Volume 1  Facilities Development Plan and Guidelines

Volume 2  Existing Facilities Assessment

Volume 3  Master Programming

Volume 4  District Standards

Summary  1

Interior Finishes  2

Systems  3

Building Exteriors and Sitework  4

Information Technology  5

Security  6

Signage  7
Summary

1. Introduction
2. District Standards Implementation
3. Author’s List
4. Approval Sign-off Document

Interior Finishes

2. Carpet
3. Resilient Flooring
4. Acoustical Ceilings
5. Tile

6. Wall Coverings
7. Toilet Partitions
8. Window Treatments

Systems

3. Design Preferences
4. District Standards
5. Architectural Systems & Materials
6. Plumbing
7. Mechanical
8. Electrical Systems
9. Landscape
10. Lighting
11. Civil

Building Exteriors & Sitework

4. See Volume One

Information Technology

5. Technology Guidelines
6. Data Center Audit and Evaluation

Security

6. In Process

Signage

7. In Process
1 SUMMARY
Introduction

The development of *Marin Community College District Standards (Standards)* was undertaken as part of the Bond Funded Master Plan Program. The Standards apply to all new projects within the District. They were developed through a series of meetings with classified staff, faculty, maintenance and operations staff, and students, between Fall 2005 and Spring 2006. This volume represents the accumulation of workshops and comments gathered during that time period. The products, materials, and equipment identified are intended to enhance the academic environment and making all academic spaces meet current standards.

This information is dynamic and expected to change. The dynamic nature of the academic environment necessitates revisiting the Standards and making appropriate revisions throughout the life of the Program.

Nevertheless, it is each A/E teams responsibility to prepare their design documents in conformance with these standards at the time of their distribution.
District Standards Implementation

The development of the Marin Community College District Standards (Standards) will provide all Architectural/Engineering teams with a basis for consistency in design and cost control. Furthermore, the Standards are meant to allow the maintenance and operations staff consistency in materials, equipment, and procedures.

The Architects and Engineers for each project will employ their best professional judgment in implementing the Standards. Documentation of compliance and variations with the Standards is required. All design teams must submit with their milestone deliverables, a statement of compliance or non-compliance with the standards and a copy of the approved design document.

The District requests that the following items not be eliminated or reduced during the Value Engineering process:

- Direct Digital Controls (DDC)
- Power and data distribution in classrooms
- District hardware specifications
- Signage
- Elevators

Prior to bid, the A/E team shall provide the District with a written list of both Owner-provided and Owner-provided/installed equipment.
The enclosed District Standards were developed by the following consultants:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Firm</th>
<th>Key Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>Steinberg Architects</td>
<td>Jeffrey Berg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Robert Barthelman</td>
</tr>
<tr>
<td>Interior Finishes</td>
<td>Steinberg Architects</td>
<td>Lisa Welty-O’hare</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jeffrey Berg</td>
</tr>
<tr>
<td>Mechanical Systems</td>
<td>Alfa-Tech</td>
<td>Michael Lucas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hormoz Jannsens</td>
</tr>
<tr>
<td>Electrical Systems</td>
<td>Alfa Tech</td>
<td>Michael Lucas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Joel Cruz</td>
</tr>
<tr>
<td>Lighting Systems</td>
<td>Alfa Tech</td>
<td>Joel Cruz</td>
</tr>
<tr>
<td>Civil</td>
<td>CSW/Stuber-Stroeh</td>
<td>Don Curry</td>
</tr>
<tr>
<td>Landscape</td>
<td>Royston, Hanamoto, Alley &amp; Abey</td>
<td>Aditya Avani</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nathan Lozier</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Alfa Tech Cambridge Group</td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>Alfa Tech Cambridge Group</td>
<td>Paul Dubois</td>
</tr>
<tr>
<td></td>
<td>w/ Tomasi-Dubois Associates</td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td>Kate Keating, Associates</td>
<td>Kate Keating</td>
</tr>
</tbody>
</table>
Approval Sign-off Document for District
District Standards

December 2006

The Interior Finishes Committee, Systems Committee and Exteriors & Site Committee at the College of Marin have reviewed and recommends approval of the enclosed District Standards for the Bond Funded Master Plan Program.

______________________________  __________________________
Andy Haber, Representative        Date
Interior Finishes Committee

______________________________  __________________________
Don Flowers, Representative      Date
Systems Committee

______________________________  __________________________
Pam Scoggins, Representative      Date
Exteriors & Site Committee

______________________________  __________________________
Name:            Date

______________________________  __________________________
Name:            Date
2 | INTERIOR FINISHES
Interior Finishes  Carpet - Tile

CARPET TILE #1
Manufacturer: Interface
Description: Glass Bac backing process with high recycled content. Highest recycled content of type 6.6 nylon available. Solution dyed nylon. Mergeable dye lots meaning tiles installed in the past will blend with tiles installed in the future. Random, direction less installation provides for easy replacement of tiles. New products made with bio-based fibers, ISO 14401 certified.
Tile Size: 20” X 20”
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.interfaceinc.com

CARPET TILE #2
Manufacturer: Shaw Contract
Description: 100% Eco-Solution Q Premium Branded Nylon, Solution Dyed Type 6.0 Nylon and Shaw’s award winning, PVC free, Ecoworx backing. Industry leader in cradle-to-cradle technology, recycled content.
Tile Size: 24” X 24”
Collection: No Rules, Product B
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.shawinc.com

CARPET TILE #3
Manufacturer: Lee’s Carpets
Description: Unibond Lifetime backing system w/ Antron Legacy 6.6 hollow filament nylon w/ Duracolor Technology (Integral Permanent Stain & Fade Resistant). Environmentally Preferable Product Certification, contains recycled content.
Tile Size: 24” X 24”
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.leescarpets.com
Interior Finishes  Carpet - Tile

CARPET TILE #4

Manufacturer:  Collins and Aikman (C & A)

Description:  Sustainability warranty, high post-consumer recycled content.  Type 6.6 Nylon, modular option offers ease of replacement.

Tile Size:  20" X 20"

Pattern / Color:  Pattern & color to be selected following the product mock-up evaluation period

Website:  www.interfaceinc.com
Interior Finishes  Carpet - Broadloom

**CARPET - BROADLOOM #1**

**Manufacturer:** Shaw Contract  
**Description:** Broadloom; 100% Eco-Solution Q Premium Branded Nylon, Solution Dyed Type 6.0 Nylon and Shaw’s award winning, PVC free, Ecoworx backing. Industry leader in cradle-to-cradle technology, recycled content.  
**Roll Width:** 12' - 0"  
**Pattern / Color:** Pattern & color to be selected following the product mock-up evaluation period  
**Website:** www.shawinc.com

---

**CARPET - BROADLOOM #2**

**Manufacturer:** Lee’s Carpets  
**Description:** Broadloom; Unibond Lifetime backing system w/ Antron Legacy 6.6 hollow filament nylon w/ Duracolor Technology (Integral Permanent Stain & Fade Resistant). Environmentally Preferable Product Certification, contains recycled content.  
**Roll Width:** 12' - 0"  
**Pattern / Color:** Pattern & color to be selected following the product mock-up evaluation period  
**Website:** www.leescarpets.com

---

**CARPET - BROADLOOM #3**

**Manufacturer:** Collins & Aikman (C & A)  
**Description:** Sustainability warranty, high post-consumer recycled content. Type 6.6 Nylon, peel and stick adhesive backing on 6’ goods allows easy patching.  
**Roll Width:** 6’ - 0"  
**Pattern / Color:** Pattern & color to be selected following the product mock-up evaluation period  
**Website:** www.tandus.com
Interior Finishes  Resilient Flooring - Linoleum Tile

RESILIENT FLOORING LINOLEUM TILE #1

Manufacturer: Forbo
Description: Natural product made of linseed oil, natural resins, wood & cork flour, limestone and pigments layered onto a jute back. Inherently anti-static and antimicrobial. Includes the revolutionary Top Shield factory finish that consists of four coats of a permanent and repairable finish.
Typical Tile Size: 20" X 20"
Pattern Name: Marmoleum Dual
Color: Color to be selected following the product mock-up evaluation period
Website: www.forbo-flooring.com

RESILIENT FLOORING LINOLEUM TILE #2

Manufacturer: Tarkett
Description: Natural product made of linseed oil, natural resins, wood & cork flour, limestone and pigments layered onto a jute back. Inherently anti-static and antimicrobial. Minimum 35% recycled content.
Typical Tile Size: 20" X 20"
Pattern Name: Veneto
Color: Color to be selected following the product mock-up evaluation period
Website: www.tarkettcommercial.com
**Interior Finishes**  
**Resilient Flooring - Linoleum Sheet**

**RESILIENT FLOORING LINOLEUM SHEET #1**

Manufacturer: Forbo  
Description: Natural product made of linseed oil, natural resins, wood & cork flour, limestone and pigments layered onto a jute back. Inherently anti-static and antimicrobial. Includes the revolutionary Top Shield factory finish that consists of four coats of a permanent and repairable finish. 76% agriculturally based product- rapidly renewable materials, recycled content, low-emitting material. Fully biodegradable, ISO 14001 certified.  
Roll Width: 79” Wide  
Pattern: Marmoleum  
Color: Color to be selected following the product mock-up evaluation period  
Website: www.forbo-flooring.com

