systems. The labels should be included in the Operations and Maintenances Manuals.

Life Cycle Cost Analysis

For projects requiring a Life Cycle Cost Analysis, these requirements will apply.

The A/E Consultant will provide a narrative description of all system alternatives considered to include the results of the Life Cycle Cost Analysis (LCCA) and modeled energy use. The energy model must include model inputs and outputs, on optimized system level alternatives by energy type. A description of special mechanical systems such as compressed air, hydraulic, nitrogen, lubrication oil, etc. must also be included.

The Consultant must show calculations and assumptions supporting equipment selections in a clear and organized manner. When charts or tables are used in the design analysis, cite the source and date of the publication. The Consultant must also provide calculations for sizing equipment, piping, ductwork and all accessories.

Provide the model number and manufacturer of each major piece of equipment used as the basis for the design.

Mechanical Drawings

Drawings must show equipment, ductwork, service access panels, and piping sufficiently to indicate all aspects of installation. Provide sections and elevations to supplement plan views.

Where practical, group all notes, legends, and schedules at the right of the drawings above the title block.

Provide legends to clarify all symbols and abbreviations used on the drawings.

To ensure serviceability, show the minimum access area around mechanical equipment, for both ground level and above ceiling equipment. Identify space necessary to access and replace items that require maintenance, such as filters, coils, heat exchangers, tube bundles, strainers, and chillers on the drawings in three-dimensions.

Show all pertinent seismic detailing for the mechanical systems on the contract drawings.

“Demolition” plans are to be separate and distinct from “new work” plans.

All volume dampers should be shown in the plans.

The equipment actually installed on a project may be different from that used in the basis of design. Therefore, mechanical equipment schedules must reflect actual required equipment capacities as calculated, not capacities provided by manufacturers' catalog data. This helps ensure that the installed equipment is optimally sized for the application.

When drawing congestion is likely, ductwork and piping should not be shown on the same plan. Single line ductwork layouts are not allowed on final drawings; provide a two-line ductwork layout to scale.

Show thermostat locations on the plans, and humidistats when required.

Show location of door louvers on floor plans - coordinate with architectural drawings.

Provide large-scale details of congested areas on the drawings, with dimensions locating all work relative to structural features of the building.

Mechanical rooms must be drawn at no less than $\frac{1}{4}" = 1'-0"$ (1:50). Congested mechanical rooms must be drawn at no less than $\frac{1}{2}" = 1'-0"$ (1:20). Mechanical room plans should be supplemented by at least one (1) section; at least two (2) sections for more complex, congested applications.

Provide a three (3)-dimensional isometric diagram representing the mechanical room piping or a two (2)-dimensional diagram indicating the entire system. Indicate shutoff valve locations to allow replacement of control valves and system components.

Provide a schedule indicating indoor and outdoor design temperatures for each room type.

Provide an equipment schedule on the drawings indicating actual design conditions, not the manufacturer's catalog data. Include as a minimum:

- Air flow quantities (maximum and minimum if applicable) and static pressure requirements.
- Coil water flow quantities and entering and leaving temperatures.
- Heating and cooling coil sensible and latent capacities including the sensible heat ratio.
- Coil entering and leaving air conditions. For cooling coils include wet bulb, dry bulb, and dew point temperatures at the design flow rate. Ensure these conditions adequately cover the design latent load. For heating coils provide entering and leaving air temperature. Include face velocity for coil selection.
- Coil maximum allowable air side and water side pressure drops.
- Motor electrical characteristics including horsepower, voltage, RPM, and NEMA motor starter size.

Control Valves Schedule

Provide flow rates, minimum Cv or maximum pressure drop, nominal valve size, service (i.e. steam, hot water, etc.), configuration (i.e. 2-way or 3-way), and action (i.e. modulating or 2-position).

Outdoor Air Schedule

Provide an outdoor air schedule on the drawings. List the outdoor air to each zone with the number of anticipated occupants. Add a footnote to each schedule indicating that the number of occupants listed is for information purposes only.

Vibration Isolator Schedule

Where vibration and/or noise isolation is required, provide a vibration isolator schedule on the drawings indicating type of isolator, application, and deflection in inches.

Fouling Factors

Indicate fouling factors for all water-to-air and water-to-water heat exchangers (i.e. coils, converters, chillers, etc.). Indicate in the appropriate equipment schedule. Fouling factors must be accompanied with their appropriate English Units.

Pressure Gauges

Indicate pressure gauge ranges; system operating pressures should be midrange on the graduated scale.

Roof Fans

Details of roof exhaust fans must include a requirement for airtight seals between the fan frame and the wood nailer of the roof curb. The details must require the duct of ducted exhaust fans to extend up through the fan curb to a flanged and sealed termination at the top of the curb.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 23 APPENDIX

1. Appendix 1: System Performance, General Installation, Validation, Operating-Conditions, and Training Requirements
2. Appendix 2: Example and Minimum Screen Display
3. Appendix 3: Submittals
4. Appendix 4: Equipment Selection
5. Appendix 5: Example of Coordination with Other Project Documents

DIVISION 24

Not used

DIVISION 25 – INTEGRATED AUTOMATION

GENERAL

The A/E Consultant must ensure that the overall design and function of the Building Automation System (BAS) must be designed for possible future expansion and/or integration with other technology. This system should communicate with the BAS system at the Building and Equipment Services Department through an Ethernet card and the instrumentation control distribution wiring system.

The City requires an open BAS, characterized by the ability for any qualified entity to readily modify, operate, upgrade, and perform retrofits on the BAS system. An open system is one (integrated, multi-vendor) system where there is no future dependence on any one contraction/user interface that provides for or controls vendor. An open system permits multiple devices from multiple vendors to readily exchange information and has the capability to easily replace any device with another device procured from multiple

sources. The BAS must include, or have the ability to integrate to a Fault Detection and Diagnostic (FDD) software system.

Some of the BAS may have proprietary components within devices, but these proprietary components must be a small percentage of the overall devices

CORE ELEMENTS

The designer shall provide all the details for the direct digital control (DDC) system. Design that simply requires the use of a standard communication protocol is not sufficient. The detailed prescriptive requirements and design methodology are necessary for are necessary for the procurement of compatible and non-proprietary systems.

The Designer shall coordinate all other specifications for HVAC and other equipment which is to be controlled or monitored by the BAS with the Control System specification. Avoid conflicts with other disciplines and building features.

The designer is responsible for specifying each control system required for the project systems and will incorporate the control loops and control system sequences of operations using the symbols, abbreviations, and acronyms designated in this guidance. This design responsibility requires producing a control package that includes a specification and a set of drawings for each control system. The designer will not depend on the control system contractor or vendor for the preparation of the contract package.

The BAS shall allow easy configuration of email alarms and access to multiple users at one time. The Mechanical/Controls Engineer must provide a sequence of operations that includes a step by step instruction for all anticipated modes of heating and cooling system operations to include unoccupied periods. Sequence of operation must include control provisions to maintain less than a fifty-five degree (55°) F dew point in the conditioned space. The Engineer must provide CO₂ demand ventilation sequence for high occupancy areas.

When developing the sequence of operation, keep in mind the following additional requirements:

- Operating sequences shall be written in the component style and it shall include descriptions of how each component behaves in each operating mode.
- Cycling of chillers, cooling towers, etc. shall keep lead equipment on until lag equipment operation has been confirmed for five (5) minutes (adjustable).
- Secondary (failsafe) programming shall call for lag equipment regardless of sequencing in BAS logic if temperature or pressure of air/water is above set point (adjustable).

Temperature settings should be set at the following temperatures with adjustable +/- two (2) degrees:

- Summer: 74° - 76° (Occupied) and 84° - 86° (unoccupied)
- Winter: 68° - 70° (Occupied) and 62° - 64° (unoccupied)

Construction/Installation Requirements

Provide metering of utilities with indication and totalization capabilities.

COSA requires a Single Source Responsibility of Contract: one contractor will be responsible for obtaining all hardware and software. The single source contractor will be responsible for the complete design, installation, and commissioning of the system.

The controls contractor shall be in the business of design, installation and service of such building automation control systems similar in size and complexity.

Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in production and installation of HVAC control systems. Products should be manufacturer's latest standard design and have been tested and proven in actual use.

The controls contractor shall provide a list of no less than five (5) similar projects which have building control systems as required by the project. These projects must be on-line and functional such that the COSA Representative would observe the control systems in full operation, if COSA selects this option.

The controls subcontractor shall have in-place a facility within fifty (50) miles with technical staff, spare parts inventory for the next five (5) years, and necessary test and diagnostic equipment to support the control systems.

The controls contractor shall have minimum of five (5) years of experience in design and installation of building automation systems similar in performance to the project. Provide evidence of experience by submitting resumes of the Project Manager/Representative, the local branch manager, project engineer, the application engineering staff, and the electronic technicians who would be involved with the supervision, the engineering, and the installation of the control systems. Training and experience of these personnel should not be less than three (3) years. Failure to disclose this information will be a ground for disqualification of the supplier.

Provide a competent and experienced Project Manager/Representative employed by the Controls Contractor. The Project Manager/Representative shall be supported as necessary by other Contractor employees in order to provide professional engineering, technical and management service for the work. The Project Manager/Representative shall attend

scheduled Project Meetings as required and shall be empowered to make technical, scheduling and related decisions on behalf of the Controls Contractor.

Mechanical Drawings

The mechanical drawings must show system control schematics for the sequence of operation for each HVAC system. The drawings must also show controller functions, such as: normally open (NO), normally closed (NC), common (C), etc. Indicate all set points. Describe all controlled equipment operating modes, sequence of events, set points, and alarms.

Controls air flow diagrams, indicating air handler configuration and equipment arrangement shall be provided with location of all control devices shown. Dampers and control valves shall have their normal (fail) position indicated on the diagram. These diagrams will be used by the controls contractor to develop the system graphics.

Chilled water and hot water piping controls diagrams, indicating pump and equipment configuration, should be provided with location of all control devices shown. Control valves shall have their normal (fail) position indicated on the diagram.

A complete controls input/output points list shall be provided on the drawings and a system architecture schematic.

A detailed sequence of operation shall be provided on the drawings, on the same sheet as the diagram for each system, and must include the following:

- Provide AHU system description, including all components such as supply fans, return or relief fans, coils, dampers, filter sections and terminal devices.
- Provide pumping system description, including all components such as pumps, heat exchangers, control valves, and bypass valves.
- Provide normal start-up sequence for each system and start-up sequence after power failure restoration. State normal position of all control dampers and valves when system commanded OFF and when system trips off due to safety or power failure. Detail equipment system response for each potential equipment alarm and failure.
- Indicate percent of full load that pumps/fans are sized and if they operate in lead/lag or both operate simultaneously.
- Provide economizer cycle sequence when applicable.
- Detail all alarms, alarm limits, and identify critical alarms.
- List initial settings for all operator modifiable control parameters, such as, but not limited to, set-point, dead-band, offset, and equipment start/restart delay.

Mechanical drawings must show temperature sensor locations for all terminal boxes with dashed line from each sensor to respective VAV box. Show dashed line at each VAV to indicate 3 feet maintenance access required for controls. Locate VAV's so that

maintenance access area is not above fixed furniture or lab casework, preferably above door entry for the room.

Drawings must show location of VFDs and control cabinets on mechanical plan. Provide VFD schedule for pumps and fans.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 25 APPENDIX

DIVISION 26 – ELECTRICAL

GENERAL

The City's goal in the design of electrical systems serving their facilities is to select systems and equipment that: are appropriate to the type of space served; give maximum value for their initial costs; are cost-effective to operate, maintain, and repair; and support the sustainability policies of the City.

LED bulbs are to be utilized for both indoor and outdoor lighting, as appropriate. At this time, LED lamps provide the most cost effectiveness with the following features: immediate light-up; stays cool to the touch; 25,000 hour lifespan vs. 1,200 hours for incandescent; not sensitive to cold temperatures; does not contain mercury; many models are dimmable; available in soft, warm, and bright white hues.

Use 4100 kelvin as the standard temperature for all LED bulbs. This is a cool white and is the recommended color temperature for offices and work-spaces.

CORE ELEMENTS

The consultant shall make all provisions required by codes, regulatory agencies, and industry practices for high quality design, installation, and ease of maintenance.

Distribution within the building shall be via readily accessible electric rooms or closets. Electric rooms or closets must be independent from all other types of closets, e.g., communications, telephone, custodial, etc. Adequate ventilation for heat producing and/or heat sensitive electrical equipment must be provided - gravity/ natural convection type wherever possible. Water piping is absolutely not allowed in transformer vaults and main switchgear areas. The City must not be exposed to the risks that can result from lack of proper design attention to this requirement. Electrical- Separate rooms shall be

designated to accommodate the immediate and/or future installation of on-site co-generation of power (i.e., micro-turbine engines or fuel cells).

The City's Project Manager will work with the consultant to provide a proposed utility distribution and connection drawing. The drawings are intended to be only diagrammatic. The consultant shall make all provisions required by codes, regulatory agencies, and industry practices for high quality installations.

Conduit and cable sizes shown on the drawings are intended to be the minimum acceptable to the City and should be increased as design calculations may dictate. When design calculations have been completed, consultants should verify that service requirements can be met at the City's proposed points of service connection(s).

Provide adequate power and data outlets to serve equipment in all spaces. Power and data outlets should be provided along the perimeter walls in accordance with all current applicable codes. In addition, convenience floor power and data outlets should also be provided throughout large open areas to allow for the greatest flexibility of space use.

When locating outlets, special attention should be paid to the possible location of office equipment and furniture.

Illumination levels should follow Illuminating Engineering Society (IES) standards.

Distribution within the building shall be via readily accessible electric rooms or closets. Electric rooms or closets must be independent from all other types of closets, e.g., communications, telephone, custodial, etc.

Provide adequate ventilation for heat-producing and/or heat sensitive electrical equipment- gravity/ natural convection type wherever possible.