**RESILIENT FLOORING LINOLEUM SHEET #2**

Manufacturer: Tarkett  
Description: Natural product made of linseed oil, natural resins, wood & cork flour, limestone and pigments layered onto a jute back. Minimum 35% recycled content. PVC Product, ISA 14001 certified. Broad color range, water-jet cut offers infinite design possibilities. No wax, low maintenance floor.  
Roll Width: 79” Wide  
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period  
Website: www.tarketcommercial.com
### Resilient Flooring - Vinyl Sheet

#### RESILIENT FLOORING VINYL SHEET #1
- **Manufacturer:** Tarkett
- **Description:** Homogeneous sheet vinyl with 23% recycled content. No wax, low maintenance floor.
- **Roll Width:** 6’-7” Wide
- **Pattern Name:** Optima
- **Color:** Color to be selected following the product mock-up evaluation period
- **Website:** [www.talkettcommercial.com](http://www.talkettcommercial.com)

#### RESILIENT FLOORING VINYL SHEET #2
- **Manufacturer:** Forbo
- **Description:** Natural product made of linseed oil, natural resins, wood & cork flour, limestone and pigments layered onto a jute back. Inherently anti-static and antimicrobial. Includes the revolutionary Top Shield factory finish that consists of four coats of a permanent and repairable finish.
- **Roll Width:** 6’-7” Wide
- **Pattern / Color:** Pattern & color to be selected following the product mock-up evaluation period
- **Website:** [www.forbo-flooring.com](http://www.forbo-flooring.com)
Interior Finishes  Resilient Flooring - Rubber

RESILIENT FLOORING RUBBER #1

Manufacturer: Nora Rubber Flooring

Description: Synthetic and natural rubber. Highly resilient, low maintenance no-wax floor. Greenguard certified, ISO 14001 certified. Highly slip resistant, has a non-porous dirt-resistant surface.

Typical Tile Size: 39.37" X 39.37" X 3.5 mm (.14")

Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period

Website: www.norarubber.com
Interior Finishes  Acoustical Ceilings

ACOUSTICAL CEILING #1
Manufacturer: Armstrong
Description: Ceiling product that reduces ambient noises, mold and moisture damage and light reflectance. Contains 55-82% recycled content and Armstrong will recycle ceiling tiles that are being replaced, this recycle program can help achieve LEED credits. Meets OSHA standards for formaldehyde requirements. Broad range of durability features, class A fire rating.
Typical Tile Size: 24” X 48”
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.armstrong.com

ACOUSTICAL CEILING #2
Manufacturer: United States Gypsum
Description: Ceiling systems contain recycled paper and materials produced as a byproduct of steel-making, which reduces the need to process raw materials. Meets OSHA standards for formaldehyde requirements. Broad range of durability features, class A fire rating.
Typical Tile Size: 24” x 48”
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.usg.com
Interior Finishes  Tile

TILE #1
Manufacturer: Terra Green
Description: Ceramic tile that contains 55% recycled glass and qualifies for LEED points. Stain and wear resistant, durable and easy to clean. Made in the US.
Typical Tile Size: 4 X 4, 6 X 6
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.terragreenceramics.com

TILE #2
Manufacturer: Daltile, Natural Hues on Eco-Body
Description: Ceramic tile composed of 45% post industrial waste, internal scrap, post consumer waste, and recycled materials. 50% of virgin materials are extracted regionally, 20% of the content is manufactured regionally. LEED qualifying product, meets or exceeds all ANSI standards for Glazed Ceramic Tile.
Typical Tile Size: 4 X 4, 6 X 6
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.quarrytile.com
Interior Finishes  Tackable Wall Coverings

TACKABLE WALL COVERING #1
Manufacturer: Maharam
Description: 100% polyolefin product with acrylic backing, washable and scrubbable, stain and tear resistant. Manufacturing process consists of heavy metal free dyes and air quality emissions are tested by the Greenguard Environmental Institute Registry. Uses solution dyed fibers, class A fire rating.
Roll Width: 54” wide
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.maharam.com

TACKABLE WALL COVERING #2
Manufacturer: Carnegie
Description: Polyethylene product (Xorel) that is free of PVC Vinyl, chlorine, plasticizers, heavy metals, ozone depleting chemicals, topical finishes and dioxin. Manufacturing process meets California State Building Guideline for Indoor Environmental and Air Quality. Exceptionally long life cycles, exceeds 1,000,000 double rubs. Highly stain resistant and easy to clean.
Roll Width: 52”, 54”, 56”
Pattern / Color: Pattern & color to be selected following the product mock-up evaluation period
Website: www.carnegiefabrics.com
Interior Finishes  Toilet Partitions

**TOILET PARTITION #1**

Manufacturer:  Bobrick  
Description: Superior non-ghosting graffiti removal finish and scratch/impact resistance. Meets Class B fire rating. Made of Solid Color Reinforced Composite material, qualifies for LEED points.  
Series:  Sierra Series  
Color:  Color to be selected following the product mock-up evaluation period  
Website:  www.bobrick.com

**TOILET PARTITION #2**

Manufacturer:  Columbia Partitions  
Description: Solid high density polyethylene with consistent color all the way through. Will not rust, rot or delaminate. Recycled content.  
Pattern / Color:  Color to be selected following the product mock-up evaluation period  
Website:  www.psisc.com
**Interior Finishes  Window Treatments**

**HORIZONTAL LOUVER BLIND**
Manufacturer: Bali Contract / Graber
Description: 1” aluminum slats with braided chord ladders
Color: White
Website: www.baliblinds.com

**VERTICAL LOUVER BLIND**
Manufacturer: Bali Contract / Graber
Description: 2” vinyl slats
Color: White
Website: www.baliblinds.com

**BLACK OUT SHADE**
Manufacturer: Mechoshade Systems, Inc.
Description: Manually operated room darkening shade complete with black-out channels
Color: Compatible with interior wall color
Website: www.mechoshade.com
3 | SYSTEMS
Systems Design Preferences

The following information has been summarized from various committee meetings conducted during 2005 and 2006. The resulting Design Preferences must be incorporated into the individual project design and construction documents. Deviation from these Preferences requires concurrence from District staff and the District's Program Manager. Other Design Guideline information can be found in 'Volume 1 – Facilities Development Plan and Guidelines'. In general, the products and manufacturers selected were based on the following criteria:

1. Reliability
2. Ease of maintenance
3. Safety
4. Manufacturers support
5. Sustainability

General
1. Specify an Extended Warranty (2 years) for all major products.
2. Specify a Maintenance Contract for all major pieces of equipment that require specific, time-sensitive servicing. Contract documents to specifically identify the equipment, by equipment number/identification number, subject to this requirement. One year Maintenance Contract to be part of bid price. Maintenance Contract period to start upon acceptance or beneficial occupancy of the building by District.

Division 2 – Existing Conditions
1. Recycle demolition materials whenever possible.

Division 3 - Concrete
1. Use High-Volume Fly Ash concrete when appropriate.

Division 5 - Metals
1. Whenever space permits, specify 'ship style' roof access ladders.
2. Avoid use of exposed steel due to local environmental conditions. Copper and Aluminum are preferred. Any exposed steel to be hot dipped galvanized. Any galvanized finish damaged during erection or as a result of field assembly to be touched-up with a cold applied zinc rich coating specifically manufactured for this purpose.

Division 6 – Woods, Plastics, and Composites
1. Specify 'FSC' lumber whenever possible.
2. Specify 'Formaldehyde-Free' wood products for all casework.

Division 7 – Thermal and Moisture Protection
1. Avoid use of steel flashings due to local environmental conditions. Copper and Aluminum are preferred.
2. Include 'Water Vapor Emission Control Systems' compatible with or specifically approved by finish flooring manufacturer, in Base Bid for all projects. (i.e. Concrete Sealer)
Systems Design Preferences

Division 8 - Openings
1. Paint grade, solid core wood doors in steel frames are preferred at building interiors.
2. Locksets
   A. New locks must accept current Best and Schlage cores and codes.
   B. Vendor must support key management software that tracks both Room # and Key #.
   C. Vendor selected for PE Complex will be named sole sourced for remainder of projects.
3. Panic Hardware: Von Duprin is preferred vendor.

Division 9 - Finishes
1. Avoid use of VCT.
2. All public / student restrooms: Ceramic tile shall extend to ceiling / use dark color grout
3. Staff restrooms: Ceramic tile wainscot up to 48". Preferred tile sizes are: 4x4 floor; 2x2 or 1x1 on walls
4. Specify ‘Low VOC’ products whenever possible.
5. Insulation products shall be ‘Formaldehyde-free’.

Division 10 - Specialties
1. The following items will be Owner Furnished / Contractor installed (OFCI). Additionally, the Contractor will be responsible for installing adequate backing and/or mounting plates:
   A. Paper towels dispensers and waste receptacle
   B. Toilet Paper Dispensers (Double roll dispensers, second roll automatically drops) recessed or semi-recessed at ADA areas.
   C. Hand Soap Dispensers
   D. Toilet Seat Protector Dispensers
   Surface mounted accessories are preferred.
2. Provide a minimum of one chalkboard for Math and Science classrooms in addition to dry erase marker board(s).
3. Emergency Exit signs less than 8'-0" shall be stainless steel for impact durability.

Division 11 - Equipment
1. Emergency Showers: Select one safety color and standardize.

Division 12 - Furnishings
1. Include integral metal slides for all moveable furniture.

Division 33 - Utilities
1. Provide tracer wire on all plastic piping
2. All buried copper piping shall be wrapped.
3. All manhole covers shall be round: Preferred style: #B12-61-D
4. Provide metal lids on all in-ground utility boxes.
Systems Design Preferences

Divisions 22 & 23 – Mechanical & Plumbing

PART 1 Heating, Ventilating, and Air Conditioning (HVAC) Systems

1.01 General

A. Provide a full design documentation package, including specifications consistent with contract requirements. The master specifications provided by the College of Marin shall be edited as required for each project. Contractual documentation deliverables are minimums. Provide sufficient details, and elevations, as required to fully illustrate the intent of the design, and eliminate need for field interpretation.

B. A provision shall be made in the specifications for contractor to include all installation labor and start up services, independent 3rd party air and hydronic balancing, and support services as required for the third party commissioning effort.

C. Vibration design shall be according to latest ASHRAE standards, guidelines and hand book of fundamentals.

D. Seismic design for equipment, duct and pipe shall be engineered by a registered structural engineer within the state of California. Engineer will supply letter at conclusion of the job that the systems have been inspected and certified to meet the seismic importance factor as required and specified all pertinent governing codes.

E. In the event of inconsistencies between the drawings and the Basis of Design (BOD), the more stringent of the two requirements must be included.

F. Codes, Ordinances, and Regulations to be considered are as follows.

The design will be based on the latest edition of the applicable national, state, and local codes, ordinances, regulations and good engineering practices including but not limited to the following:

a. CBC 2001 California Building Code
b. CPC 2001 California Plumbing Code
c. CMC 2001 California Mechanical Code
d. CFC 2001 California Fire Code
e. CEC 2005 Title 24 California State Energy Code
f. ASTM Applicable American Society of Testing and Materials Standards
g. ANSI Applicable American National Standards Institute Standards
h. AWS American Welding Society
i. NFPA National Fire Protection Association
j. UL Underwriters Laboratory, Inc.
k. SMACNA Sheet Metal and Air Conditioning Contractors National Association
l. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

1.02 The HVAC system design shall be based on the attached general design criteria. Specific design criteria and proposed HVAC systems for each project shall be submitted to the College of Marin for approval prior to commencing the design. The HVAC design for the campus facilities shall consider the general guidelines and propose the potential systems included in this document. The vendors for the various HVAC equipment shall be specified per the master specifications. The design shall not include any vendors not reflected in the master specifications.

1.03 The HVAC design shall include the following systems.

A. Outside Air Ventilation System: This system shall be designed for facilities larger than 25,000 square feet area. The minimum outside air shall be per Title 24 requirement. The system shall include institution of total energy heat wheel with minimum efficiency of 85%. This will offer reduction of required cooling and heating capacities.
Systems Design Preferences

B. Variable Air Volume (VAV) System: This system shall be one of the options for the facilities larger than 25,000 square feet area. The air handling portion of the unit shall be provided with variable frequency drive units for both the supply and the return fans. The HVAC unit shall be totally self-contained with air-cooled DX condenser (VAV roof-top packaged unit), or shall be an air handler equipped with chilled water and hot water coils. The chilled water shall be provided with an air-cooled or water cooled chilled water system. The air-cooled chiller shall be equipped with screw compressors (minimum of two) and shall be high efficiency unit. The water-cooled chiller shall be rated at 0.5 KW/TON or less. The gas fired hydronic boilers shall be 85% efficient.

C. The terminal VAV units shall be pressure independent. The medium pressure ductwork (upstream of VAV units) shall be sized at 2,000 feet per minute. The low pressure ductwork (down stream of VAV units) shall be sized at friction drop of 0.8” W.C. per 100 feet of ductwork. The hydronic piping shall be sized at 4 feet of pressure drop per 100 feet of pipe and shall be variable flow primary system with VFDs for the pumps. The water distribution system shall be provided with system by-pass valve. All equipment shall be provided with high efficiency motors.

D. All systems shall have minimum of 50% redundancy.

   a. Constant Air Volume System: This system shall be one of the options for the campus facilities. The system shall include high efficiency roof-top gas electric packaged units. This system shall also include ground coupled water source high efficiency heat pump units. All ductwork shall be sized at friction drop of 0.8” W.C. per 100 feet of ductwork.

   b. Air Distribution System: The supply distribution system will consist of externally insulated galvanized steel ductwork with pressure independent electrically actuated supply VAV or CV air terminal devices, reheat coils, low pressure externally insulated ductwork downstream of air terminals and diffusers. Sound attenuating flexible ductwork with woven nylon fabric type lining will be provided at the supply diffusers to control noise.

   c. Control Systems: A central, computer based, direct digital control (DDC), building automation system (BAS) shall be provided to properly control all systems. The vendor for the building automation system shall be one of the vendors included in the master specification. Complete monitoring and data logging of the facility systems shall be provided as well as typical graphics for each system. Different levels of password protection shall be provided to allow different users to do only the agreed functions (monitoring only up to full programming as desired). External network access shall be provided for interface to outside the building via Ethernet. The BAS system shall perform full energy management and energy optimization of various systems and control of outside lighting. The system shall include monitoring of process vacuum, CDA, and any system if appropriate. The BAS system shall be a campus wide system.

1.04 Duct Systems

A. Supply Air: The supply duct system will be designed as a 2” static pressure class system with seal class A. The system shall be galvanized sheet metal using round spiral duct where space allows. Larger ducts will be rectangular with large aspect ratios, where possible, to minimize duct cost. The medium pressure supply duct mains will be designed at 2000 fpm above 10,000 cfm and .15” wg/100ft friction loss below 10,000 cfm. The duct system inside the building will be externally wrapped with insulation per current Title 24 standards. Ducts installed exposed to outdoors may be double wall duct for acoustic considerations. Low velocity duct downstream of the terminal boxes will be sized at .10” wg /100 ft.
Systems Design Preferences

B. Return/Exhaust Air: The duct system will be designed as a -1" static pressure class system with seal class C. The system shall be galvanized sheet metal using round spiral duct where space allows. Larger ducts will be rectangular with large aspect ratios, where possible, to minimize duct cost. The low pressure return duct mains will be designed at 2,000 fpm (above 10,000 cfm) with a friction rate up to .1" wg / 100 ft. (below 10,000 cfm). The duct system inside the building will be externally wrapped with insulation per current Title 24 standards. Ducts installed exposed to outdoors may be double wall duct for acoustic considerations. Duct from grille to the terminal box or main duct will be sized at .1" wg / 100 ft.

C. All insulation shall have anti-microbial coating and/or lining.

1.05 HVAC Equipment & Controls

A. All outdoor equipment shall be provided with corrosion proof treatment.

B. The building automation system shall be a campus wide system, and shall be capable of supporting the phased construction process.

PART 2 Plumbing Systems

2.01 Domestic and Industrial Water Piping

A. Below ground pipe and fittings:

1. Pipe smaller than 2 Inches: Type K hard-drawn copper tubing; solder pattern seamless wrought copper alloy or cast copper alloy fittings.

2. Protective Coating for Underground Copper Pipe: Extrude polyethylene sheath, as made by Amstead “Plexco”; yellow color, to Federal Specification L-C-530; all fittings and joints sealed using heat-cured sheath shrunk in place, Raychem “Thermofit” sleeves.

3. 2 Inch Pipe and Larger: Ductile iron, cement-lined, Pacific States Cast Iron Pipe, U.S. Pipe and Foundry or American Cast Iron Pipe Company mfr. Pipe shall conform to ANSI A21.51; thickness class for 150 psi working pressure; mechanical joint or Tyton push-on joint. Fittings shall conform to ANSI rubber gasketed conforming to ANSI A21.11.

B. Above ground pipe and fittings:

1. Pipe smaller than 4 Inches: Type L hard-drawn copper tubing; solder pattern seamless wrought copper alloy or cast copper alloy fittings.

2. 4 Inch Pipe and Larger: Schedule 40 galvanized steel pipe per ASTM A53; grooved-end pipe couplings; galvanized malleable iron grooved-end fittings, 150 pounds minimum; flanges of carbon steel, 1/16 inch thick compressed fiber gaskets (full-faced or flat-faced flanges); optional (cold water piping only), screwed-end joints and screwed galvanized malleable iron fittings.

C. The industrial water shall be connected to the domestic water system through an approved reduced pressure backflow preventer.

2.02 Sanitary and Drainage System

A. The sanitary sewer shall be cast iron.

B. The lab waste systems below grade and above grade shall be “Fuseal” polypropylene pipe and fittings, fire-retardant grade. They shall be tied into the sanitary sewer outside the building.

C. A sampling station pit for the lab waste shall be provided if required.
3.6 Systems

2.03 Roof Drain and Overflow System
A. These systems shall be provided as part of the shell system.

2.04 Domestic and Industrial Hot Water
A. A common industrial and domestic hot water system shall be provided.
B. The system shall be gas fired and shall include a recirculating pump and piping loop, ASME storage tank and an expansion tank.
C. Two parallel water heaters shall be provided if required and each sized at 50% of the anticipated load.
D. The piping shall be type L copper.
E. The entire system shall be properly sterilized.

2.05 Compressed Air System (CDA)
A. Two air compressor systems shall be provided. The compressors, dryers, and other components shall be parallel piped.
B. Each compressor shall be sized to provide 50% of the design load.
C. The system shall be designed to provide 80 psi at the use points. Regulators shall be provided where necessary to reduce to 15 psi.
D. The system shall include oil-less compressors, redundant filters, dual desiccant dryers, factory mounted control panel, and necessary accessories.
E. The air shall be instrument grade in accordance with “Quality Standards for Instrument Air” and shall include filters to remove hydrocarbons and particulate, and dried to –40°F.
F. Piping shall be Type L copper, cleaned and capped for nitrogen service. Fittings shall be cleaned and bagged.
G. The piping joints shall be copper brazed with a continuous nitrogen purge.