Water piping is not allowed in transformer vaults and main switchgear areas.

Electrical Equipment Clearances

Adequate equipment clearances and safe escape routes must be maintained to allow safe access to and around equipment.

- Working space shall not include access lane. Lane shall be a minimum three (3) feet clear distance.
- Provide two (2) exits around work area.
- Provide doors that allow removal of electrical equipment.
- Provide a minimum three (3) feet clearance around the electrical equipment and from any wall.
- Provide a working space of three (3) feet or the width of the equipment (whichever is greater), in front of the electrical equipment.
- The headroom of the working spaces around switchboards or control centers shall not be less than seven (7) feet distance from the floor to ceiling.

- If the electrical equipment exceeds seven (7) feet, provide minimum headroom not less than the height of the equipment plus twenty-four (24) inches.
- Within the headroom working space height requirement, other equipment associated with electrical installation located above or below the electrical equipment will be permitted to extend not more than six (6) inches beyond the front of the electrical equipment. The intent of this requirement is to preclude the installation of equipment, such as a transformer, in the working space for other electrical equipment, such as panel board; this type of installation impedes access and can create an unsafe working condition.
- Do not locate piping, ducts, or equipment foreign to the electrical installation in the dedicated equipment space.

Emergency Lighting and Power

The design professional shall design the electrical power system such that it operates at a ninety-five (95) to ninety-seven (97) % lagging power factor during peak estimated demand load conditions. The power factor must not become leading under minimum load conditions. This may require coordination with the electrical utility company if the power factor supplied is already low.

Exterior and Site Lighting

Exterior and site lighting shall be designed to:

- Provide a safe and pleasant experience during hours of darkness, and assist in way-finding.
- Promote “dark sky” policies.
- Implement energy conservation and sustainability policies.
- Discourage excessive lighting and harsh contrasts.
- Limit the type of light fixtures, lamps and standards for maintenance purposes.
- To create a safe environment.

“Dark Sky” - Site lighting shall conform to requirements as specified in the Unified Development Code, Sec. 35-339.04. Military Lighting Overlay Districts - refer to DIVISION 26 APPENDIX

Photocells and time clocks should be used for automatic control of exterior lighting.

Design teams should utilize photometric plans when designing light layouts to ensure adequate lighting levels. All lighting levels should be provided in footcandle units and meet the recommendations of the Illuminating Engineering Society of North America (IESNA).

The COSA Project Manager/Representative may request additional information following the initial lighting plan submittal, such as:

- A brief written narrative, with accompanying plan or sketch, which demonstrates the objectives of the lighting.
- (ii) Photometric data, Color Rendering Index (CRI) of all lamps (bulbs), and other descriptive information on the fixtures, and if applicable or required, designation as Illuminating Engineering Society of North America (IESNA) “cutoff” fixtures.

Lighting Systems

The lighting and day-lighting systems of a building represent one of the most critical components of the building aesthetics, performance of the function of the spaces and the annual energy consumption.

The lighting design shall be in accordance with applicable codes and standards. In addition, the lighting design shall minimize maintenance requirements, including the use of mechanized equipment to change burned-out bulbs/lamps.

The lighting system design must consider reducing glare, minimizing contrast ratios and providing proper color rendering are recommended in the IES Lighting Handbook, latest edition.

Lighting fixtures designed for LED bulbs/lamps are the default.

The use of custom fixtures is discouraged. Utilize the same/similar lighting fixtures as much as possible at the same project location.

Light sources, power supplies and controls are to be rated and warranted for a long useful life to increase the time between maintenance cycles.

Occupancy sensors and other control methods designed to automatically reduce lighting levels are required by Code.

Lighting controls should be located within eighteen inches (18”) of the entry door(s) of individual, interior spaces.

Meeting Rooms and AV Projection

Where a ceiling-mounted projector is designated, an electrical outlet should be located at the ceiling. Outlet location to be coordinated with projector location.

Where podium is utilized, lighting controls should be either located within close proximity to or controlled from it.

Lighting should be zoned in order to allow for the proper viewing of projected images.

Room should be zoned in a manner which allows for light fixtures at / near the projection screen to remain off so as not to impede viewing of images on the screen.

Consideration should be given to the utilization of a flat screen LCD television with data input, in lieu of a traditional projection screen and overhead projector.

Electrical System Basis for Design

The Design Analysis is a presentation of facts to demonstrate the concept of the project is fully understood and the design is based on sound engineering principles. As a minimum, include the following information in the Design Analysis.

Document design decisions throughout the design process. List any special features and alternatives that were considered. Provide a written narrative accurately addressing the electrical and telecommunication design. Describe the design approach to all electrical systems. Include the method used for sizing conductors, conduit, protective devices, and other equipment. Show all calculations used in determining capacities of electrical systems. When tables from industry standards are used in the design, indicate the title, source, and date of the document. Include a complete list of all design standards and references used for the design.

Update the Basis of Design for each submittal to accurately show the current state of the design. Include the information in the following sub-paragraphs as a minimum.

Exterior Primary Power Distribution Systems

- Existing Primary Power Source – Identify the location of the point of connection into the existing primary system. Address the characteristics of this primary system, including ANSI voltage designation, phase, number of conductors, available fault current, and the circuit grounding classifications (ungrounded, uni-grounded, resistance grounded, or multi-grounded). Address the adequacy of the primary system; if inadequate, state measures proposed to correct the inadequacy.
- Estimated Electrical Project Load – Provide an estimate of total connected load (kVA) and the resulting demand load (kVA), transformer size, and service size.
- Voltage Selection – Provide basis for selection of primary and secondary voltages.
- Conductors – Include conductor size, type, number of conductors, insulation voltage rating, and insulation level.
- Standards of Design – Describe pertinent standards of design, such as voltage drop, and equipment ratings.
- Materials – Provide manufacturer's data sheets and product data for selected equipment.

Other Exterior Systems

- Telecommunications (including voice, video and data) System – Identify point of connection into City system. Describe modifications, if required, to existing City system.

- Special Systems – Identify any special systems, such as Electronic Security Systems (ESS) or Cable Television (CATV). Describe how and where the facility will connect to the City Mass Notification System (if applicable).
- Exterior Lighting Systems – Describe types of luminaires and illuminance values.
- Alternate Energy Sources – Describe alternate energy systems such as engine-generator sets, photovoltaic power systems, wind turbines, and fuel cells.
- Conductors – Include conductor type and number of conductors.
- Standards of Design – Describe pertinent standards of design, such as voltage drop and equipment ratings.
- Materials – Provide manufacturer's data sheets and product data for selected equipment.

Interior Distribution Systems

Describe the electrical systems including the following: lighting systems; power systems; alternate energy systems, emergency lighting; emergency/standby power; grounding systems; telecommunications system; other systems such as television; physical and electronic security features such as electronic security systems (ESS), or access control.

- Electrical Characteristics – Describe the electrical system to be provided and justify its selection. Indicate ANSI voltage designation, phase, and number of conductors.
- Switchgear and Switchboards – Provide specific design information for the following: nominal system voltage, short circuit ratings, maximum voltage ratings, basic impulse level (BIL), main bus ampacity, and Single-line, plan, and elevation drawings with full details of instrumentation and relaying.
- Estimated Electrical Loads – Provide a breakdown, by category, of the estimated loads (kVA). Include lighting, convenience outlet, mechanical equipment, special operating equipment, user equipment, and miscellaneous load categories.
- Wiring Methods – Indicate the type of wiring method, such as rigid conduit, electrical metallic tubing, cable tray, nonmetallic sheathed cable, and where proposed to use.
- Conductors – Indicate the type of conductors and insulation material such as CU, AL, THW, XHHW, and where proposed to use.
- Standards of Design – Describe the proposed standards of design, such as voltage drop, illuminance values, type of light sources, and energy conserving features.
- Special Systems – Describe the proposed type of systems. Indicate each system's function and the interrelationships between systems, when applicable. Identify City of San Antonio-furnished equipment, if any. Special systems include such systems as CATV, Closed Circuit Television (CCTV), Intercom, Sound, Security, or Uninterruptible Power Supplies (UPS). Identify special security requirements. Identify special physical security requirements.
- Telecommunications Systems – Identify space required for telecommunication equipment, and size of incoming duct/conduit. Include documentation

concerning telecommunications room sizes, to accommodate interface equipment provisions for multi-use systems (i.e. special use systems, such as voice, video, and data).

- Materials – Provide manufacturer’s data sheets and product data for selected equipment.

System Maintainability

Design the system in a manner that facilitates periodic maintenance of the equipment.

Instrumentation and Controls

Coordinate all interfaces with instrumentation and control systems provided by other disciplines, and provide required connections, either empty conduits or power wiring as required. Normally, the designer for the discipline that is responsible for the process (such as electrical, mechanical, or civil) is also responsible for the instrumentation and controls design of that system.

Electrical Calculations

The Designer of Record (DOR) shall provide calculations (in accordance with the associated follow-on paragraphs) to verify proper design and operation of the facility to the point of connection to the existing electrical systems. The DOR is also responsible for contacting and obtaining all utility data required to complete the relay coordination study from the respective Electric Utility Department or Private Utility Company including existing upstream protective device types and settings.

- Calculations shall be described fully, written clearly, and lead the reviewer through the design by stating all assumptions and design inputs. Computer printouts are acceptable only if accompanied by explanations to allow adequate independent review of calculation methods and results.
- Most electrical-related calculations for significant projects will be completed with software tools; hand calculations are typically only acceptable for minor modifications to an existing system. For power systems analyses, coordinate with the City of San Antonio to determine if specific software tools are required for the analyses. Whenever software tools are used to perform analyses, provide the electronic software files with each submittal. Before using any software tools, identify any service-specific limitations regarding which software packages can be used.
- Calculations shall provide complete analysis with supporting data. Analysis shall cover system arrangement; voltage selection; and major equipment selections including load analysis and equipment sizing calculations. Whenever sizing electrical equipment, such as transformers, breakers, or electric cables, provide calculations to demonstrate proper facility design. The following calculations shall be provided unless the Basis of Design clearly explains why a particular calculation type is not applicable:
 - o Load analysis.
 - o Short circuit analysis, including protective device interrupting rating.

- o Protective device time-current coordination study.
- o Arc flash analysis.
- o Voltage drop.
- o Motor starting/flicker analysis.
- o Lighting.
- o Underground structure design.
- o Cable pulling tension.
- o Directional Boring.
- o Sag, tension, and guying analysis.
- o Cathodic protection calculation.
- o Lightning protection analysis.
- o CATV network loss calculations.
- o ESS calculations.

Load Analysis

- Load Analysis for Service Entrance Equipment, Including Feeders: Complete a load analysis (Basis of Design). Base calculations on NFPA 70 criteria.
- Load Analysis for Service Entrance Transformer:
 - o Apply the demand and diversity factors to the final load analysis to determine the transformer size.
 - o For building designs, the service transformer shall not exceed 12 VA/square foot (130 VA/square meter) of facility gross floor area or seventy (70)% of the total connected load on installations served by transformer rated 300 kVA or greater.
- Load Analysis for Emergency/Standby Generator: Provide sizing calculations including starting KVAs.
- Load Analysis for Alternate Energy Systems: Provide maximum power calculations applicable to the type of alternate energy system. Identify actual power delivered from source.
- Load Analysis for Uninterruptible Power Supply (UPS): Provide sizing calculations in accordance with IEEE Std 485, IEEE Std 1115, or IEEE Std 1184 as appropriate for the selected battery type and application.
- Load Analysis Criteria:
 - o Assign a “0%” demand factor for fire pump loads in demand calculations.
 - o Size the service conductors (continuous current rating) in accordance with Annex B (Neher-McGrath method) of NFPA 70. Minimum design

ampacity rating shall be larger than the ampacity rating of the main overcurrent protective device.

- o Design the incoming service, including spare conduit to fully unload the maximum rating of the service equipment (i.e. 1200 amperes for 1200 ampere rated equipment protected with 1000 ampere device).
- o Design main service equipment to provide a minimum of approximately 15% combination of spare devices/space to accommodate future work.
- o Select appropriate size transformers based on the standard available three phase ratings (45, 75, 112.5, 150, 300, 500, 750, 1000, 1500, 2000, and 2500 kVA) and the calculated demand load of the facility.
- o For small systems 225 amps or less, or for small modifications to large systems, the load analysis can be performed manually using the above criteria. For larger systems, a load analysis using computer software tools is necessary to evaluate properly all of the possible facility modes of operation.