2.06 Nitrogen Systems
A. Nitrogen shall be provided by local cylinders or N₂ micro bulk.
B. Piping shall be Type L. Piping shall be cleaned and capped for nitrogen service. Fittings shall be cleaned and bagged.
C. The piping joints shall be copper brazed with a continuous nitrogen purge.

2.07 Specialty Gases
A. The only specialty gas that is presently provided as part of the facility design is carbon dioxide. If any lab requires other specialty gas (oxygen, hydrogen, helium, argon, etc.) it shall be provided as required from local cylinders piped to the point of use inside the laboratory.
B. The carbon dioxide shall be provided from multiple cylinders dewars or mini bulk system located in the utility yard.
C. Piping shall be Type L. Piping shall be cleaned and capped for nitrogen service. Fittings shall be cleaned and bagged.
D. The piping joints shall be copper brazed with a continuous nitrogen purge.
Systems Design Preferences

2.08 Natural Gas
A. Gas service shall be provided at medium pressure by PG&E and metered at each facility.
B. A seismic valve shall be provided.
C. Gas shall be distributed to the at medium pressure where it shall be regulated as required.
D. A regulator at appliances shall be installed to reduce to low pressure.
E. Piping shall be schedule 40 black steel.

2.09 Laboratory Process Vacuum System (PV)
A. A skid mounted duplex process vacuum system consisting of one vacuum receiver, two oil sealed liquid ring vacuum pumps and required components shall be designed.
B. Each vacuum pump shall be sized to provide for 50% of the design load. The cycle of the pumps will be timed to provide even wear on the system.
C. The system shall be designed to provide 0.5 scfm at 23” Hg at the use points.
D. The system shall be skid mounted and provided with a single point electrical connection, UL listed factory mounted control panel, nema 12 enclosure, automatic alternator HOA switch, lag-on alarm audible/visual alarm indication, vibration isolation, interconnecting piping, control devices and other necessary accessories required to make a fully functional system.
E. Piping shall be Type L copper. The piping joints shall be copper brazed. The pipe and fittings for this system shall not be required to be cleaned and bagged.
F. The vacuum system internal piping and controls shall be fitted with a purge assembly capable of cleansing the pumps and oil reservoir of residual chemicals. The purge cycle will be maintained for at least 14 minutes.

2.10 Plumbing Fixtures & Accessories
1. Provide automatic flush valves for all toilets and urinals.
2. Bathroom vanity sinks to have automatic valves.
4. All interior water fountains shall be cooled, filtered and have bottle fill dispenser.
5. Custodian sinks: commercial faucet with hose threads, high-impact plastic / fiberglass
6. Provide mop racks and storage shelving in all custodian closets.
7. Toilets shall be wall mounted
8. Waterless urinals are not allowed.
9. Provide plaster traps at all art room sinks
10. Staff showers: institutional quality, low-flow head with metering valve for timed usage.
11. Interior and exterior hose bibs must be located in lock boxes
12. Provide several hose bibs from building plumbing (i.e. potable water) around perimeter of building.
PART 3 MECHANICAL DESIGN CRITERIA

3.01 The following list, when fully complete, will indicate the assumptions that will be used to design the mechanical systems. The items shown in parenthesis are ALFA TECH’s preliminary assumptions that can be agreed to by placing an “X” in the right hand column. Note any desired changes to the criteria in the right hand column. An “R” indicates revised since last revision. An “N” indicates new since the last revision.

A. Project location: (South San Francisco, CA)

PART 4 OUTSIDE DESIGN CRITERIA

4.01 Summer

\[(87°F DB/68°F WB)\]  \(R\)

ASHRAE 0.1% (San Francisco Airport) 89°F DB/66°F WB - 67°F WB
ASHRAE 0.5% (San Francisco Airport) 83°F DB/64°F WB - 64°F WB
ASHRAE 2.0% (San Francisco Airport) 74°F DB/61°F WB - 61°F WB

Note: First WB is mean coincident with DB
Second WB listed is mean design WB

Daily Range: (20°F)
Winter: (35°F - 80% RH)
ASHRAE: Median of extremes (San Francisco Airport) 31°F
0.2% (San Francisco Airport) 35°F
0.6% (San Francisco Airport) 38°F
Latitude: (37.6 degrees)
Elevation: (8 ft.)

PART 5 INSIDE DESIGN CRITERIA:

<table>
<thead>
<tr>
<th></th>
<th>Temp/Tolerance</th>
<th>Humidity/Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>72 ± 2°F</td>
<td>None</td>
</tr>
<tr>
<td>Labs</td>
<td>72 ± 2°F</td>
<td>None</td>
</tr>
<tr>
<td>Electrical and Mechanical Rooms</td>
<td>65 to 80°F</td>
<td>None</td>
</tr>
<tr>
<td>IDF/MDF/IMPOE</td>
<td>75 ± 3°F</td>
<td>None</td>
</tr>
<tr>
<td>Lunch Room</td>
<td>74 ± 2°F</td>
<td>None</td>
</tr>
<tr>
<td>Conference</td>
<td>72 ± 2°F</td>
<td>None</td>
</tr>
</tbody>
</table>

PART 6 POWER HEAT LOADS:

<table>
<thead>
<tr>
<th></th>
<th>Load</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>(3.0 watts/sq.ft.)</td>
<td>X</td>
</tr>
<tr>
<td>Labs</td>
<td>(10 watts/sq.ft.)</td>
<td>R</td>
</tr>
<tr>
<td>Lab Support</td>
<td>(20.0 watts/sq.ft.)</td>
<td>X</td>
</tr>
<tr>
<td>Freezer Rooms</td>
<td>(30 watts/sq.ft.)</td>
<td>N</td>
</tr>
<tr>
<td>Lunch Break rooms</td>
<td>(1,000 watts)</td>
<td>X</td>
</tr>
<tr>
<td>Conference</td>
<td>(3 watts/sq.ft.)</td>
<td>X</td>
</tr>
<tr>
<td>Mall/Copy/Fax</td>
<td>(1,500 watts)</td>
<td>X</td>
</tr>
<tr>
<td>IDF</td>
<td>(10,000 watts)</td>
<td>R</td>
</tr>
<tr>
<td>MDF</td>
<td>(10,000 watts)</td>
<td>R</td>
</tr>
<tr>
<td>Security Rooms</td>
<td>(20 watts/sq.ft.)</td>
<td>N</td>
</tr>
</tbody>
</table>
PART 7 PEOPLE:

<table>
<thead>
<tr>
<th>Space</th>
<th>Minimum air changes/hour:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>(1/150 NSF)</td>
</tr>
<tr>
<td>Labs</td>
<td>(1/200 SF)</td>
</tr>
<tr>
<td>Lab Support</td>
<td>(1/150 NSF)</td>
</tr>
<tr>
<td>IDF/MDF/MPOE</td>
<td>(0)</td>
</tr>
<tr>
<td>Lunch Break rooms</td>
<td>(1/25 NSF)</td>
</tr>
<tr>
<td>Conference</td>
<td>(1/15 NSF)</td>
</tr>
<tr>
<td>Mail/Copy/Fax</td>
<td>(1/100 NSF)</td>
</tr>
</tbody>
</table>

7.01 Minimum air changes/hour:

<table>
<thead>
<tr>
<th>Space</th>
<th>Minimum air changes/hour:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs</td>
<td>(6)</td>
</tr>
<tr>
<td>Toilet rooms</td>
<td>(12)</td>
</tr>
<tr>
<td>All others</td>
<td>(Code)</td>
</tr>
</tbody>
</table>

PART 8 Exhaust Quantities:

<table>
<thead>
<tr>
<th>Space</th>
<th>Exhaust Quantities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilets</td>
<td>(12AC/hr.)</td>
</tr>
<tr>
<td>Hoods Face Velocity</td>
<td>(100 fpm)</td>
</tr>
<tr>
<td>Maximum Hood Opening</td>
<td>(18&quot;)</td>
</tr>
</tbody>
</table>

PART 9 Should hood exhaust system be variable or constant volume? (TBD - VAV)

<table>
<thead>
<tr>
<th>Space</th>
<th>Should hood exhaust system be variable or constant volume?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bypass type hoods will be provided?</td>
<td>(TBD)</td>
</tr>
</tbody>
</table>

PART 10 Can exhaust systems be interconnected or are there incompatible materials? (All can be interconnected except for the Radioactivity Room & perchloric hood.) (TBD)

1. Any special exhaust duct materials required? (Use SS for wet exhaust and radioisotope exhaust)

2. Any spark resistant exhaust fans required? (Yes)

3. Any filters required on the exhaust systems? (Yes)

4. Will there be a wind consultant hired to study proper locations of intakes and exhaust? (Yes)

5. Snorkel exhausts:

<table>
<thead>
<tr>
<th>Space</th>
<th>Snorkel exhausts:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>(4&quot;)</td>
</tr>
<tr>
<td>Cfm</td>
<td>(50)</td>
</tr>
<tr>
<td>S.P.</td>
<td>(0.5&quot;)</td>
</tr>
<tr>
<td>To handle fumes only, no particulates?</td>
<td>(No)</td>
</tr>
<tr>
<td>Hair filters?</td>
<td>(No)</td>
</tr>
</tbody>
</table>
### Systems Design Preferences