Short Circuit Analysis

Complete a short circuit analysis in accordance with IEEE Std 551 and include the following in the analysis:

- Include the utility system data as well as data for the distribution system. Contact the electrical utility provider for the utility system data and available fault current on the primary side of medium voltage equipment. When accurate data does not exist, the Designer of Record shall assume that maximum available fault exists, up to a possible infinite bus on the primary side of the upstream transformer, and design the system assuming such conditions.
- Calculate the available short circuit and ground fault currents at each bus. Incorporate any motor contribution in determining the momentary and interrupting ratings of the protective devices.
- The study shall be calculated by means of a commercially-available software program designed for the type of required analysis. Incorporate pertinent data and the rationale employed in developing the calculations in the introductory remarks of the study. Equipment interrupting capability evaluations shall meet the requirements of IEEE C37.06, IEEE C37.13.1, or UL 489 criteria, as applicable.
- Where diagrams will not fit on standard letter size paper, present the data determined by the short circuit study in a tabular format. Include the following:
 - o Device identification
 - o Operating voltage
 - o Protective device
 - o Device rating
 - o Calculated short circuit current

Protective Device Time-Current Coordination Study

- Design the electrical system such that any fault in the system will be preferentially isolated by the selective operation of only the overcurrent protective device closest to the faulted condition. Perform a coordination study at the design stage to establish the basis for the system design and to enable completion of an initial arc flash analysis.
- Provide a final coordination study based on the as-built configuration of the system. Identify locations where selective coordination is not achievable, such as with instantaneous trips on molded case circuit breakers.
- The Designer of Record is responsible for the selective coordination of overcurrent protective devices, including protective relays and medium voltage protective devices, high side transformer protection for distribution transformers, main secondary breakers, and secondary feeder protective devices. The Designer of Record shall ensure coordination between the new equipment design and the existing distribution system.
- The Designer of Record shall ensure that construction contract documents require the Contractor to submit manufacturer's published time-current curves for primary fuses, relays, main secondary breakers, and secondary feeder protective devices. This information is required during the submittal process. Using the time-current curve data, the Designer of Record shall perform a coordination study in accordance with the following paragraphs to ensure that protective devices are properly coordinated.
- Coordination Study. The completed study shall include a system one-line diagram, short circuit and ground fault analysis, and protective coordination plots. The Designer of Record shall provide to the Contractor settings for relays, main secondary breakers, secondary feeder protective devices, and any other protective devices in the circuit. The final coordination study and the specified setting information shall be based on the as-built configuration.
- One-Line Diagram(s). Show on the one-line diagram all electrical equipment and wiring to be protected by the overcurrent devices including breakers and fuses. Multiple one-line diagrams may be used if required to clearly present all of the required data. Also, show on the one-line diagram the following specific information:
 - o Calculated short circuit values and X/R ratios at the project utility point of connection.
 - o Breaker and fuse ratings.
 - o Transformer kVA and voltage ratings, percent impedance, and wiring connections.

- o Identification and voltage at each bus.
- o Conduit material; and feeder conductor sizes, type, insulation, length and configuration.

Coordination Curves

Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination. Graphically illustrate on a log-log scale that adequate time separation exists between series devices, including the utility company upstream devices where applicable. Plot the specific time-current characteristics of each protective device in such a manner that all applicable upstream devices will be clearly shown on one sheet. Include the following information on the coordination curves:

- o Device identification.
- o Voltage and current ratios for curves.
- o 3-phase and 1-phase ANSI damage points for transformers directly fed from the switchgear.
- o Minimum melt and total clearing curves for fuses.
- o Cable damage curves.
- o Transformer inrush points.
- o Maximum short circuit current.

Settings

Develop a table to summarize the settings selected for each protective device. Low voltage protective devices less than 225 amperes, unless adjustable trip, are not required to be included. The table shall address all relays and relay functions. Include in the table the following:

- o Device identification and breaker or load controlled.
- o Relay CT ratios and electronic set point equivalents for relay tap, time dial, and instantaneous pickup points.
- o Circuit breaker sensor rating.
- o Fuse rating and type.
- o Ground fault pickup and time delay.
- o Differential relay settings.

Arc Flash Analyses

Complete an arc flash evaluation in accordance with NFPA 70E and IEEE Std 1584 as part of the short circuit study to determine personal protective clothing (PPE) requirements. Note: PPE criteria shall be in accordance with Direct current (DC) systems analysis is not required since it is not currently addressed in industry standards. Include the following:

- Description of the software used to perform the evaluation, including an explanation of software-specific user adjustable analysis settings that were used for the study.

- Scope of analysis. When switchgear, switchboards, and panelboards are equipped with main circuit breakers, provide both “Line Side” and “Bus Side” results for each item. If the facility or system has different operational configurations, such as different transformer supplies, emergency generator operation, or UPS bypass, evaluate each possible operating configuration and provide the arc flash results for each case. When equipment design includes dual protective device settings for the purpose of equipment maintenance (non-coordinated system), provide the arc flash result for that scenario. Summarize all data and include the worst-case results in terms of arc flash levels.
- Assumed working distance in feet. For low voltage systems, assume a working distance of eighteen (18) inches. For medium voltage systems, assume a minimum working distance of four (4) feet. For high voltage systems, assume a minimum working distance of six (6) ft.
- Calculated energy in cal/cm² at each evaluated location. The design goal shall be to establish arc flash levels that result in PPE levels of Category 2 or less. Consider remote racking device designs (robots) to rack breakers in and out to limit personnel exposure to an arc flash event. Specifically identify locations where Category 2 cannot be achieved, such as upstream of a main breaker (between the breaker and an upstream transformer) or downstream of UPS systems.
- Specified protective device settings to achieve the arc flash results. Reconcile arc flash protective device setting recommendations with the protective device time-current coordination study.
- List of prohibited energized work locations based on arc flash results.

Voltage Drop

- Size service and feeder conductors for maximum voltage drop of two (2) percent at the circuit’s rated capacity. Size branch circuits for a maximum voltage drop of three (3) percent at the circuit’s rated capacity.
- If the conductor size must be increased due to voltage drop, do not increase the size of the overcurrent protection device for the circuit. The overcurrent protection device may be protecting downstream equipment and increasing the size of the overcurrent setting can reduce the level of equipment protection. If the phase conductor size is increased for voltage drop, increase the size of the equipment grounding conductor proportional to the circular mil increase of the phase conductor.

Motor Starting/Flicker Analysis

- Motor calculations shall account for both starting and running current.

- Provide a motor starting/flicker analysis for motors forty (40) hp and greater for four hundred- eighty (480) volt systems and for twenty-five (25) hp for system rated for two hundred-forty (240) volts and below. Verify that the voltage drop at the service entrance does not exceed five (5) percent during motor starting.
- Refer to IEEE Standard 241 for information regarding the calculation and effect of flicker.

Lighting

Provide calculations for interior and exterior lighting systems.

Underground Structures Design

Provide sizing and cable bending radius calculations for underground structures (manholes and handholes) with cable sizing exceeding 500 kcmil.

Cable Pulling Tension Calculations

Provide cable pulling tension calculations for medium voltage cable.

Provide Calculation For Directional Boring.

Provide Calculation Sag, Tension, And Guying Analysis.

Cathodic Protection Calculations

Provide calculations for all cathodic designs. Include environmental resistivity and justify all assumptions.

Lightning Protection Calculations

Provide a lightning risk assessment in accordance with NFPA 780 Annex L and document the required level of protection. If lightning protection is a design requirement, provide a lightning protection system. Provide side flash calculations as required by NFPA 780.

CATV Network Loss Calculation

Provide in accordance with Building Industry Consulting Services International (BICSI) Provide ESS Calculations.

The A/E designer need to take into consideration the soil potential for movement to the electrical equipment.

Drawing Requirements (see NFPA standards, ANSI, IEEE, and City Code for additional requirements)

To avoid conflicts with furnishings and equipment, light switches, thermostats and fire alarm strobe/annunciator are to be located within the eighteen (18) inch clear area at doors, as required by the ADA.

Provide adequate plans, including demolition, existing conditions, and new work, legends, details, and diagrams to clearly define the work to be accomplished. Coordinate construction drawings and specifications; show information only once to avoid conflicts.

Lighting, power and communications wiring shall not be shown on the same drawings when the scale is less than one-quarter inch to the foot.

Complicated areas requiring careful coordination of trades shall be detailed with plans and cross-section drawings at one-quarter inch to the foot or larger scale, showing all systems.

Plans and cross-sections shall be provided for all electrical equipment rooms to show the horizontal and vertical relationship of important components. Such drawings shall indicate access for routine operation, maintenance and repair. "Burying" apparatus requiring operation, maintenance and repair above or behind fixed piping, conduit, ductwork, etc. is unacceptable.

Provide a General Note at the beginning of the Electrical Drawings clarifying the work to be accomplished. The following note is recommended for most jobs: "ALL ELECTRICAL WORK AND MATERIAL IS NEW AND SHALL BE PROVIDED BY THE CONTRACTOR UNLESS INDICATED OTHERWISE".

Arrange the Electrical Drawings in accordance with the National CAD standards
Follow the NFPA 70 Metric Designations (mm) and Trade Sizes (in) for conduit.

Apply ANSI Y 32.9, Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction, for symbols used in plan and detail drawings. Apply Institute of Electrical and Electronic Engineers (IEEE) 315, Graphic Symbols for Electrical and Electronic Diagrams, for symbols used in one-line, three-line, riser, schematic, and wiring diagrams.

Apply NFPA standards for fire systems.

To avoid misinterpretation as to the quantity of cables and conduit required in multiple conduit and cable runs, use one of the following acceptable descriptions:

- Acceptable: Two 4-inch conduits, each containing four 500 kcmil and one #2 Gnd
- Acceptable: Two 4-inch conduits, each with four 500 kcmil and one #2 Gnd
- Acceptable: Two 4-inch conduits, with four 500 kcmil and one #2 Gnd in each conduit
- Unacceptable: Two sets of four 500 kcmil and one #2 Gnd in 4-inch conduit
- Unacceptable: Parallel Service: Four 500 kcmil and one #2 Gnd in 4-inch conduit

Legends and Abbreviations.

All symbols used in the drawings shall be defined in the legend. Locate legend on the first electrical sheet using multiple legends where required and identifying the specific use of each legend. Use different legends for new and existing work. Avoid using composite legends that include all symbols but fail to indicate which symbols are to be used on which drawings.

Site Plans

- Show utility point of connectivity to the power and telecommunications systems on the site plan. Provide explicit direction on method of entering existing manholes. Provide all details including composition of duct banks and depth and configurations of the duct banks.
- Electrical Site Plans shall be separate and distinct from other utility site plans and shall be included with the electrical drawings. Electrical and civil site plans may be combined only when the project requires minor utility work.
- The orientation of electrical drawings shall be consistent with the civil drawings. In addition, the orientation of partial building or site plans shall be identical to the orientation of the larger plan from which the partial was taken. Indicate the exact title of each particular detail, partial plan or elevation as identified on the cross-referenced sheet.
- For overhead distribution use a separate symbol for each individual circuit; define each circuit by voltage level as well as number, size and type of conductors. Coordinate guying and conductor sag information shown on the drawings with that shown in the specifications.
- Indicate overhead distribution pole details on the drawings.
- Indicate conductor initial sag values. Provide initial sag values at ambient temperatures in eighteen (18) degree F increments for a temperature range, which includes the outside summer and winter design temperature values. Clearly indicate each different calculated ruling span on the plans and provide initial sag for one span in the calculated ruling span.
- Provide appropriate symbol and detail indicating the use of backup current limiting fuses with the device being protected. Indicate the fuse type and ampere rating as well as the voltage rating and current designation of the backup current limiting fuse.
- Indicate transformer details on the drawings.
- Provide the following transformer descriptive information:
 - o Transformer type (e.g., pad-mounted, pole mounted, station type, unit-sub)
 - o KVA, single or three phase
 - o Voltage ratings per IEEE C57.12.00 (e.g., 11.5KV – 208Y/120 volts)
 - o Primary and secondary connection (when using single-phase units for three-phase service; specifically indicate how the units are to be connected, i.e., connect delta-wye grounded for 208Y/120 volt secondary service)
- Include the following information for surge arresters and fused cutouts:

- o Surge arrester kV rating
- o Cutout kV, continuous ampere, and interrupting ampere rating
- o Fuse link type and ampere rating.

Underground Distribution

- Profiles may be required for ductbank runs. Discuss profile requirements with the electrical reviewer. Indicate structure (manhole and handhole) tops, ductbank elevations, slopes and diameters. Coordinate structure numbers with plan sheets. Show and label all crossing utility lines, both existing and new. If depths of existing utilities are unknown, indicate the horizontal location of the utility and indicate the vertical location with a line representing the anticipated range of elevations where the utility will be found in the field. Indicate the method of new utility installation routing above or below conflicts.
- Provide a cable/ductbank schedule indicating cable identification, description, conduit size, and remarks.
- Provide manhole foldout details or exploded views for all multiple-circuit primary systems and all primary systems requiring splices. Indicate the entrance of all conduits and the routing of all conductors in the manholes.

Demolition Plans

- Provide “Demolition” plans separate and distinct from “New Work” plans, except where only minor demolition work is required. Clearly show what is to be demolished, at an appropriate scale. Indicate the beginning and ending points of circuit removals.
- For modification of or additions to existing equipment, provide the manufacturer’s name and other pertinent manufacturer’s identification (e.g., serial number, model number, style, and any other manufacturer’s identifying markings).
- Provide a sequence of demolition; if necessary, include any known requirement for continuous operation and limited shutdown requirements. Identify these in the special scheduling paragraphs of the specifications.
- Indicate the quantity of lighting ballasts that contain PCBs and the quantity of lamps that contain mercury.

Lighting Plans and Details

- Do not show lighting and power on the same floor plan, unless the scale of the plan is 1:50 ($\frac{1}{4}$ in = 1 ft – 0 in) or larger.
- Provide luminaires (lighting fixtures) details and a separate luminaires schedule. Provide applicable luminaires type symbol(s) with each luminaire sketch/detail.

- Detail the luminaire(s) on the drawings providing the following minimum information:
 - o Luminaire type (e.g., high bay, fluorescent, industrial, downlight, roadway type, floodlight).
 - o Physical construction including housing material and fabrication method, description of lens, reflector, refractor.
 - o Electrical data including number of lamps, lamp type, ballast data, operating voltage.
 - o Mounting (surface, suspended, flush) and mounting height.
 - o Special characteristics such as wet label, specific hazardous classification, or air handling.

Power Plans

Show all power requirements and points of connections. Specifically identify each piece of equipment including HVAC and mechanical equipment (e.g., unit heater No. 1, unit heater No. 2).

Communications Plans

Show locations of voice and data outlets in each room, closets, and equipment spaces. Detail all outlet, cable tray and backboard or distribution frames. Power and communication systems may be shown on the same floor plans provided the design is small, the electrical designer and the telecommunications registered communications distribution designer (RCDD) are the same person, and combining the drawings is approved by BESD. However, when there is extensive communication work to be shown, show power and communication systems on separate plans. The communications plans shall be signed by both a registered professional engineer and an RCDD.

Grounding Plan

Provide grounding plans and details at an appropriate scale.