**Owner to provide locations?**  
(TBD)  
A. **VBSE exhaust?**

6. **The following areas shall be 100% outside air without recirculation:**

<table>
<thead>
<tr>
<th>Area</th>
<th>Requirement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Rooms</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Offices</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Labs</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Lab Support</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Freezer Rooms</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>IDF/MDF/MPOE</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Lunch Room</td>
<td>No but provide exhaust</td>
<td>R</td>
</tr>
<tr>
<td>Conference</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Mail/Copy/Fax</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

7. **Supply air filter requirements:**

<table>
<thead>
<tr>
<th>System</th>
<th>Requirement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Mounted Air Handlers</td>
<td></td>
<td>(30% pre – 95% cartridge) R</td>
</tr>
<tr>
<td>IDF/MDF/MPOE</td>
<td></td>
<td>(20% pre)</td>
</tr>
</tbody>
</table>

8. **Lighting Load: watts w/ballast**

<table>
<thead>
<tr>
<th>Area</th>
<th>Requirement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Areas</td>
<td>(1.5 w/SF - verify w/electrical engineer)</td>
<td>R</td>
</tr>
<tr>
<td>General Circulation</td>
<td>(1.3 w/SF – verify w/electrical engineer)</td>
<td>R</td>
</tr>
<tr>
<td>Labs</td>
<td>(2 w/SF – verify w/electrical engineer)</td>
<td>N</td>
</tr>
</tbody>
</table>

9. **Outside air ventilation minimum:**  
(15 cfm/person)  

10. **Noise criteria:**

<table>
<thead>
<tr>
<th>Area</th>
<th>Requirement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference Rooms</td>
<td>(NC 30)</td>
<td>X</td>
</tr>
<tr>
<td>Private offices</td>
<td>(NC 30-35)</td>
<td>R</td>
</tr>
<tr>
<td>Open Offices</td>
<td>(NC 35)</td>
<td>X</td>
</tr>
<tr>
<td>Labs</td>
<td>(NC 45-50)</td>
<td>R</td>
</tr>
<tr>
<td>Lab Support &amp; Freezer Rooms</td>
<td>(NC 50)</td>
<td></td>
</tr>
<tr>
<td>Lobby</td>
<td>(NC 35)</td>
<td>X</td>
</tr>
<tr>
<td>General facility spaces</td>
<td>(NC 40)</td>
<td>X</td>
</tr>
<tr>
<td>Training Rooms</td>
<td>(NC 35)</td>
<td>X</td>
</tr>
</tbody>
</table>

11. **Equipment redundancy:**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Requirement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air handlers</td>
<td>(3 @ 50%)</td>
<td></td>
</tr>
<tr>
<td>Exhaust Fans</td>
<td>(N + 1)</td>
<td></td>
</tr>
<tr>
<td>Vacuum Plant</td>
<td>(2 @ 50%)</td>
<td>R</td>
</tr>
<tr>
<td>Compressed Air Plant</td>
<td>(2 @ 50%)</td>
<td>R</td>
</tr>
</tbody>
</table>

12. **Provide air side economizers?**  
(Yes)  

13. **Type of control system desired?**

- DDC, pneumatic, electronic, combination?
- **Central Systems:**  
  - (DDC) X  
- **Zone Controls:**  
  - X
### Systems Design Preferences

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Office:</td>
<td>(DDC) X</td>
</tr>
<tr>
<td></td>
<td>Labs:</td>
<td>(DDC) X</td>
</tr>
<tr>
<td>14.</td>
<td>Special control requirements? Redundancy, graphic displays, etc.</td>
<td>(TBD)</td>
</tr>
<tr>
<td>15.</td>
<td>Which control manufacturers do you wish to consider (Honeywell, Johnson, Siemens, Invensis, ALC)?</td>
<td>(Siemens) X</td>
</tr>
<tr>
<td>16.</td>
<td>What quality level of air handler do you wish to use? Standard (Carrier, Trane, McQuay) or Semicustom (Pace, Temtrol, Energy Labs)? [Copper fin - salt problem]</td>
<td>(Semi Custom) X</td>
</tr>
<tr>
<td>17.</td>
<td>Do you have any predetermined HVAC system types you want to use or consider?</td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>CV reheat</td>
<td>(NA)</td>
</tr>
<tr>
<td>b.</td>
<td>VAV reheat</td>
<td>(Labs and Office) X</td>
</tr>
<tr>
<td>c.</td>
<td>VAV perimeter air</td>
<td>(No)</td>
</tr>
<tr>
<td>d.</td>
<td>VAV fan powered w/ hot water coils</td>
<td>(No)</td>
</tr>
<tr>
<td>e.</td>
<td>VAV with hot water baseboard</td>
<td>(No)</td>
</tr>
<tr>
<td>f.</td>
<td>VAV double duct</td>
<td>(No)</td>
</tr>
<tr>
<td>g.</td>
<td>Four pipe fan coil</td>
<td>(No)</td>
</tr>
<tr>
<td>h.</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>Consultants choice - best system</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>18.</td>
<td>Seismic design criteria per code or more stringent?</td>
<td>(TBD) R</td>
</tr>
<tr>
<td>19.</td>
<td>Ceiling space will be return air plenum?</td>
<td>(No) X</td>
</tr>
<tr>
<td>20.</td>
<td>Glass type:</td>
<td>(Viraco single pane low E tinted)</td>
</tr>
<tr>
<td></td>
<td>Shading device</td>
<td>(mini blinds)</td>
</tr>
<tr>
<td></td>
<td>Shading coefficient</td>
<td>(SC = .35)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U = .71)</td>
</tr>
<tr>
<td>21.</td>
<td>Wall type:</td>
<td>(GFRC)</td>
</tr>
<tr>
<td></td>
<td>Insulation</td>
<td>(R-11)</td>
</tr>
<tr>
<td>22.</td>
<td>Roof insulation</td>
<td>(R-19)</td>
</tr>
<tr>
<td>23.</td>
<td>Which equipment must be on emergency power?</td>
<td>(All) X</td>
</tr>
<tr>
<td>24.</td>
<td>Plant or clean steam?</td>
<td>(NA)</td>
</tr>
<tr>
<td>25.</td>
<td>Variable frequency drives:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chilled water pumps</td>
<td>(Yes) X</td>
</tr>
<tr>
<td></td>
<td>Hot water pumps</td>
<td>(Yes) X</td>
</tr>
<tr>
<td></td>
<td>VAV AHUs</td>
<td>(Yes) X</td>
</tr>
<tr>
<td></td>
<td>CV AHUs</td>
<td>(Yes)</td>
</tr>
<tr>
<td></td>
<td>Exhaust fans</td>
<td>(Yes) X</td>
</tr>
</tbody>
</table>
### Systems Design Preferences

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No/Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. How complicated/important is the validation procedure?</td>
<td>(Validation will not be required) X</td>
</tr>
<tr>
<td>Standard Balance and Start-up reports or Special?</td>
<td></td>
</tr>
<tr>
<td>27. All motors shall be the premium efficiency type?</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>28. Provide air flow monitors on air handlers.</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>Airflow monitor on exhaust</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>Local or DDC readout?</td>
<td>(TBD - Local)</td>
</tr>
<tr>
<td>29. Provide air flow switches on all air handling units and current switches on all exhaust fans, except toilet exhaust, and connect to DDC system to prove operation.</td>
<td>(TBD - Yes) R</td>
</tr>
<tr>
<td>30. Are doors in labs normally left open or closed?</td>
<td>(TBD - Closed) R</td>
</tr>
<tr>
<td>31. Automatic pressure control or one time balance for airflow?</td>
<td>(TBD - Balance) R</td>
</tr>
<tr>
<td>32. Do labs operate twenty-four (24) hours?</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>Leave hood exhaust fans on continuous?</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>Leave supply fans on continuous?</td>
<td>(Yes) X</td>
</tr>
<tr>
<td>Provide hood alarms, power shutdown, and gas shutoff on air flow failure?</td>
<td>(TBD - Yes) R</td>
</tr>
<tr>
<td>Specification by hood manufacturer?</td>
<td>(TBD - Yes) R</td>
</tr>
<tr>
<td>32. System Over sizing</td>
<td></td>
</tr>
<tr>
<td>Cooling capacity</td>
<td>(10%) X</td>
</tr>
<tr>
<td>Heating capacity</td>
<td>(10%) X</td>
</tr>
</tbody>
</table>

### PART 11 PLUMBING DESIGN CRITERIA

1. Compressed Air Plant:
   - Conditions:
     - Dew point? (-40) X
     - Final Filter? (0.02) R
     - Oil free compressors? (Yes) X
     - Carbon Filters? (Yes) X
     - 100% standby system? (Yes) X
   - Pressure at use points? (TBD - 80 psig) X
   - Desiccant dryer double column? (Yes) R
   - Drop size to benches? (TBD - ½") X

2. Process Vacuum Plant:
   - Duplex? Yes X
   - Pressure at use point? (25 to 28" hg) X
   - 100% standby system? (Yes) X
### Systems Design Preferences

3. **House Vacuum, Dry Vacuum:**
   - Pressure? (None)  X
   - Flow? ( )
   - Operators? ( )
   - Duplex systems? ( )

4. **Wet Vacuum System:**
   - Pressure? (None)  X
   - Flow? ( )
   - Operators? ( )
   - Duplex systems? ( )

5. **Animal Bedding Vacuum?**
   - (NA)

6. **N₂ Source:**
   - Nitrogen required at labs? (TBD)  R
   - Peak flow? (TBD - scfm)
   - Use rate? (TBD - scf/day)
   - Central leased tank? (No)  X
   - Size? (TBD - gal)
   - Multiple bottles? (TBD)  R
   - Bottles at use points? (TBD)  R
   - Piping type? [Copper vs stainless steel] (Copper)  X

7. **Liquid nitrogen:**
   - (TBD)  R
   - Local Dewars as required? (TBD)  R

8. **Natural gas pressure at use point?**
   - Animal incinerator? (None)

9. **Any other bottled gases? Argon, Oxygen, He**
   - (TBD)  R

10. **Gas cabinets or wall-mounted cylinders?**
    - (TBD)

11. **Specialty gas filtration to 0.2 microns?**
    - Specialty gas piping type? (TBD)

12. **D.I. Water to labs:**
    - (Yes)  X
    - Projected peak flow? (TBD - gpm)
    - Projected daily use? (TBD - gpd)
    - Storage capacity? (TBD - gal)
    - Recirculated system? (Yes)  X
    - Resistivity required? (TBD - 10 to 14 m. ohm)  X
    - RO unit on make-up water? (Yes)  X
    - Leave space for future RO unit? (TBD - Provide now)  R
    - Softeners on make-up water? (Yes)  X
    - Pipe type? (CPVC)  R
    - Valve type? (CPVC – socket weld)  R
    - Millipore system at labs (TBD – Milli-Q)  R
13. Distilled Water required? (TBD)  
   Flow rate? (TBD gph)  

14. Animal Water:  
   USP or potable, or RO or DI (NA)  

15. Potable or industrial water to labs? (Potable to ice machines and EWS) (Industrial)  

16. High temperature water to any specialty areas such as glass wash or autoclave or standard hot water.  
   Cage Wash (N/A)  
   Glass Wash (N/A)  
   Autoclaves (N/A)  
   All other - Standard (N/A)  

17. Industrial Waste:  
   a. Will labs collect and haul away acids, solvents, and other chemicals or dump down drain? (TBD - Collect)  
   b. Separate piping with sampling manhole? (TBD - Yes)  
   c. Monitoring required? (TBD - No)  
   d. Equalization tank required? (TBD - No)  
   e. Fire water containment tanks required? (No floor sinks in labs) (TBD - No)  
   f. Waste pipe material: CI, Duriron, Fuseseal? (TBD)  

18. Animal Soil Waste:  
    NA)  

19. Will waste treatment system be required? (No)
Systems Design Preferences
Division 26 – Electrical

DESIGN INTENT/GENERAL INFORMATION

1. Date
   This standard is being issued on November 20, 2006.

2. Drawing Numbering System
   Refer to Division 1 - General Requirements.

3. National Testing and Certification
   All electric devices (individual devices as well as "composite" systems such as life safety systems) must be listed by Underwriters Laboratory (UL), Electrical Testing Laboratories (ETL), or other national testing laboratory. For composite systems, the system must be labeled as well as the individual parts. Coordinate these requirements with the authorities having jurisdiction.

4. Labeling
   Ensure that contractor provides label on every electrical device provided or affected under his/her contract. Ensure that the contractor provides directories for new panels. Ensure that the contractor replaces the existing panel directory in every branch circuit panel affected by a renovation project. Replacement directory must accurately indicate loads served at the completion of the project.

5. Energy Codes & Rebates
   Comply with energy requirements of the authority having jurisdiction. Perform a net-present value analysis for available energy rebates and make recommendations for the project.

6. Demolition
   a) Require the contractor to recycle fluorescent lamps that contain mercury.
   b) Require the contractor to properly dispose of PCB containing materials, including ballasts or transformers.

SECTION 26 00 01 – WIRING METHODS

1. Branch Circuit Loading
   a) Connect no more than six general-purpose receptacles to a 20A/1P circuit.
   b) Do not segregate receptacles serving computer equipment onto dedicated circuits. Receptacles serving printers may be on circuits dedicated to printers.
   c) Branch circuits: with less than approximately 65% of breaker ampacity.
   d) Elevator feeders per manufacturer recommendations.
   e) Do not combine special loads such as door operators, small exhaust fans, control power to DDC devices, and fire alarm power supply on to circuits with other loads.
   f) Do not combine power and lighting on the same circuits except for under-cabinet fixtures.

2. Branch Circuit Materials
   a) Do not use AC cabling for central utility plant (CUP), penthouse, mechanical room, or other exposed branch circuit wiring.
   b) Design MC cable branch circuits such that conduit and wire are used to bring branch circuits to a point in the corridor ceiling adjacent to each department or area (maximum 6 circuits per homerun). From this point use MC cable.
Systems Design Preferences

c) Use Schedule 40 PVC conduit with THHN conductors for underground branch circuits.
d) Use IMC conduit with XHHW for branch circuits exposed outside of buildings but not underground.
e) Use EMT conduit with set-screw fittings and THHN conductors for all other branch circuits.
f) Use only cooper conductors for all building wires and cables. Avoid aluminum conductors.
g) All wiring #10 and smaller shall be solid conductors. Not stranded.
h) Conduit buried underground shall be High Density Polyethylene (HDPE) Schedule 40.

3. Receptacles & Outlets
   a) Obtain required National Electrical Manufacturers Association (NEMA) configuration from the equipment manufacturer for every special outlet during design and indicate it on the drawings. Do not leave this determination up to the contractor.
   b) Use thermoplastic plates on receptacles. Provide label on every receptacle indicating source of power and circuit number. Use dynamo type labels, not glue-on or engraved labels.

4. Overcurrent Protection Devices
   a) Whenever possible, use circuit breakers in lieu of fuses.
   b) For loose motor starters or disconnects requiring short circuit protection, use motor circuit protectors in lieu of fuses.

5. Other Special Systems
   a) Any other special power system requests are to be reviewed by the Owner’s project representative and the facility-engineering department.

SECTION 26 00 02- ELECTRICAL POWER - DESIGN CRITERIA

1. Sizing Requirements For Distribution Equipment
   a) In all cases, modify feeder sizes as required to comply with NEC voltage drop requirements.
   b) Size switchboards for the calculated demand load plus known future loads plus 5% for future unknown loads.
   c) At branch circuit panel boards, provide 20% of calculated demand load as spare feeder capacity. Provide a minimum of 25% spare 1P-20A breakers based on the percentage of active circuits. In addition, provide a minimum of 20% 1-pole spaces based on the percentage of active circuits. Provide only 42 circuit panel boards.
   d) For distribution panel boards provide spare feeder capacity in an amount equal to the sum of the spare capacity required for each branch circuit panel board served, times a multiplier of 0.5 for four or less panel boards, plus a multiplier of 0.3 for those in excess of four panel boards. Provide space for a minimum of three additional 3-pole breakers of frame sizes consistent with the active breakers and anticipated future loads.
   e) Size feeders on the same basis as the equipment being served. Provide reasonable spare empty conduits to all feeders routed in areas that will be generally inaccessible at a later date. All empty conduits shall be so labeled. Coordinate with the Owner’s project representative and the facility engineering department as to the quantity and location of spare raceways.
   f) Feeders to fixed equipment need only be sized for the load served.
   g) Size transformers in a manner similar to switchboards.
   h) Size MCCs based on the calculated demand load, known future loads and 5% for future unknown loads. “Space only” provisions are recommended for MCCs rather than any spare device. In project using package equipment served from power panels, MCCs are usually not required. Coordinate with the Owner’s project representative and the facility-engineering department.
   i) In all cases, coordinate the architecture to accommodate the future provisions planned in all of the distribution equipment. The electrical design must clearly indicate, in outline form on the plans, the spaces that may be required to accommodate the future provisions described above. The architectural plans must also clearly indicate this information.
   j) For expansion provisions provide empty conduits to accessible locations. Coordinate with the Owner’s project representative and the facility-engineering department for the location and quantity of spare conduits. Conduits shall be sized to accommodate the estimated future load plus 15% spare.
2. **System Demand Factors**
   a) **Authorities Having Jurisdiction**
   Use the most aggressive demand factors acceptable to the authorities having jurisdiction.

   b) **Historical Data**
   Whenever possible, use historical data for determining the existing load requirements (NEC 220-35).

   c) **Load Demands**
   When the Authority Having Jurisdiction will not accept historical data for calculating load factors, apply load demand factors in accordance with NEC Article 220 and Article 430 requirements, including aggressive use of 220-21.

   d) **Demand Factors**
   Suggestions for such demand factors are as follows:
   1) Branch Receptacles 10 kw at 100%, remainder at 50%.
   2) Branch Lighting 100% for areas where all lighting is likely to be on at one time.
      For other than branch circuits, 50 kw at 40%, remainder at 20%.
   3) Duty cycle, intermittent or redundant motor branch 80%.
   4) Continuously operating motor branch such as air handler units: Compare actual motor sizing with the design brake horsepower requirements. Use prudent demand factor. For most designs, 80% is acceptable.
   5) Elevators use demand factors in NEC 620 14.
   6) Food Service Equipment use demand factors in NEC 220 20, including such equipment in conference rooms, break rooms, etc.

3. **Power Quality**
   a) Where possible, specify electrical equipment that minimizes harmonics back into the balance of the system.
   b) Do not routinely provide power conditioning, oversized transformers, K-rated transformers, oversized neutrals, etc. Carefully evaluate the proposed system for vulnerable points and only provide power quality improvement devices at such locations.