Roof Plan

When roof mounted equipment, including HVAC equipment, cannot be adequately shown on the Power Plan, provide an appropriately scaled roof plan. However, the A/E shall limit the number of roof penetration so that the integrity of the facility envelope is not compromised. HVAC equipment shall be located on mechanical room at the first floor level.

Lightning Protection Plan

Provide lightning protection plan and details at an appropriate scale. Plan shall indicate locations and number of system components required. Show air terminal installation details, roof and wall penetration details, and details to show concealed components of the system. Coordinate roof and wall penetrations with other disciplines to ensure that the integrity of the facility envelope is not compromised.

Hazardous Location Plan

Provide on the drawings the boundaries and classifications of all hazardous locations in accordance with NFPA 70. Coordinate drawing with the fire engineer. The fire protection engineer in coordination with other disciplines shall clearly designate the hazardous location on the drawings and the requirements for the hazardous locations.

Power One-Line/Riser Diagrams

- Provide a power one-line (single-line) diagram for:
 - Medium-voltage distribution systems, including substations and switching stations.
 - Systems involving generation, either low voltage or medium voltage.
 - Building switchgear, switchboards, and main distribution panels (MDPs).
- The one-line diagram must show all components (including metering and protective relaying), and shall indicate sizes of bus, feeders and conduits. Connections of transformers, PTs, CTs, and capacitors shall be shown on the one-line diagram by means of the proper symbol. Show potential and current transformer ratios. Indicate relay quantity and function (overcurrent, voltage, differential) using ANSI designation numbers.
- On most facility-related projects, it is acceptable to combine the one-line diagram with a riser diagram. The one-line diagram would begin with the medium voltage system and continue through the transformer up to and including the main breaker and feeder breakers within the MDP. Sub-panels beyond the MDP may be shown in the riser diagram format.
- Indicate kV ratings for surge arresters, and kV and ampere rating for cutouts. Indicate fuse link type and ampere rating. For capacitors indicate kVAR per unit, number of units per bank, voltage (voltage rating of units, not the system voltage), phase (e.g., three-phase or single-phase units), fuse size, and fuse type.
- Show the following on the one-line diagram when a transformer is indicated.
 - Primary switches.
 - Wye or delta connection.
 - Loadbreak elbows.
 - Lightning arresters.
 - kVA rating.
 - Rated voltage (primary & secondary).
 - Transformer identification number.
 - Industry standard impedance.
 - Meter type.
 - CT and PT sizes.
 - Fuse sizes.

- Show all pertinent information on the transformer and the service entrance on the one-line diagram as opposed to the specifications. Items that are common to all transformers can be indicated by notes on the one-line diagram if a typical detail drawing is provided.
- Show the following on the one-line diagram when pad-mounted switchgear is indicated:
 - Spare ways (cubicles)
 - Protective devices
 - Loadbreak elbows
 - Switch identification number
- Show the following on the one-line diagram when a new primary is indicated:
 - In-line splices in manholes
 - Normally open points
 - Number and sizes of phase, neutral and ground cables
 - Conduit sizes
- If there is demolition involved or work is to be done to existing equipment, the Designer of Record shall provide an existing one-line diagram showing the current arrangement of the gear and then show a new one-line diagram indicating by line weights what is existing or new.
- Insure that information shown on the one-line diagram is not duplicated elsewhere in the construction package, as this will likely cause conflicts if changes are necessary. Indicate on the electrical legend the exact nomenclature used to indicate conductor and conduit sizing. Provide a schedule for feeder runs. Medium voltage one-line diagrams for stations and distribution systems shall have a geographic affiliation to the actual constructed distribution system.

Telecommunications Riser Diagram

Clearly indicate service entrance cable and duct, entrance protector assemblies, and connections to existing outside cable plant. Include the following:

- Cross-connects. Indicate by notation that voice and data cables terminate in separate fields. Indicate method of cross connecting – patch panel or connector block.
- Telecommunications outlets, including room numbers.
- Cable for building backbone and horizontal distribution system.
- Pathway, including conduit and cable tray for backbone and horizontal distribution system.

- Telecommunications grounding system.

Intercommunication/Paging Riser Diagram

Show power source, master station with associated equipment, speakers, and outlets. Include room numbers, wiring/conduit between components.

Fire Alarm Riser Diagram

If required, fire alarm riser diagrams will be provided by the fire protection engineer.

Special Systems Riser Diagrams

Provide other riser diagrams similar to those developed for telecommunications or intercommunication/paging.

Schedules and Elevations

- Provide schedules for all panelboards. The panelboard schedule shall reflect the actual circuit breaker and bus arrangement. Include the following:
 - o Panelboard designation and location (i.e. room number).
 - o Voltage, phase, frequency, number of poles, and minimum interrupting rating.
 - o Main amperes indicating main breakers or lugs only.
 - o Surface or flush mounting.
 - o Circuit number, wire size, breaker trip, connected load, and identification of load associated with each branch or feeder. Note that identification of load shall be specific. For example, the directory marking shall not merely indicate "Lighting," but rather "Lighting, Room 102."
 - o Total connected load.
 - o Any special breaker requirements such as GFI or SWD.
- All circuiting (identifying conduit and wiring back to specific panels but not identifying the exact routing required during construction) shall be shown on the design drawings exactly as they are to be installed.
- Provide plan and elevation or isometric drawings for switchboards and switchgear, showing compartments, their intended use, and instruments and controls. Clearly show contents of all sections including whether or not breakers are individually or group mounted and indicate that switchboards and switchgear shall be mounted on four (4) inch elevated concrete pads. Coordinate design of pad with structural engineer.
- Provide plan and elevation or isometric drawings for Motor Control Centers (MCCs) identifying compartments. Provide schedule listing each compartment. Schedule shall include (for each compartment) description of load, load in amperes, load in horsepower, NEMA size and type of starter, breaker size, conductor and conduit size, control devices, and other special requirements.

- o Indicate, on plans or in specifications, enclosure type, bus rating, bus material, bus bracing, NEMA class and wiring type, service voltage, control voltage and source, and top or bottom feed.
- o Indicate on the drawings that MCCs shall be mounted on 4 in elevated concrete pads. Coordinate design of pad with structural engineer.
- o Provide elevation of control panels, indicating front panel devices, such as indicator lights, pushbuttons, gauges, and switches.

Details/Diagrams

- Detail all telecommunications outlets, cable tray, and backboard/distribution frames. Provide elevations of pertinent communication room walls. Indicate additional details as required.
- Provide a junction box detail on the drawings showing the interface between the Systems Furniture wiring harness and the branch circuit wiring.

Grounding Diagrams

- Provide grounding diagrams with explicit grounding requirements beginning with the medium-voltage system and continuing through the transformer up to and including the service entrance equipment, step down transformers, sub-panels and telecommunications systems grounding.
- The service entrance grounding electrode systems and interconnections with other system grounding electrodes must be clearly shown and identified on the grounding plan. The main bonding jumper connection must be indicated and system bonding jumper connections for separately derived systems must be clearly indicated. Automatic Transfer switches must be identified indicating 3-pole design for single-phase systems and 4-pole design for three-phase systems.
- Provide cathodic protection plans and details at appropriate scales. Indicate on the drawing the location of all rectifiers, anode beds, structures protected by cathodic protection system(s) and all structures that may be affected by stray current corrosion as a result of cathodic protection of the specific structure within the affected area of cathodic protection. An NACE-certified Cathodic Protection Specialist shall prepare cathodic protection drawings. Coordination with other disciplines critical.

Due to soil movement, the below shows the separation of electrical conduits from the electrical enclosure:



Specification and Other Requirements

The design shall include the information in this section into the design, specification, and drawings.

Demolition or replacement of existing electrical equipment may involve hazardous materials and waste. This includes, but is not necessarily limited to the following:

- Pad mounted transformers – dielectric fluid containing PCBs, lead paint on the exterior
- Pad mounted switches – dielectric fluid containing PCBs, lead paint on the exterior
- Oil-fused cutout switches – dielectric fluid containing PCBs
- Capacitors - dielectric fluid containing PCBs
- Pole mounted transformers – dielectric fluid containing PCBs
- Fluorescent ballasts – dielectric fluid containing PCBs
- Fluorescent and HID lamps – mercury
- Self-luminous exit signs – tritium
- Lead cables – lead
- Manholes and handholes – asbestos fireproofing
- Storage batteries – lead, cadmium, lithium, and electrolytes

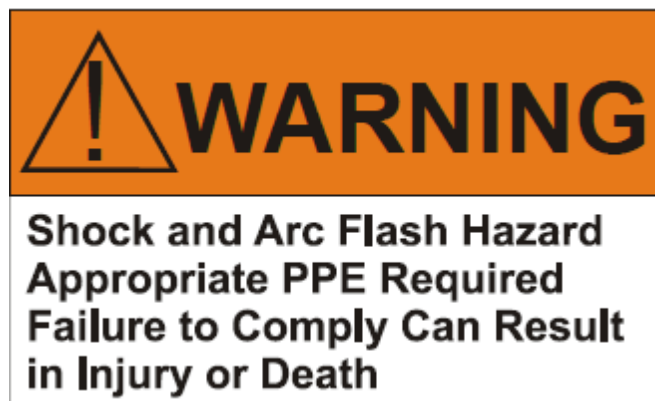
Existing equipment to be “Modified” or “Added to” shall be uniquely identified. This identification shall include the manufacturer’s name and other pertinent manufacturer’s identification (e.g., serial number, model number, style), if such information exists. Determine and identify scheduling, sequencing, and outage requirements including anticipated outage durations as a part of contract design documents. Include a specific and detailed suggested sequence of construction and identify any temporary requirements. Provide sustainable design, energy efficiency, and green procurement of environmentally preferable materials to achieve the required LEED or other agency certification level.

The special design requirements listed below apply when electrical equipment is routinely subjected to corrosive environment or is installed in locations exposed to condensing humidity that has historically caused premature rusting and degradation of equipment enclosures.

- o Entire transformer assembly shall be corrosion resistant and be fabricated of stainless steel.
- o Use stainless steel cabinets and hardware for pad-mounted switchgear, switchboards, and sectionalizing termination cabinets.
- o Use stainless steel enclosures and hardware for exterior safety switches and other electrical equipment.
- o Do not use aluminum-conductor steel-reinforced (ACSR) overhead conductors.
- o When feasible, equipment enclosures can be designed to comply with NEMA 4X non-metallic enclosure requirements instead of stainless steel if the enclosures are not subject to physical or structural integrity damage.

Provide arc flash warning labels on electrical equipment likely to require examination, servicing, or maintenance while energized. Some typical types of equipment include pad-mounted transformers, switchgear, switchboards, panelboards, disconnect switches, industrial control panels, meter socket enclosures, and motor control centers.

Provide labels in accordance with the format shown in below:



Design buildings and similar support structures such as parking structures, sewage pump stations, and fueling facilities in accordance with the general requirements of NFPA 70 and other standards:

- The demarcation for the “service point” (for clarification of the NFPA 70 Article 100 definition) shall be at the building/support structure service equipment line side connection.
- The demarcation between NFPA 70 and IEEE C2 for electrical power design purposes shall be the secondary terminal of the building/support structure utilization electric supply system.
- The demarcation between NFPA 70 and IEEE C2 for communication and security systems shall be the incoming service interface equipment including the five foot raceway extension outside the building/support structure.

Design all exterior underground and overhead, medium and low voltage systems not specifically associated with a building/support structure in accordance with the general requirements of IEEE C2 except that NFPA 70 ampacity and conduit fill tables shall be utilized to the extent possible for all designs.

Design the following in accordance with the general requirements of NFPA 70:

- Exterior lighting systems (parking lot, roadway, security, and sports).
- Exterior branch or feeder circuits originating from building/support structure service equipment.

Wiring from and connections to non-utility equipment supplying power to the wiring system of the facility or the low-voltage terminals of the medium-voltage distribution system, including engine-generator sets, photovoltaic power systems, wind turbines, and fuel cells.

Consider oil spill containment for substation transformers. Containment is not authorized for pad-mounted oil-filled distribution transformers and switches.

The new building shall be provided with a perimeter grounding ring with appropriate interconnections between the grounding electrodes. The ring shall be designed in accordance with Institute of Electrical and Electronic Engineers (IEEE) Standard 142, Grounding.

Provide a direct connection from the grounding ring to telecommunications systems. Separation of power and communication wiring is required, in accordance with National Electrical Code (NEC) and the National Electrical Safety Code (IEEE C2).

Provide utility revenue meter provided to monitor energy consumption at the service entrance.

Light switches shall be twenty (20) amp, 120-V AC, specification-grade. Dimmer switches shall be 120-V AC, specification-grade, with Radio Frequency Interference (RFI) noise suppression, line-voltage regulation, slide-bar decora style. 3-way versions

shall work with a 3-way switch. All areas that are not continuously occupied shall be provided with dual-technology occupancy sensors.

Luminaires located inside of the building shall use linear fluorescent T8 lamps with 4100-degree, K-color temperature. Electronic ballasts will be used for high energy efficiency. Controls for lighting will include manual switching, with occupancy sensors in the restrooms and office spaces.

Egress lighting will be designed in accordance with the NEC and NFPA 101 Life Safety Code requirements. The final design shall provide at least one-foot, candle-maintained illumination along the egress paths and exit discharge when the fixtures are operating on the emergency (battery back-up) power source. Exit signs with green lettering, light-emitting diode (LED) lamps, and integral battery back-up shall be provided where required along the egress paths. The egress lighting systems shall automatically perform the required system testing and provide a problem light if the system does not meet testing requirements.

The design shall include lights mounted to the building that will illuminate the egress exits and the area around the building. Exterior lighting shall be automatically controlled via a photocell/timer, with the ability to manually override the automatic control. Exterior lights shall be turned off from 12 a.m. (midnight) to 5 a.m. and shall be user adjustable.