### SECTION 26 00 03 - TRANSMISSION & DISTRIBUTION - DESIGN CRITERIA

1. **Service Voltage**
   a) If the project occurs on a campus already containing other buildings, in general, provide service to the building at the same voltage (12KV) as already provided to other buildings on site.

2. **Utilization Voltage**
   a) Use 480/277 volt for elevators, motors, lighting, and other equipment. Use 120/208 volt for miscellaneous branch circuits.

3. **Service Equipment**
   a) In high voltage switchgear, use a drawout breaker for the main device and loadbreak switches for distribution devices.
   b) Distribution System
      1) Generally, provide dry-type transformers with a maximum size of 3000 kVA.
      2) Coordinate the location and design of substation rooms to allow for the physical replacement of transformers.
SECTION 26 00 04– LOW-VOLTAGE DISTRIBUTION

1. Electrical Equipment Location Criteria
   a) Location
      Locate electrical equipment (including power distribution equipment and communications equipment) in rooms or closets dedicated to housing electrical equipment. Whenever possible, locate electrical rooms adjacent to IT rooms. Provide at least one doorway into a corridor from the room.
   
   b) Computer vs. Electrical Equipment
      Do not locate electrical equipment in Information Technology (“IT”) spaces.
   
   c) Other (Non “IT”) Communication System Equipment
      Locate equipment for other, non-IT communication systems equipment (i.e., fire alarm, television, etc.) in a room dedicated to such equipment. Locate this room adjacent to the IT room. Provide at least one doorway into a corridor from this room. Mount as much of the equipment as possible on walls other than the common wall between this room and the IT room. Do not use this room as a corridor or access path to the IT room.
   
   d) Motor Control Equipment
      Locate motor control equipment within sight of the motors controlled to avoid the necessity of local disconnect switches at the motors. This applies both to MCCs and to switch and gutter installations. Motor control equipment for motors located on roofs should be located on the floor below or in a rooftop penthouse to avoid placing equipment in wet locations.
   
   e) Accessible Ceilings
      Locate electrical, communications, and IT rooms in areas where ceilings are accessible. Coordinate the location for these equipment rooms so that access for future growth and modification is unimpeded. Where accessible ceilings do not surround electrical and communications rooms, provide spare raceways from the room(s) into an accessible ceiling area. Do not install ceilings in electrical, communications, or IT rooms.

2. Distribution System
   a) Provide a number of 277 volt to 120 volt transformers in the building to minimize cost (i.e., balance cost of feeders vs. cost of transformers). In general, distribute at 480 volts and provide local transformers rather than distributing at 208 volts.
   
   b) Equip panel boards with main breakers. Whenever possible, provide two-section panels in lieu of two one-section panels.
   
   c) Coordinate naming of distribution system equipment with existing nomenclature and with Owner’s facility staff.
   
   d) Provide door-in-door construction panel boards.
   
   e) Provide a similar distribution scheme for each substation system.
   
   f) Provide discrete distribution and/or panel boards for different departments to the extent practical.
   
   g) Coordinate vertical stacking and central locations for all electrical rooms within the building.

3. Feeders
   a) Route feeders of 600V and below in EMT conduit.
   
   b) Use set-screw fittings for feeder conduit.
   
   c) Route feeders of more than 600V in IMC conduit with threaded fittings.
   
   d) Do not combine feeders of different voltages in common conduits or raceways.
   
   e) Allow the use of aluminum conductors for all feeders.
   
   f) Combine feeders between buildings in duct banks. Minimize the number of duct banks. Where possible, share trenches for conduits and piping of various systems.
   
   g) Do not route feeder conduits below slab on grade.
Systems Design Preferences

4. Electrical Raceway Routing
   a) Accessible Ceilings
      Route all feeders above accessible ceilings where possible. Coordinate feeder routing with other trades so as to
      maintain access to electrical feeders. Indicate feeder routing on electrical drawings, beginning with Design
      Development. Utility feeders may be run below grade. Do not route feeders over “hard” ceilings. Access doors as a
      means of above-ceiling access is not acceptable unless unavoidable. Route conduits above lobby or corridor spaces
      wherever possible. The preferred means of access is through a standard, 2’x4” lay-in ceiling. Coordinate the
      requirements of this section with the requirements of Division 9 – Finishes.

   b) Low-voltage communication systems
      1) Provide a system of j-hooks on hangers through corridors for the support of cabling for low-voltage communication
         systems. Provide sufficient “hooks” to support information technology, security, fire alarm, intercom, alarm,
         building automation, and other system cabling. For cabling provided under this Division, require the contractor to
         bundle and tag the cabling for each system.

      2) Install devices for low voltage cabling systems in backboxes with conduits up to accessible ceiling spaces. From
         that point, support the cabling using the j-hook support system.

      3) Install wiring for low-voltage system cabling in conduit only where required by codes.

      4) Route j-hook supports above accessible ceilings in corridors. Where the routing path must cross inaccessible
         ceilings or penetrate fire-rated partitions, provide conduit to accommodate the equivalent area for cabling.
         Coordinate locations of j-hook supports with the requirements of Division 18. Provide a minimum of 18” clearance
         around the j-hook supports for access.

   c) Pull Boxes
      Do not locate pull boxes for any system above inaccessible ceilings.

SECTION 26 51 00 - INTERIOR LUMINAIRES - DESIGN CRITERIA

1. IES Guidelines
   Unless otherwise indicated in these standards, provide lighting levels as recommended in Illumination Engineering Society
   (IES) Guidelines. In general, aim towards the lower end of the acceptable range rather than towards the higher end.

2. Switching
   Use occupancy sensors wherever possible for all light switching in office type facilities. Provide program start ballasts for
   all fluorescent fixtures controlled by occupancy sensors.

   a) Provide time clock control for all lights not controlled by occupancy sensors.

   b) Make aggressive use of occupancy sensors and time switches Use them in administration areas, equipment rooms,
      storage rooms, lab prep rooms, offices, and other similar rooms that are frequently unoccupied.

   d) Control lighting in corridors with occupancy sensors.

   e) Provide two-level switching for all spaces 100 square feet or larger in which the connected lighting load exceeds 0.8
      watts per square foot. The light switching shall be capable of a reasonably uniform reduction of illuminance.

   f) For daylit areas greater than 250 square feet, provide at least one control that controls only luminaries in the daylit
      area, and controls at least 50 percent of the lamps.

3. Fluorescent Fixtures
   Use fluorescent fixtures wherever possible. Lamp count and type (cool white vs. warm white) in each fixture should be
   consistent within the building and coordinated with other buildings on the campus, if they exist. Color output of
   non-fluorescent fixtures must be matched when fluorescent and non-fluorescent fixtures are used in close proximity to each
   other. Provide only electronic ballasts with THD less than or equal to 20%. Where no existing building standard exists,
   follow the guidelines set forth in the IEEE White Book. All lamps shall be ECO-type lamps. All lamps shall be 3500 K and
   minimum 80 CRI.
4. Under Cabinet Lights
Where functionally required for specific tasks, provide under-cabinet lights. Location of all under-cabinet fixtures shall be reviewed and approved by the Owner’s project representative. Coordinate the requirements of this section with the requirements of Division 6 - Wood & Plastics. Limit use of undercounter lighting.

5. Reflectance Values
Lighting system design shall reflect the following minimum reflectance values:
   a) Floors - 20%
   b) Ceilings - 80%
   c) Walls - 50%

SECTION 26 56 00 - EXTERIOR LUMINAIRES - DESIGN CRITERIA

1. Source
Use high-pressure sodium lamps for all exterior fixtures. Metal halide lamps may be used where additions are being made to an existing site with metal halide fixtures. Luminaires shall be a maximum of 400 watts. Metal Halide, fluorescent, or halogen or other suitably colored light in areas where needed for security.

2. Pole Heights
In general parking and landscaping areas, provide twenty to twenty five foot high poles. For walkways, provide lower level lighting as appropriate (see item 4d and 5 below).

3. Illumination Levels
Provide the following minimum illumination levels:
   a) For parking areas - maintained average of 1 foot-candle and average to minimum ratio of 4:1.
   b) For circulation spaces – maintained average of 2 foot-candles and average to minimum ratio of 4:1.
   c) For building entrances and exits maintained average of 5 foot candles and average to minimum ratio of 4:1.
   d) For pedestrian walkways maintained average of 5 foot candles and average to minimum ratio of 4:1. Use 12' 0" high pole mounted fixtures with 175 watt maximum lamps in these areas.
   e) For parking structures maintained average of 5 foot candles and average to minimum ratio of 4:1. Vehicle entries and exits require 50 foot candles. Stairwells and elevator lobbies require 20 foot candles. Ramps and corners require 10 foot candles.

4. Specialty Fixtures
Bollard lights, step lights, floodlights, and other specialty fixtures shall be reviewed and approved by the Owner’s project representative and the facility Engineering and Security Departments. Do not provide in-ground recessed up-lights.

5. Controls
   a) Control all exterior lighting by means of photocells and time clocks.
   b) Lights in the following inpatient parking areas shall be on from dusk to dawn: Employee Parking, Pedestrian Walkways, Traffic circulation paths, building exits, and other areas needing security.
   c) For all other areas, operate the lights only from dusk to one hour past visiting hours (or closing time) and from one hour before operating hours until dawn.
SECTION 28 31 00 - FIRE ALARM SYSTEMS

6. Annunciator Locations
   For buildings located on a campus, provide annunciators in each building for that building. In addition, provide one
   annunciator that monitors the entire site. Carefully coordinate the location of the site annunciator with facility
   representatives. Coordinate all annunciator locations with local fire department.