The mechanical engineer will determine which equipment will have integral magnetic contactors and/or disconnect switches and which equipment will require separate magnetic motor controllers and disconnect switches. In general, packaged refrigeration equipment has integral magnetic contactors and in some instances will have an integral disconnect switch also. Air-handling units and pumps usually require separate magnetic motor controllers and disconnect switches.

The electrical engineer, in conjunction with the mechanical engineer, will determine the location of motor controllers and disconnect switches. Place motor controllers and disconnects in readily accessible locations as defined by NFPA 70.

The electrical engineer must not provide any magnetic motor controller information for mechanical equipment on the electrical drawings, but must determine the type of controller required (full voltage, reduced voltage, reversing, multi-speed, NEMA size, and NEMA enclosure type) and furnish it to the mechanical engineer for incorporation in mechanical equipment schedules. Mechanical equipment schedules must also include electrical characteristics of motor and packaged equipment; e.g., voltage, full load amperes or minimum circuit amperes, number of phases, horsepower, and frequency. Note integral disconnects, if provided, in the mechanical equipment schedules and coordinated with the electrical drawings. Require integral disconnects be furnished with thermal overloads where appropriate for small fractional horsepower motors. The mechanical specifications must be coordinated with the mechanical equipment schedules and mechanical plans.

Use Motor Control Centers (MCC) only when there is a centralized location for the control of a large number of motors. Use individual motor starters for all other applications.

MCC should be factory assembled, dead front units, totally enclosed, free-standing type, with structures joined to form one assembly but designed so that the units may readily be removed and other structures added as required in the future. List and brace the entire assembly for maximum fault available, with equipment busing connections, and with the following minimum provisions:

- o Means for locking each circuit separately.
- o Class A, factory wired, complete including breakers, contactors, starters, relays, transformers, and other required items.
- o Lifting angles or eyebolts to facilitate hoisting and placing.
- o Each structure with two horizontal wiring spaces, one at the top and one at the bottom, which will line up with the adjacent units to convenient wiring raceways the entire length of the control center.
- o Copper bus throughout with a separate ground bus bar the entire length of the motor control center.

Fueling connection shall be on the on the driveway of side street. The fueling connection shall not be located between the equipment and the building wall. Provide for spill control during fueling and maintenance operations.

Electrical box outside the building shall be design for the wind loads and other loads.

Coordinate with the structural engineer. An example of light fixture connection that are failing due to environmental loadings condition:





Secure and weatherproof all electrical connecting in HVAC units.



Discounted equipment shall be accessible. This electrical equipment installation is not accessible.



Spacing between other utilities and shall meet the working space requirements by NFPA and OSHA.



Equipment shall not be obstructed by other electrical or other systems.



DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 26 APPENDICES

DIVISION 27 – COMMUNICATIONS

GENERAL

A/E shall refer to the City of San Antonio Information Technology Services Department (ITSD) for Division 27 and Division 28 requirements.

CORE ELEMENTS

Intermediate Distribution Frames (IDF) Room

There may be multiple IDFs in each building as required to maintain horizontal cable distances of two hundred ninety-five (295) feet for the permanent link.

Building workstation access network equipment will reside in the IDF.

The IDF may share space with other systems such as security panels and paging systems. Space allocation for other systems should be coordinated with the applicable disciplines.

Fire alarm panels and building control panels should not be located inside the IDF.

Space allocation for these systems needs to occur outside of the IDF.

The IDF should not be used for storage, serve as a mechanical or electrical distribution space, nor should it have within its space main electrical feeds, electrical switch gear, transformers, water or main sprinkler lines.

The layout of cabinets, equipment racks, wall fields, and cable management should be as indicated in the ITSD Structured Cabling Infrastructure Standards.

Main Distribution Frame (MDF) Rooms

There should be only one (1) Main Distribution Frame (MDF) Room that serves a building or multi-building “campus.”

Wall and floor space should be reserved for service provider demarcation equipment and incoming infrastructure terminations.

The MDF may share space with other systems such as security panels, paging systems, and CATV cabling. Space allocation for other systems should be coordinated with the applicable disciplines after approval from the COSA Information Technology Service Department. All coordination should be completed prior to installation.

The MDF should not be used for storage, serve as a mechanical or electrical distribution space, nor should it have within its space main electrical feeds, electrical switch gear, transformers, and water or sprinkler main lines.

The layout of cabinets, equipment racks, wall fields, and cable management should be as indicated in the ITSD Structured Cabling Infrastructure Standards.

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 27 APPENDIX

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

GENERAL

A/E shall refer to the COSA Information Technology Services Department (ITSD) for Division 27 and Division 28 requirements.

CORE ELEMENTS

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 28 APPENDIX

DIVISION 29

Not used

DIVISION 30

Not used

DIVISION 31 – EARTHWORK

GENERAL

In this section, important measures are considered for site grading and the protection of existing plant material, the reuse of site resources such as topsoil as well as mention of means to ensure that built environments can be easily maintained and safely maneuvered by patrons for their intended uses.

A/E is to consider the use of organic enhancements to improve the microbial biomass of existing soils, which may mitigate or reduce the need for additional soil and/or compost materials.

REFER TO DIVISION 31 APPENDIX for the COSA Tree Preservation Ordinance for various requirements.

CORE ELEMENTS

Clearing and Grubbing

Confine clearing and grubbing operations to the limits as indicated on the drawings. In the absence of such a designation on the drawings, confine work to the minimum area reasonably necessary to undertake the work as determined by COSA Project Manager/Representative /Representative. Clearing and grubbing operations should never extend past the property line limits without all the consent of all parties.

No onsite burning is allowed unless approved by Owner. Trees/vegetation to remain should be adequately fenced and protected from damage by construction operations. Other reference information can be found in the COSA Tree Preservation Ordinance. REFER TO DIVISION 31 APPENDIX.

Excavation and Trenching

Excavation, trenching and backfilling operation should be coordinated such that no more than two-hundred (200) linear feet of trench is open at any one time. It is preferential that no trenches be left open after hours; however, when that is not feasible, any and all open excavation shall be properly lighted, signed and barricaded, with the General Contractor responsible for ensuring that adequate measures are taken to protect the general public from potential peril.

Additionally, measures are to be taken to prevent runoff water from entering the trench.

An excavation/trench safety program shall be implemented which complies with OSHA trench safety standards. A trench safety plan shall be prepared and sealed by a Texas registered Professional Engineer and approved by the design professional of record prior to the start of construction.

Grading

Slopes of planted areas should allow for easy maintenance. Turf areas should have a slope of no more than three to one (3:1) and no less than one (1) %. An average two (2)% (1/4"/ft.) minimum slope is preferred with controls to mitigate erosion in areas of higher slopes and concentrated drainage flow.

Existing trees and other plant material to be preserved should be indicated on the grading plan. Where trees are to be preserved please refer to the project's approved tree preservation plan for information about plant material to be preserved as well as details

of the specific measure used to do such. Other reference information can be found in the COSA Tree Preservation Ordinance.

Slopes for all accessible routes/walkways should comply with Texas Accessibility Standards (TAS). All placement and compaction of subgrade and select fill material should be per the directive of the Texas registered Professional Engineer and approved by the design professional of record or geotechnical report, whichever is more stringent. All select fill should be free from organic matter, large rocks or other deleterious materials.

Site Clearing/Tree Preservation

Along with overseeing the development and improvement of land, it is the responsibility of the Development Services Department, under the guidelines of the Tree Preservation Ordinance, to maintain, preserve and add to the existing tree population. The goals of the Tree Preservation Ordinance are to enhance the aesthetic environment, to provide health benefits to our community, and to continue to provide elements essential to establish and maintain a strong ecosystem. In order to assist with meeting these goals, the City provides incentives to encourage the maximum preservation of trees.

Topsoil

If good friable top soil exists on site, strip this material to a maximum depth of twelve (12)" and stockpile for reuse in areas to receive grass and other landscaping. Topsoil is to be free of significant vegetation, rocks greater than one (1)" or more in diameter, or other deleterious materials.

Topsoil should be a natural, fertile, friable soil; possessing characteristics of representative productive soils in the vicinity.

Topsoil should be obtained from approved naturally well-drained areas. It should not be collected from sites that are infected with a growth of, or the reproductive parts of, noxious weeds (Nut Sedge, Johnson grass, Bermudagrass).

Topsoil should not be stripped, collected, or deposited while wet.

The Landscape Architect for the project should be given the opportunity to review the soil once overburden is stripped to confirm viability and desired consistency.

When required to import topsoil, it is the responsibility of the General Contractor to furnish to the COSA Project Manager/Representative /Representative in writing the location where the topsoil is to be obtained, as well as a one gallon sample of such soil for approval.

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 31 APPENDIX

1. City of San Antonio Tree Preservation:
<http://www.sanantonio.gov/DSD/Constructing/Tree>
2. City of San Antonio Tree Preservation Ordinance 201 0 - 05 - 0 6 - 0 3 7-6
http://docsonline.sanantonio.gov/FileUploads/dsd/R_4298_20100518110056.pdf

DIVISION 32 – EXTERIOR IMPROVEMENTS

GENERAL

The City of San Antonio (COSA) has the expectation that the entire design team understands the nature of each site and the desires of the client and blends the interior and exterior spaces into a harmonious composition. The design process seeks to bring the quality of the building details and materials into the exterior environment. Aesthetic and functional parameters bear equal weight. Sustainable approaches ensure that the final product is a durable and cost effective solution that meets the City’s initiatives.

All professional disciplines that come together to design COSA projects need to approach a project with the understanding the interior and exterior portions of the project need to be seamless and that all design efforts should strive to be easily maintained, efficient and serve the needs of the patrons.

COSA is an advocate of low impact and sustainable landscape designs incorporating native and adapted plant materials in conjunction with efficient irrigation. These plants are naturally drought tolerant and resistant to pests and diseases and will utilize less water, fertilizer, and chemicals, thereby contributing to the overall health of the landscape. Where feasible and supported by the Client Department, design teams are encouraged to utilize, or incorporate, Low Impact Design features.

Additionally, when possible, design teams should incorporate landscapes supportive of the “Monarch Champion” pledge/commitment made by City officials in December, 2015. REFER TO DIVISION 32 APPENDIX.

Design team is to consider the use of organic enhancements to improve the microbial biomass of existing soils, which may mitigate or reduce the need for additional soil and/or compost materials.

Landscape Irrigation

COSA encourages the use of alternative water sources for landscape irrigation other than potable water. Any opportunities to utilize recycled water, condensate or harvested rainwater should be considered as an alternative to potable water sources, when feasible.

The design and installation of all landscape irrigation systems must meet Texas Commission on Environmental Quality (TCEQ) irrigation laws and requirements. Irrigation systems should be designed and installed under the supervision of a Licensed Irrigator. Materials used in the system should be new, without flaws or defects, and should be the best of their class and kind. The irrigation system should be positively separated from the domestic water system by a separate water meter, and should be equipped with a double check or reduced pressure type backflow preventer.

The chosen type should be suitable to the installation location and conditions. Backflow preventers may be placed in the mechanical space of the building when appropriate. Double check valve backflow preventers located in the landscape, when placed underground should be in valve boxes or vaults with adequate room for testing. Backflow preventers placed above ground, should be located to minimize visibility, and/or be concealed with plants or landscaping features to maintain aesthetics. All backflow preventer devices placed above ground on the exterior should have a lockable enclosure provided to deter tampering and vandalism.

Enclose pipe and wiring beneath roadways, sidewalks, curbs, etc., in sleeves. Extend sleeve ends twenty-four (24) inches beyond the edge of paved surface. Mark sleeve location with 3/8" X 3" brass or stainless steel stove bolt embedded in the concrete at each end. Sleeving pipe beneath pedestrian pavements should be PVC Class 200 with solvent welded joints. Sleeving pipe beneath drives and streets should be Schedule 40 with solvent welded joints. Sleeves installed under pavement for future irrigation installation should be loose capped on each end and marked with stove bolts as above. Size and depth of sleeve should be coordinated with the landscape architect/design professional of record, with a minimum size being four (4)".

Systems should be looped (where practical) to improve system hydraulics and mitigate possible contamination of tubing if system is damaged. Avoid any dead ends that cannot be flushed. Mainline should be PVC Schedule 40 with integral bell ends. Lateral pipe should be PVC Class 200 with integral bell ends. Mainline and lateral fittings should all be PVC Schedule 40. All PVC pipe and slip fittings should be joined with primer and solvent cement. Cure time for cement should be in accordance with manufacturer's instructions. For threaded PVC connections, use only Teflon-type tape. When connection is PVC to metal, the PVC component should have male threads and the metal component should have female threads. For sprinkler heads, use swing joints that are made with rigid piping and multiple elbows to allow for multidirectional adjustment.

When feasible, the satellite irrigation controllers should be located outside the building. Controller units should be compatible with the existing controller systems. For controller, provide quick disconnect from power source next to controller. A two (2) wire controller system is preferred. Electric wire from the satellite controller to each remote control valve and the common wire should be AWG No. 14 solid copper, type UF cable, UL approved for direct underground burial. Wire color should be continuous over its entire length. Use white for common ground wire. Use easily distinguishable colors for other control wires. Control wire splices should be made with 3M-DBY or equal

direct burial splice kit. If multiple splices are made in one location, splices are to be placed in a valve box. Install a control wire from controller to each remote control valve. Multiple valves on a single control wire are not permitted. Control wires should be in same trench as constant pressure lines.

Provide an isolation valve for each zone; however, it is acceptable to install two (2) zones to an isolation valve if necessary. Remote control valves should be placed in valve boxes. Remote control valves and irrigation heads should be compatible with any existing irrigation system (when applicable). Head to head, or one-hundred (100)% overlap, spacing is required. Spacing must not exceed manufacturer's recommended spacing. All heads should be adjusted to factory specifications.

Irrigation mainlines should be placed in trenches so that they have a minimum of eighteen (18) inches of backfill cover. Laterals should be similarly placed with a minimum of twelve (12) inches of backfill cover. All irrigation lines should be placed in a sand cushion bed that extend one (1) inch below the pipe and one (1) inch above to prevent sharp objects from damaging the pipe. Excavated material is generally satisfactory for the remainder of the backfill. Backfill should be free from rubbish, vegetation, and stones larger than one (1) inch in dimension. The General Contractor should be responsible for adding soil to trenches after settling has occurred. Upon completion of work, remove from site all excess materials, and rubbish.

General Contractor should provide a demonstration and walk through of entire irrigation system with the COSA Project Manager/Representative /Representative and Client Department/Owner's Representative. The General Contractor should supply record drawings ("as-builts") of all irrigation as installed in ground to the COSA Project Manager/Representative /Representative. Zones, back flow preventer, and controllers, as well as the zone flow measurement for each zone should be included and shown on the drawings. Drawings should be at a scale no smaller than one (1) inch equals thirty (30) feet (1"=30'-0"). Drawings should be sealed, dated and signed by licensed irrigator in the State of Texas. Operation manuals for controller and other irrigation equipment should be submitted at time of record drawings.

Schedule 40 PVC irrigation sleeves, "loose capped" on each end, should be provided under all site paving to allow for later installation of a site irrigation system. The location and size of sleeves should be coordinated with the landscape architect with a minimum size being four (4) inches in diameter. Sleeve locations should be permanently marked with a 3/8" x 3" brass stove bolt embedded in the concrete over each end of the sleeve. The bolt should be in the top of curb at street crossings and the top of paving on flatwork three (3) in from edge of pavement). Sleeves should have a minimum cover of eighteen (18) inches and extend a minimum of two (2) feet beyond the edge of pavement/back of curb. Sleeve depth should be coordinated with pavement section.

The irrigation system should be installed with a separate potable water supply with controls located in the building mechanical space (preferably in an area that can oversee a large area of the system installed). Where the water system pressure is not adequate for

proper operation and function of the irrigation system a heavy duty duplex booster pump station should be provided in this project. A positive “air break” should be provided between the station and the water system. All equipment that is placed in the open environment should be protected by a lockable enclosure or vault.

Low Impact Development

COSA advocates the use of Low Impact Development (LID). LID is an innovative storm-water management approach with a basic principle that is modeled after nature: manage rainfall at the source using uniformly distributed decentralized micro-scale controls. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Techniques are based on the premise that storm-water management should not be seen as storm-water disposal.

Instead of conveying and managing / treating storm-water in large, costly end-of-pipe facilities located at the bottom of drainage areas, LID addresses storm-water through small, cost-effective landscape features located at the lot level. These landscape features, known as Integrated Management Practices (IMPs), are the building blocks of LID. Almost all components of the urban environment have the potential to serve as an IMP. This includes not only open spaces, but also rooftops, streetscapes, parking lots, sidewalks, and medians.

LID is a versatile approach that can be applied equally well to new development, urban retrofits, and redevelopment / revitalization projects. COSA has collaborated with other local public agencies such as the San Antonio River Authority and San Antonio Water Systems (SAWS) to jointly support the LID movement to highlight its numerous benefits and advantages over conventional storm-water management approaches.

CORE ELEMENTS

Concrete Mow Strip

When use of wheel stops is not feasible, project design should consider utilizing concrete mow strips. Mow Strips should be twelve (12) inches wide x four (4) inches thick. Reinforcing should be No. 3 rebar. Medium broom finish should be utilized. Concrete should be three-thousand (3000) PSI at twenty-eight (28) days minimum. All disturbed areas should be graded to properly drain and seeded, hydro-mulched or sodded with a permanent grass.

Curbs, Gutters, Paving and Driveways and Sidewalks

Site paving should be provided to facilitate pedestrian and vehicular access along with emergency and service vehicle access to the site and facility being designed. Materials, parameters and methods should be in basic conformance with the TxDOT “Standard Specifications for Construction of Highways, Streets and Bridges,” latest edition, and applicable ASTM standards.

Cool Pavement

A possible exception to the above TxDOT specifications is to provide a paving material that has a higher reflective value. Solar reflective "cool" pavements stay cooler in the sun than traditional pavements. It can also provide for improved night lighting. Pavement reflectance can be enhanced by using reflective aggregate, a reflective or clear binder, or a reflective surface coating. These options are to be reviewed with the COSA project manager for applicability. REFER TO DIVISION 32 APPENDIX.

Subgrade material to receive pavement sections other than pedestrian sidewalk which has a plasticity index (PI) greater than seventeen (17), should be stabilized in place with lime prior to placing the pavement. Lime should be placed in slurry form. With the design professional's approval, lime may also be dry placed as Type C pelletized quicklime (grade DS). Lime should be thoroughly mixed into the subgrade with a rotary pulverizing mixer using a two-step preliminary mix/final mix procedure with appropriate curing times between mixes and compaction before opening to traffic or placing additional courses.

Subgrade material to receive pavement sections other than pedestrian sidewalks which has a plasticity index (PI) less than five (5) should be stabilized in place with Type I Portland cement. The cement should be dry mixed into the subgrade using a rotary pulverizing mixer, appropriate water added and then thoroughly mixed with the cement and soil until a full depth uniform mix has been obtained. Appropriate compaction and curing should occur prior to opening to traffic or placing additional courses. Stabilized subgrade should be compacted full depth to a minimum of ninety-five (95)% of the maximum density as per ASTM D-1557 a minimum of twelve (12) inches beyond the supported pavement section. The amount of lime or cement to be added to the subgrade and the depth of stabilization should be determined by the geotechnical Consultant based on design mix tests and anticipated traffic loadings.

Pavement sections subject to vehicular traffic should be either a rigid section of Portland cement reinforced concrete (PCRC) or a flexible section consisting of hot mix asphaltic concrete (HMAC) surface over an approved flexible base material (coordinate pavement type selection with Owner). PCRC pavement sections should be a minimum of six (6) inches thick. Finish should be broom or burlap drag. HMAC should be Type "D" and the flexible base material should be Type A, grade one (1) or two (2) as defined in the TxDOT standard specifications. The flexible base should be compacted in maximum eight (8) inch lifts to a minimum density of ninety-five (95)% of the maximum density as per ASTM D-1557 and should be primed with a cutback asphaltic material such as MC-30 at a rate established by the team and shown on the plans prior to HMAC placement. The HMAC surface course should be compacted to contain three (3) to eight (8) percent air voids when tested in accordance with Tex-207-F and Tex-227-F.

The thickness of the pavement section elements should be recommended by the geotechnical Consultant based on soil conditions and anticipated traffic loadings. Pavement at trash dumpsters, loading docks, etc., subject to heavy vehicular maneuvering and turning should be PCRC.

Pedestrian sidewalks should be PCRC with a minimum thickness of four (4) inches and generally a minimum width of five (5) feet. Pedestrian sidewalks that may also be service and/or emergency vehicle pathways should be a minimum of six (6) inches thick and appropriate width. The finish should typically be a light broom finish but should be coordinated with any standard finish schemes. Sidewalks should be cross-sloped (max.2%) in the direction of site drainage patterns. Sidewalks adjoining concrete curb and gutter should be doweled into the curb and gutter section. Sidewalks adjoining foundations at doors and other points of pedestrian circulation should be doweled to the foundation in a manner to prevent differential movement. It will be the responsibility of the design professionals and the General Contractor to ensure that all PCRC placed should meet slope and finish guidelines set forth by the Americans with Disabilities Act (ADA).

Concrete pavement should typically be edged with a six (6) inch concrete curb. Preferably, the curb should be poured monolithically with the pavement, but doweled curb sections are allowed. If poured separately, the curb section should be recessed one (1) inch into the pavement and attached with dowels of sufficient spacing and length, to hold the curb firmly to the pavement.

HMAC flexible pavement sections should typically be edged by reinforced concrete curb and gutter to receive storm drainage from the pavement and to stabilize the pavement edge. Curb and gutter section should be one (1) foot tall from bottom to top-of curb and two (2) feet in width, have a 1 - 1 ½" (inch) lip above the gutter and be reinforced with three (3) deformed reinforcing bars. Curb and gutter section should be a minimum of six (6) inches thick with a thicker section to form the lip. Place doweled expansion joints in curb and gutter as a minimum at end of radius returns, at curb inlets and at maximum forty (40) foot centers in straight runs. Expansion joints in curbs with adjoining sidewalks should match the joint location and spacing in the sidewalk. Contraction joints a minimum depth of ¾" (inches) or 1/4 slab depth. Whichever is greater should be placed at ten (10) foot intervals. Curb and gutter section should be placed on four (4) inches of flexible base material compacted to the same requirements as the pavement section.

Reinforced concrete valley gutters should be placed in areas of concentrated storm water runoff across HMAC pavement such as at street/driveway intersections. Valley gutters at street intersections should be six (6) feet wide with one to one and a half (1 – 1 ½) inch lips above the flowline on each side. The valley gutter should be a minimum of six (6) inches thick with a thicker section to form the lips. The valley gutter section should be placed on four (4) inches of flexible base material compacted to the same density requirements as the pavement section. Doweled expansion joints should be placed in valley gutters at maximum forty (40) foot centers.

All pavement/surfaces and gutters should be crowned and/or sloped sufficiently to positively direct storm runoff to points of discharge or collection as to eliminate "birdbaths". Minimum cross slopes for open pavement areas should be one (1) %;

minimum crown for streets should be six (6) inches above the gutter line; minimum slopes for curb and gutter should be 0.5%. Design professionals should very clearly denote all required/requested slopes and cross slopes of accessible parking areas and paths of travel within asphalt pavement areas for General Contractor's reference.

A jointing plan should be prepared as part of the design plans showing the type and location of joints in all PCRC pavements including sidewalks and curbs/valley gutters. The expansion joints in sidewalks should be placed at walk intersections and at maximum twenty (20) foot centers in straight runs. Expansion joints in street sections should be placed at maximum sixty (60) foot centers and at maximum forty (40) foot centers in parking lots and should extend through the curb section. Expansion joints, contraction joints, construction joints and isolation joints should be placed in accordance with good engineering practice as required to control cracking and other distress in the concrete pavement and to facilitate construction.

Concrete for all site paving/curbs/gutters should have a minimum compressive strength of three-thousand (3,000) psi at twenty-eight (28) days. Reinforcement should be new deformed steel bars conforming to ASTM A615, Grade 60 minimum No. 4 bar in size. No welded wire fabric should be used as reinforcement except in unique situations as approved by Owner. All concrete should be adequately cured by protecting it against moisture loss for a period of not less than seventy-two (72) hours beginning immediately upon completion of finishing operations and initial set of concrete. Expansion joints should consist of smooth bar dowel assemblies conforming to ASTM A615, grade 60 with a PVC sheath over the free end, asphalt impregnated fiber board filler and two-part, cold applied self-leveling polyurethane sealant with closed cell polyethylene backer rod.

Patching of damaged/inferior newly placed concrete or asphalt is discouraged. COSA requires that all design professionals incorporate into their specifications a limit on the amount of concrete repairs that can occur in any given cast-in-place application. The amount of acceptable repairs/patches should be limited to no more than two (2)% of the total/overall area before total replacement is necessary.

The preferred configuration of parking lots should be as follows:

- Parking Angle: Ninety (90) degrees
- Stall Width: Nine feet (9') – zero inches (0") (wider than this at Senior Centers)
- Handicap Stall Width: Should utilize Universal Design Guidelines and must meet Texas Accessibility Standards

Stall Depth

Twenty feet (20'-0") depth in head to head configuration with concrete wheel stop two feet (2') – six inches (6") o.c. from front edge; eighteen feet (18'-0") depth with landscape overhang/median; if an accessible path/sidewalk is present at the front edge of the space, the minimum stall depth should be twenty feet (20'-0") with wheel stop at two feet, six inches (2'-6") o.c. from front edge or the sidewalk width must be a minimum of seven feet, six inches (7'-6") in width.

Overall Module Width

Drive lanes per Code with preferred stall depths incorporated.

Stripe Width: four (4) inch

Stripe Length: Sixteen (16' - 0") feet

Stripe Colors: White should be utilized in for general parking and red in no parking zones.

Landscaped Medians

Planted, irrigated, and spaced appropriate to the design.

Concrete Mow Strips

Two (2'-0") feet wide back of curb for head-in parking when wheel stop application is not feasible.

Area/Security Lighting

One (1) foot candle minimum.

Concrete Walks: Concrete sidewalks should generally be minimum five (5) feet in width.

Concrete sidewalks are generally medium broom finish. Avoid surface drainage of storm water across sidewalks.

Concrete Joints: Concrete joints should be saw cut "green" as soon as the concrete hardens to support the weight of an early entry type concrete saw and operator and avoid raveling.

Landscape Planting

All landscaping plantings should be planned and designed to be compatible with design concepts and surrounding landscaping schemes. Plantings on projects should be kept to a minimum, unless the overall project concept requires otherwise. Emphasis should be placed on durability and low maintenance characteristics, and when possible, should incorporate features supportive of the "Monarch Champion" pledge/commitment made by City officials in December, 2015.

Landscape Seeding

Do not use wet seed, or seed which is moldy or otherwise damaged in transit or storage. Sow seed using a spreader or seeding machine/drill. After sowing seed, rake the seed lightly into top 1/8" of soil, roll lightly, and water with a fine spray. The period between October 1st to March 1st is not considered suitable for seeding Bermuda grass. During this period the soil will be stabilized by one seeding of cool season seed, such as Rye grass. After May 15th, the area seeded with the cool season grass mix is to be reseeded with the Common Bermuda grass, following proper preparation. Rye grass is to be closely mowed and be allowed to "burn out." After the temporary grass is dead, the area is to be lightly scarified and over-seeded with Bermuda grass and reestablished prior to

acceptance by the COSA Project Manager/Representative /Representative. Immediately following seeding and compacting; apply mulch to a thickness of 1/8" (inches). The General Contractor is responsible for providing maintenance on the seeded grass areas until the area has been established to ninety (90) % coverage evenly across the seeded areas.

Planting Mixture

Premixed blend of topsoil, organic matter, and sand in a ratio suited for the area and plant material specified. Seasonal color beds should have two (2) inch depth of peat moss tilled into top layer of planting mix before installation of plant material.

Planters

Twelve (12) inch minimum of planting mix placed in planter. Crown surface for positive drainage.

Turf Areas

Four (4) inches of topsoil after settlement. Topsoil is to be a dark black soil and not a sandy loam. Topsoil should be placed and fine graded before placement of turf.

Shrubs

It is critical in the plant layout in the field to consider the mature height and spread of the specified material. Plant material is to be spaced away from the edge of the hardscape elements so the plant material does not overhang, causing continual maintenance for the Owner with trimming and pruning. Verify with the COSA Project Manager/Representative prior to specifying a plant material that is going to overhang hardscape.

Excavate pits with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Minimum diameter of excavation should be twice the diameter of rootball. When proposed planting areas have a rock substrate, fill shrub pits with water to insure that they drain completely within a twenty-four (24) hour period.

All plant material is preferred to be container-grown, fully rooted out in the containers and true to the species specified. Plant material shall bear a growers label to clearly identify the plant material. Verify with the COSA Project Manager/Representative prior to specifying any field collected material.

All plant materials are to be full in growth habits, free of insects, disease and defects.

All plants, other than trees, are to be installed at a level that, after settlement, they bear the same relationship to the finished grade of the surrounding soil from which they were dug or from the container they were grown in. Backfill around shrub root balls should be fifty (50)% approved topsoil and fifty (50)% of a three (3) way soil mix of equal parts of topsoil, sand, and compost. Where a more acid soil mix is required around plant material such as roses, use fifty (50)% topsoil and fifty (50)% rose mix equal to that as provided by Gardenville (or approved equal).

When required to import topsoil, it is the responsibility of the General Contractor to furnish the location where the topsoil is to be obtained to the COSA Project Manager/Representative in writing, as well as a one (1) gallon sample of such soil for approval.

Mulch should be shredded native mulch that is twice ground. No large chunks or pieces allowed. A four (4) inch thick layer of mulch should be used over expanses of the shrub and groundcover beds and pulled two to three (2-3) inches away from the stem of the shrubs.

When feasible, the project should utilize City furnished mulch. Coordination of mulch availability, transports, etc., shall be project specific and coordinated with COSA Solid Waste management. The COSA Project Manager/Representative will assist with coordination.

Turf and Grasses

Sod should be variety approved by the COSA Project Manager/Representative. Sod should be composed of certified, approved, or nursery grown grass and should be true to name/ variety. Sod should be substantially free of noxious weeds, disease, insects, thatch and undesirable grasses. Sod should have a sufficient density so that no surface soil is visible at a mowing height of 1.5". Sod should be neatly mowed and mature enough that when grasped at one end it can be lifted and handled without damage to the sod.

Maximum mowing height should be two and a half (2.5) inches. Sod should be cut to provide a sufficient root zone and stand of live grass. Sod should be cut with a uniform soil portion of a one-half (½) inch thickness, plus or minus one-quarter (¼) inch. Sod should be cut, delivered and installed within twenty-four (24) hours of cutting. Sod should be cut by mechanical means such as sod cutters. Sod should be cut when the moisture content (either excessively wet or dry) will impact the lifespan of the sod.

Area designated for sod should be fine graded, smoothed, with topsoil placed before final grading. If soil is dry, lightly moisten before placement of sod. First row of sod should be placed in a straight line with additional placement of rows parallel and tightly placed against each row. Staggered lateral joints butted tightly should be used. Sod should not be stretched or overlapped.

Sod on slopes greater than three to one (3:1) should be placed perpendicular to slope. Sod on slopes should be temporally fastened to ground by stakes, staples, pegs or other approved methods. After sod has become established, the General Contractor should remove fasteners. Sod should be lightly rolled after section is placed. Once the sod has been placed, immediately water sodded area to prevent excessive drying. Thoroughly water sod until underside of sod and soil are completely wet.

Trees

All trees are to be first quality trees; free of defects, disease, and injury.

All selected trees should have a central leader for strength and vigor in growth habit. No “Y” crotch trees are to be accepted. All trees should be delivered covered with a tarp during the cool part of the day to avoid windburn on the trees (unless in a deciduous state at the time of delivery).

Container grown trees are preferred; however, balled and burlap (B&B) trees are acceptable, providing the trees are cured trees and not freshly dug. It is preferred that the B&B trees are dug in the cool season of the year and healed in for two to three (2 - 3) months prior to installation minimum.

Trees specified should have a root ball or container size of such a size and weight, that staking is not required. Stakes and guy wires are discouraged, due to the safety risks of injury to the public. Only Palm trees should be considered for staking.

Tree balls are to be set so the top of the root ball is no lower than the adjacent grade or just slightly higher. A four (4) inch layer of mulch should be used over the root balls and pulled two to three (2-3) inches away from the trunk of the tree.

Tree pits should be dug wide enough to allow for twelve (12) inches of soil mix around the outside of the root ball. In rocky areas, Tree pits should be filled with water prior to planting to ensure the pit drains within twenty-four (24) hours. Backfill around the root balls should be fifty (50)% approved topsoil and fifty (50)% of a three (3) way soil mix of equal parts of topsoil, sand, and compost.

The design team’s specifications need to reiterate the one (1) year warranty requirement for the project. This includes all planting and landscape materials. If the project can afford such, the design team is encouraged to bid/price one (1) year of landscape maintenance as an alternate to the project’s base bid. Whether this additional service is accepted or not, however, the General Contractor remains responsible for periodically overseeing and monitoring plant material during the one (1) year warranty period.

If deficiencies in the plant and landscape care are noticed, it will be the responsibility of the General Contractor to formally advise the COSA Project Manager/Representative in writing of specific deficiencies. No absolution of responsibility is possible without acknowledgement from COSA that such deficiencies are indeed the reason for said landscape demise.

Any specified plant material that perishes within the project’s warranty period needs to be replaced in no more than thirty (30) days from the time of/discovery of demise. It will not be acceptable for a General Contractor to wait until the eleventh (11th) month of, or very end of, the warranty period to make all necessary replacements. This delayed replacement practice negates the ability of the owner to have a proper warranty as well may leave the project looking incomplete, or poorly maintained. Conversely, any plant material that is voluntary, or does not belong in the planting bed needs to be removed in a timely manner.

DEPARTMENT SPECIFIC REQUIREMENTS

(None)

DIVISION 32 APPENDIX

1. Monarch Champion City:

<https://www.sanantonio.gov/Commpa/News/ArtMID/1970/ArticleID/6023/Mayor-Ivy-Taylor-to-become-first-ever-Monarch-Champion>

2. Cool Paving: <https://www.epa.gov/heat-islands/using-cool-pavements-reduce-heat-islands>

DIVISION 33 – UTILITIES

GENERAL

All connections to facility distribution systems or public utilities should be accurately located by dimensions or coordinates. Depth of piping should be shown and inverts must be shown at manholes and other critical points.

CORE ELEMENTS

Domestic Water

The domestic water system must be designed and installed in accordance with TCEQ requirements.

Domestic water piping four (4)" inches and larger should be AWWA C-900, Class 200 PVC with elastomeric gasket push-on joints. Fittings should be cement mortar lined and appropriately coated and protected mechanical joint ductile iron. Piping smaller than four (4)" inches should be SDR 21 Class 200 ASTM D2241, PVC with elastomeric gasket push on joints. Fittings should be PVC of equal strength.

All angles, bends, tees etc. should be stabilized with concrete thrust blocks sized by the Project A/E. Appropriately spliced and terminated tracer wire should be laid with all non-metallic water line.

Line valves should be placed at all points of connection to existing water lines, at branch intersections and any other location necessary for adequate control of the water system. Typically the number of valves at an intersection will equal the number of branches less one. "In line" valves should be placed in long runs of pipe at approximate two thousand (2000) foot spacing. Adequately supported air/vacuum relief valves should be installed as required along the main in enclosures to facilitate draining and maintenance/inspection.

Sanitary Sewer

Gravity sanitary sewer mainlines should be no less than six (6) inches and services lines should be no less than four (4) inches. All gravity sanitary sewer piping should be SDR 26 PVC (ASTM D 3034) or heavier. Exposed piping should be ductile iron with appropriate coating protection. PVC and ductile iron piping should have watertight push-on joints using elastomeric gaskets meeting the requirements of ASTM F 477 and AWWA C111 respectively. Fittings should be of equal strength as the piping.

Manholes on sanitary sewer mainlines should be spaced no further than three hundred-fifty (350) feet apart and be placed at all piping intersections and significant angle points with the exception of four (4) inch service lines. Appropriate wye fittings should be used at such service connections. Sanitary sewer manholes should be either cast-in-place or pre-cast (ASTM C478) with a reinforced concrete foundation. Minimum twenty-eight (28) day concrete strength should be three thousand (3,000) psi. The invert of the manhole should be sloped and smooth finished sufficiently preventing deposition of solids. If the elevation difference between an entering pipe and the existing pipe is more than two (2) feet, a drop type manhole should be used.

Sanitary sewer and the storm sewer should be shown on separate sheets along with profiles.

All pipes penetrating exterior walls below grade must be installed properly to prevent breakage due to building settlement or expansive soil.

Provide thirty (30) inch diameter minimum size access openings for all sanitary manholes.

Cleanouts should be provided for all service laterals and be located at each bend, at connections to manholes and every one-hundred (100) feet in straight pipe runs. Cleanouts should be installed on all four (4) inch sanitary sewer service lines as required to facilitate line cleaning.

Profiles on sewer lines should be shown for all pipes sized six (6) inches and greater. The profiles should show as a minimum: depth of cover, other utility crossings, slope, inverts, pipe material and class of pipe.

The sanitary sewer system must be designed, installed and tested in accordance with Texas Commission on Environmental Quality (TCEQ) requirements. Leakage test on PVC pipe should be a low pressure air test performed as set forth by the Uni-Bell PVC Pipe Association. Deflection tests should be by a mandrel pull thirty (30) days following trench backfill. All tests should be witnessed by the Owner.

DEPARTMENT SPECIFIC REQUIREMENTS

DIVISION 33 APPENDIX

SECTION III – General Appendix

1. Criteria Modification Request Form
2. COSA Soil Policy, March 18, 2015
3. Facility Sustainability Review Checklist
4. Architecturally Exposed Structural Steel Framing



CITY OF SAN ANTONIO
TRANSPORTATION & CAPITAL IMPROVEMENTS

City of San Antonio – Facilities Design Guidelines and Standards (FDGS)

CRITERIA MODIFICATION REQUEST FORM (CMRF)

Date:

Name:

Company/Organization:

Email:

Phone:

<u>Page Number</u>	<u>Modification Request</u>

Please submit to Barbara F. Smith, SMA with TCI – Barbara.f.smith@sanantonio.gov



CITY OF SAN ANTONIO
TRANSPORTATION & CAPITAL IMPROVEMENTS

TO: Sheryl Sculley, City Manager
THROUGH: Peter Zaroni, Deputy City Manager
FROM: Mike Frisbie, P.E., Director/City Engineer 
COPIES TO: Executive Leadership Team
SUBJECT: Capital Project Soil Relocation Policy and Communication Plan
DATE: March 18, 2015

The Transportation & Capital Improvements (TCI) Department routinely manages the excavation of soil as part of the many street, drainage, park and building projects undertaken each year. In this infrastructure work, TCI is sensitive to local, state, and federal environmental requirements with respect to soil excavation.

Soil has been and will continue to be tested by private, licensed professionals and is compared to Texas Commission on Environmental Quality (TCEQ) standards for residential/commercial use. When soil exceeds TCEQ standards for residential/commercial use, TCI adheres to TCEQ guidelines for the appropriate handling and disposal of soil in a certified landfill. When soil is within TCEQ standards for residential/commercial use, TCI may reuse the soil on another suitable site as allowed by the TCEQ.

The process TCI has followed and will continue to follow to test, handle and move soil is appropriate and in accordance with industry standards. However, to better communicate this process, TCI will implement the attached Capital Project Soil Relocation Policy and Communication Plan, effective immediately.

Attachment



CITY OF SAN ANTONIO
TRANSPORTATION & CAPITAL IMPROVEMENTS

Capital Project Soil Relocation Policy and Communication Plan

Transportation & Capital Improvements (TCI) routinely moves soil as part of the many street, drainage, park and building projects it manages annually. Prior to any excavation, the soil is tested by private, licensed professionals and is compared to Texas Commission on Environmental Quality (TCEQ) standards for appropriate reuse or disposition.

Residential/Commercial Grade Soil

When soil excavated from a City of San Antonio capital improvements project is tested and confirmed to be within TCEQ standards for residential/commercial use and is greater than 15,000 cubic yards, regardless of its originating source, the soil may be reused on another suitable site after the following communication steps are taken.

TCI will notify the City Manager, Mayor and City Council about the soil through email. TCI will initiate meetings with the respective City Council Member(s) in whose district the soil originated and will be reused. These meetings will include the TCI Director or designee.

Property owners within a 200 foot radius of the reuse site will receive a letter from TCI outlining where the soil originated from, where it will be reused, and the testing measures taken before deciding to move the soil.

Additional key stakeholders also will be notified by letter from TCI outlining where the soil was excavated from, where it will be reused, and the testing measures taken before deciding to move the soil.

Members of the public at large will be notified using the City's website and other public communication tools, as the situation requires.

When soil excavated from a City of San Antonio capital improvements project is tested and confirmed to be within TCEQ standards for residential/commercial use and is less than 15,000 cubic yards volume, the soil may be reused on another suitable site. Since the soil is of high quality and low volume, information about this soil will be provided as requested.

When a low volume of residential/commercial grade soil (less than 15,000 cubic yards) is from the Central Business District or from a location that may be perceived of having soil issues, the soil may be reused on another suitable site after the following appropriate communication steps are taken. TCI will notify the City Manager and respective City Council Member(s) in whose district the soil originated and in whose district the soil will be reused. The communication will be through email and will include information about the originating and destination sites.

Non-Residential/Commercial Grade Soil

When soil excavated from a City of San Antonio capital improvements project is tested and confirmed to exceed TCEQ standards for residential/commercial use, regardless of the volume, the soil will be taken to a certified landfill.

If the amount of non-residential/commercial soil excavated exceeds 15,000 cubic yards, TCI will provide the City Manager, Mayor and City Council details of the project through email and with personal conversations as necessary. In addition TCI will provide property owners within a 200 foot radius of the originating site written notification of the soil. The notification letter will include details to include where the soil originated, the certified landfill where the soil will be taken, and the volume of soil to be moved.

When excavated soil is less than 15,000 cubic yards, TCI will provide the City Manager, Mayor and City Council details of the project through email and with personal conversations as necessary. The details will include where the soil originated, the certified landfill where the soil will be taken, and the volume of soil to be moved. Additional details regarding the excavated soil will be available as requested.

Soil Relocation and Communication Plan Policy Review and Revision

This policy will go into effect immediately as of March 16, 2015.

In its first year, this policy will be reviewed biannually to make any necessary adjustments as feedback is received. TCI will engage with the City Manager, Mayor, City Council, and stakeholders to determine if the policy is being appropriately applied and if it can be improved.



City of San Antonio
Office of Sustainability

COSA NEW FACILITY/SUBSTANTIAL RENOVATION

SUSTAINABILITY REVIEW

BACKGROUND

On August 11, 2016, the City of San Antonio City Council adopted the SA Tomorrow Plans that include a Comprehensive Plan, Multi-Modal Transportation Plan, and a Sustainability Plan. The Sustainability Plan is a long-term community plan, as well as a plan to improve COSA's sustainability through "Leading by Example" actions and performance measures.

Specific municipal strategies from the adopted SA Tomorrow Sustainability Plan that are related to COSA facilities include:

1. Explore renewable energy distributed generation and battery storage opportunities at critical municipal facilities.
2. Update city facility design guidelines to require new construction and significant renovations to meet and receive EPA Energy Star Certification within the 80th percentile.
3. Develop a building and facility energy management system for real-time data and operational control.
4. Require all appropriate City-funded infrastructure projects be designed to deliver no net runoff/or provide for an increase in net natural areas.
5. Assess city-owned buildings and install green or cool roofs to reduce building energy consumption and mitigate urban heat island impact.
6. Ensure all essential City assets and systems are assessed for their preparedness and ability to recover from current and future extreme weather events.
7. Provide incentive programs and shower and storage facilities for all COSA employees who commute to work utilizing clean sources (bike, walk, carpool, transit, alternative fueled vehicle).
8. Green the city fleet to reduce fuel use (EV's, efficient vehicles, rightsizing, telematics, and behavior change).
9. Expand incentives and essential infrastructure for employees to regularly engage in physical activity and make healthy choices

In order to ensure that new city facilities, as well as substantial renovations are meeting CoSA's adopted sustainability priorities and incorporating sustainability elements, projects shall complete this checklist for review and approval of the Office of Sustainability.



INSTRUCTIONS

1. Fill in basic project information in Section One.
2. Check all sustainability measures being utilized in the project, as well as a written description, in Section Two.
3. Attach spec sheets or additional information for applicable sustainability measures.
4. This form should be utilized as a checklist during each stage of design: SD's, DD's, and CD's, to ensure the design team is fulfilling these sustainability measures.
5. The completed form is to be sent to the City of San Antonio Chief Sustainability Officer at the completion of DDs and updated for the CD's.

SECTION ONE: PROJECT INFORMATION

Project Name:

Location:

Project Manager:

Document Type:

- ☐ DD
- ☐ CD

Contact Information:

Name of Person Completing Form:

Contact Information:

Date:



SECTION TWO: SUSTAINABILITY MEASURES

1. Energy

- ☐ Solar Panels
- ☐ Solar Ready
- ☐ Designed to Meet Energy Star Certification (80th Percentile)
 - ☐ Building Automation System (BAS) Description of Checked Items:

Description of Checked Items:

I



2. *Lighting*

- ☐ LED Bulbs/Fixtures
- ☐ Energy Saving Switching
- ☐ Occupancy Sensors
- ☐ Dual Switching
- ☐ Daylight Zoning
- ☐ “Dark Sky” Design/Lighting

Description of Checked Items:



3. *Transportation*

a. **Fleet**

- ☐ Electric Vehicle (EV) Charging Stations
- ☐ EV Ready

b. **Bike Communizing/Active Lifestyles**

- ☐ Bike Racks
- ☐ Bike Lockers
- ☐ Shower Facilities
- ☐ Water Bottle Filling Stations

Description of Checked Items:



4. Site

- a. Landscaping
 - ☐ Native Landscaping
 - ☐ Drought-Resistant Landscaping
 - ☐ Monarch Butterfly Habitat
 - ☐ Drip Irrigation
 - ☐ Pervious Pavement
- b. Urban Heat Island Mitigation Target – Minimum 50% of Total Site
 - ☐ "Green" or Cool Roof
 - ☐ Reflective Parking Lot Material
 - ☐ Trees (#, size, species)
 - ☐ Low Impact Development

Description of Checked Items:



5. *Resilience*

- ☐ Flood Risk Assessment and Mitigation
- ☐ Back-up Power
 - PV +Battery
 - Generator
- ☐ PV Powered EV Charging Stations
- ☐ Emergency Shelter
 - Cooling Center
 - Tornado Shelter
- ☐ Public PV Phone Charging Stations

Copyright 2014 by The American Institute of Architects (AIA)

Exclusively published and distributed by Architectural Computer Services, Inc. (ARCOM) for the AIA

SECTION 051213 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

GENERAL

SUMMARY

Section includes architecturally exposed structural-steel (AESS).

Requirements in Section 051200 "Structural Steel Framing" also apply to AESS.

Section applies to:

All Pavilion tapered beams

All pavilion exposed columns

DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

AESS: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

Preinstallation Conference: Conduct conference at Project site.

ACTION SUBMITTALS

Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.

Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

Samples required in "Samples" Paragraph below can be used as quality standards in place of mockups.

Samples: Submit Samples of AESS to set quality standards for exposed welds.

Two subparagraphs below are examples only. Revise as needed to provide representative examples of required finishing of welded connections.

Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld and with weld ground smooth.

Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.

QUALITY ASSURANCE

Retain "Fabricator Qualifications" Paragraph below if requirements for fabricator qualifications in this Section exceed those in Section 051200 "Structural Steel Framing." Category STD is for steel building structures; other categories in fabricator certification program are for bridges.

Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

Retain "Installer Qualifications" Paragraph below if requirements for installer qualifications in this Section exceed those in Section 051200 "Structural Steel Framing." Because this is a recently established program, verify availability of certified erectors. Retain category from two options below: ACSE for advanced certified steel erectors, CSE for certified steel erectors.

Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

Retain "Shop-Painting Applicators" Paragraph below if requirements for shop-painting applicators in this Section exceed those in Section 051200 "Structural Steel Framing." Qualifications below are usually for high-performance coatings rather than for customary shop priming. Before retaining, verify that fabricators or shop-painting applicators serving Project area are qualified. AISC's program qualifies fabricators as an endorsement to plant certification; SSPC's program usually qualifies paint shops rather than steel fabricators. AISC's Sophisticated Paint Endorsement is based on industry standards and manufacturers' storage, surface preparation, application, and curing requirements; P1 is for enclosed facilities, P2 for covered facilities, and P3 for outside facilities.

Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

DELIVERY, STORAGE, AND HANDLING

Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

FIELD CONDITIONS

Field Measurements: Where AECS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PRODUCTS

BOLTS, CONNECTORS, AND ANCHORS

Retain this article only for those materials that apply to AECS and are not specified in Section 051200 "Structural Steel Framing."

Tension-control (twist-off) bolt assemblies in "Tension-Control, High-Strength Bolt-Nut-Washer Assemblies" and "Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies" paragraphs below correspond to strength of ASTM A 325 (ASTM A 325M) bolts; retain if round-head bolts are required.

Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

Retain one option in "Finish" Subparagraph below.

Finish: Mechanically deposited zinc coating.

Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 3, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

FILLER

Filler: Polyester filler intended for use in repairing dents in automobile bodies.

PRIMER

Retain this article only for those materials that apply to AESS and are not retained in Section 051200 "Structural Steel Framing." Insert proprietary primers if required as part of special coating or painting system. Coordinate primer selection with surface preparation and topcoats, requirements for slip-critical joints, and limitations of sprayed fire-resistive materials and intumescent mastic fireproofing. Insert color if required.

Primer: Fast-curing two-part epoxy such as PPG Pitt-Guard Epoxy Mastic Coating #97-148 or approved equal. Primer shall comply with all federal standards for VOC, lead and chromate levels.

FABRICATION

In addition to special care used to handle and fabricate AESS, comply with the following:

Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.

Grind sheared, punched, and flame-cut edges of AESS to provide smooth surfaces and edges.

Fabricate AESS with exposed surfaces free of mill marks.

Fabricate AESS with exposed surfaces free of seams to maximum extent possible.

Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.

Fabricate AESS to the tolerances specified in AISC 303 for.

Seal-weld open ends of hollow structural sections with 3/8-inch closure plates.

Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch.

Retain option in "Bolt Holes" Paragraph below if permitted. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" permits thermally cut bolt holes if approved by engineer of record. Revise standard bolt holes to oversized, short-slotted, or long-slotted bolt holes if permitted and indicate locations of each type on Drawings.

Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

Retain "Cleaning Corrosion-Resisting Structural Steel" Paragraph below for unpainted, corrosion-resisting (weathering) structural steel.

Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

Delete option in first subparagraph below if allowing thermally cut holes.

Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

Weld threaded nuts to framing and other specialty items indicated to receive other work.

SHOP CONNECTIONS

High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

RCSC requires that joint types be specified in the Contract Documents for most loading conditions. See Evaluations for a discussion of the joint types in "Joint Type" Subparagraph below, which are the three types RCSC now recognizes. Insert particular bolt pretensioning method for pretensioned or slip-critical joints if required; RCSC states that each type can provide satisfactory results.

Retain option in "Weld Connections" Paragraph below for "High-Seismic Applications" as defined in AISC 360.

Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.

Use weld sizes, fabrication sequence, and equipment for AECS that limit distortions to allowable tolerances.

Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AECS is exposed to weather.

Provide continuous welds of uniform size and profile where AECS is welded.

Retain one of first two subparagraphs below.

Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch.

Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.

Remove backing bars or runoff tabs; back-gouge and grind steel smooth.

At locations where welding on the far side of an exposed connection of AECS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.

Retain one of two subparagraphs below.

Make fillet welds oversize and grind to uniform profile with smooth face and transition.

SHOP PRIMING

Retain this article if shop priming is required and is different from that specified in Section 051200 "Structural Steel Framing."

Shop prime steel surfaces except the following:

Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

Surfaces to be field welded.

Surfaces to be high-strength bolted with slip-critical connections.

Surfaces to receive sprayed fire-resistive materials.

Surface that are weathering steel

Retain subparagraph below if galvanized surfaces are not to be shop primed.

Surface Preparation for Nongalvanized Steel:

Retain surface-preparation standards in six subparagraphs below or revise to suit Project.

Coordinate minimum surface-preparation requirements with selection of primers, paint, and coating systems. See Evaluations.

Cleaning in first subparagraph below removes loose rust, mill scale, and paint.

SSPC-SP 3, "Power Tool Cleaning."

Cleaning in first subparagraph below permits tight residues of rust, mill scale, and coatings to remain.

SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

Cleaning in first subparagraph below exceeds SSPC-SP 7/NACE No. 4 but is less than cleaning specified in SSPC-SP 6/NACE No. 3.

SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."

Cleaning in first subparagraph below requires complete removal of rust, mill scale, and paint by power tools. SSPC-SP 11 uses nonabrasive methods and bridges the gap between the marginal cleaning required in SSPC-SP 2, SSPC-SP 3, and SSPC-SP 7/NACE No. 4, and the more thorough cleaning required in SSPC-SP 6/NACE No. 3, SSPC-SP 10/NACE No. 2, and SSPC-SP 5/NACE No. 1.

SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

Cleaning in first subparagraph below requires that two-thirds of surface area be free of visible residue.

SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

Cleaning in subparagraph below requires that 95 percent of surface area be free of visible residue.

SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

EXECUTION

EXAMINATION

Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment.

If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.

ERECTION

Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

Erect AESS to the tolerances specified in AISC 303 for steel that [is] [is not] designated AESS.

If thermal cutting is permitted, retain option in paragraph below.

Do not use thermal cutting during erection

FIELD CONNECTIONS

High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

RCSC requires that joint types be specified in the Contract Documents for most loading conditions. See Evaluations for a discussion of the joint types in "Joint Type" Subparagraph below, which are the three types RCSC now recognizes. Insert particular bolt pretensioning method for pretensioned or slip-critical joints if required; RCSC states that each type can provide satisfactory results.

Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.

Remove backing bars or runoff tabs; back-gouge and grind steel smooth.

Remove erection bolts, fill holes, and grind smooth.

Fill weld access holes and grind smooth.

FIELD QUALITY CONTROL

Retain "Testing Agency" Paragraph below to identify who shall perform tests and inspections.

Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AECS as specified in Section 051200 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.

Architect will observe AECS in place to determine acceptability relating to aesthetic effect.

REPAIRS AND PROTECTION

Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