7. Zoning
   Coordinate zoning of system with that of other building systems. These systems include architectural area separations, fire
   sprinkler systems, and air handling systems. Provide one set of floor plans that indicate the zoning of each of these
   systems. Clearly indicate sequence of operation in each fire alarm zone.

8. Building Codes
   In general, provide only devices and operations so as to comply with minimum code requirements of Authorities Having
   Jurisdiction.

9. Elevator Equipment Rooms
   Provide smoke detector and heat detector in the elevator equipment room. Use heat detectors set to lower temperatures
   than sprinkler head fusible links. When the heat detector is activated, it shall first recall the elevators and then shunt-trip the
   breakers in the elevator equipment room.

10. Connection of Auxiliary Devices
    Connect auxiliary devices such as hood fire protection system and roll down doors to the fire alarm system.
## Systems District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 35 00 - Concrete Finishing</td>
<td>1. Integral Colored Concrete</td>
<td>ACI 301 - Structural Concrete for Buildings ACI 302 - Guide for Concrete Floor and Slab Construction</td>
<td>L.M. Scofield Company Davis Colors, Inc. Solomon Colors</td>
</tr>
<tr>
<td>03 39 00 - Concrete Curing</td>
<td>1. Liquid Membrane Curing 2. Sheet Material Curing</td>
<td>ACI 308 - Standard Practice for Curing Concrete</td>
<td>W.R. Meadows Company Fortafiber Building Systems Group</td>
</tr>
<tr>
<td>05 51 13 - Metal Pan Stairs</td>
<td>1. Shop Fabricated Stairs 2. Stair Nosings</td>
<td>NAAMM - National Association of Architectural Metal Manufacturers</td>
<td></td>
</tr>
<tr>
<td>05 52 00 - Metal Railings</td>
<td>1. Steel Tube Handrails &amp; Guardrails 2. Ornamental Metal Railings</td>
<td>CBC Sections 1003.3.3.6 &amp; 1003.3.3.7 Placement: CBC Chapter 11-B DSA Access Plan Review Checklist</td>
<td>R &amp; B Wagner</td>
</tr>
<tr>
<td>05 53 00 - Metal Gratings</td>
<td>1. Metal Bar Grates, Frames &amp; Supports</td>
<td>NAAMM - National Association of Architectural Metal Manufacturers</td>
<td>McNichols Company</td>
</tr>
<tr>
<td>07 13 00 - Sheet Waterproofing</td>
<td></td>
<td>NRCA - Manuals for Waterproofing and Roofing</td>
<td>W.R. Grace &amp; Company</td>
</tr>
<tr>
<td>07 14 00 - Fluid Applied Waterproofing</td>
<td></td>
<td>NRCA - Manuals for Waterproofing and Roofing</td>
<td>American Hydrotech, inc.</td>
</tr>
</tbody>
</table>
## Systems District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>07 71 00 - Roof Specialties</td>
<td>1. Reglets 2. Roof Expansion Joints</td>
<td></td>
<td>Fry Reglet Corporation</td>
</tr>
<tr>
<td>07 72 00 - Roof Accessories</td>
<td>1. Roof Hatches</td>
<td></td>
<td>The Bilco Company</td>
</tr>
<tr>
<td>07 72 00</td>
<td>1. Vault Lids</td>
<td>AASHTO H-20</td>
<td>Christy Products Bilco</td>
</tr>
<tr>
<td>07 81 00 - Applied Fireproofing</td>
<td>1. Intumescent Mastic Fireproofing 2. Cementitious Fireproofing</td>
<td></td>
<td>Cafco Albi Manufacturing AD Fire Protection Systems Grace Construction Products</td>
</tr>
<tr>
<td>07 84 00 - Firestopping</td>
<td>1. Penetration Firestopping 2. Fire Safing</td>
<td>UL 1479</td>
<td>3M Company Hilti Corporation Tremco, inc.</td>
</tr>
<tr>
<td>07 95 00 - Expansion Control</td>
<td>1. Joint Cover Assemblies</td>
<td></td>
<td>Michael Rizza Company C/S Group</td>
</tr>
<tr>
<td>08 11 00 - Metal Doors and Frames</td>
<td>1. Hollow Metal Doors 2. Hollow Metal Frames</td>
<td>HMMA - Hollow Metal Manufacturers Association SDI - Steel Door Institute</td>
<td>Stiles Custom Metal, incl Security Metal Products</td>
</tr>
</tbody>
</table>
### Systems District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
</table>
| **08 14 00 - Wood Doors** | 1. Flush Wood Doors  
2. Stile & Rail Wood Doors | NWWDA - National Wood Window & Door Association  
WI - Woodwork Institute | Marshfield Door Systems  
Eggers Industries  
Algoma Hardwoods, inc. |
| **08 30 00 - Specialty Doors and Frames** | 1. Fire Damper Access Doors | | Nystrom Building Products  
Milcor, inc.  
Karp Associates, Inc. |
| **08 33 00 - Coiling Doors and Grilles** | 1. Coiling Counter Doors  
2. Overhead Coiling Doors | | The Cookson Company  
Cornell Iron Works |
| **08 40 00 - Entrances, Storefronts, & Curtain Walls** | 1. All-Glass Entrances  
2. Aluminum-Framed Storefronts  
NFRC - National Fenestration Rating Council | Kawneer, North America  
The Vistawall Group  
EFCO Corporation |
| **08 51 00 - Metal Windows** | 1. Aluminum Windows  
2. Steel Windows | AAMA - American Architectural Manufacturers Association  
NFRC - National Fenestration Rating Council  
SWI - Steel Window Institute | Hope's Windows, inc.  
Torrance Steel Window Comp., inc.  
Bonelli enterprises |
| **08 52 00 - Wood Windows** | 1. Metal-Clad Wood Windows  
2. Plastic-Clad Wood Windows | WDMA - Window & Door Manufacturers Association | Sierra Pacific Windows  
Andersen Corporation  
Pella Corporation |
| **08 71 00 - Door Hardware** | 1. Hinges  
2. Locksets  
3. Closers  
4. Stops  
5. Thresholds  
6. Weatherstripping  
7. Panic Hardware  
8. Security Hardware | | Hager / McKinney  
Schlage  
Glynn-Johnson / LCN Closers  
Pemko  
Pemko  
Von Duprin  
As Required |
| **08 80 00 - Glass Glazing** | 1. Glass Glazing  
2. Mirrors  
Pilkington LLC |
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 90 00 - Louvers &amp; Vents</td>
<td>1. Louvers 2. Vents</td>
<td>AMCA - Air Movement &amp; Control Association</td>
<td>Wonder Metals Corporation Construction Specialties, Inc. Greenheck Architectural Products</td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
</tbody>
</table>
| 09 72 00 - Wall Coverings | 1. Vinyl-Coated Fabrics  
2. Textile Wall Coverings | CFFA-W-101A                                             | Maharam Knoll International Koroseal                |
| 09 80 00 - Acoustic Treatment | 1. Acoustic Blanket Insulation  
2. Acoustic Wall Coating | ASTM C-665                                              | Certzin Teed Corporation                           |
| 09 90 00 - Paints and Coatings | 1. Interior Painting  
2. Exterior Painting  
| 10 11 00 - Visual Display Surfaces | 1. Markerboards  
2. Tackboards  
| 10 14 00 - Signage | 1. Restroom Signage | Design/Style: CBC Chapter 11-B  
| 10 21 003 - Compartments & Cubicles | 1. Toilet Compartments  
2. Urinal Screens  | CBC Chapter 11-B  
DSA Access Plan Review Checklist | Bobrick                                             |
| 10 26 00 - Wall and Door Protection | 1. Wall Corner Guards |                                                      | DecoGard Products                                  |
| 10 28 00 - Toilet, Bath & Laundry Accessories | 1. Paper Towel Dispensers  
2. Waste Receptacles  
3. Toilet Paper Dispensers  
4. Sanitary Napkin Dispensers  
5. Soap Dispensers  
6. Grab Bars  
7. Coat Hooks  
8. Baby Changing Station | Placement: CBC Chapter 11-B  
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
</table>
NFPA 10  
ANSI A17.1 | Larsen's Manufacturing Company  
Potter Romer LLC  
JL Industries, inc.  
Amerex Corporation |
| 14 20 00 - Elevators   | 1. Hydraulic Elevators               | CBC Chapter 11-B  
NEII - National Elevator Industry, inc. | KONE Corporation  
ThyssenKrupp AG |
| 21 11 16               | 1. Hydrants                          | AWWA C503  
AWWA C550 (Coating) | Long Beach |
| 22 11 16               | Domestic Water Piping                | 1. Copper Type L (Above Grade)  
2. Copper Type K (Below Grade)  
3. PE Encasement (Below Grade) | 1. N/A |
| 22 13 16               | Sanitary Waste and Vent Piping       | 1. No-Hub Cast Iron  
2. 304 SS couplings (Below Grade)  
3. DWV Copper (Condensate Drainage) | 1. N/A |
| 22 14 00               | Storm Drainage Piping                | 1. No-Hub Cast Iron  
2. 304 SS couplings (Below Grade) | 1. N/A |
| 22 33 00               | Electric Domestic Water Heaters      | 1. Instantaneous  
2. Storage Type | 1. Chronomite (Instant)  
2. Eemax (Instant)  
3. PVI (Instant)  
4. A.O. Smith  
5. PVI  
6. Rheem |
| 22 36 36               | Gas Water Heaters                    | 1. Storage Type | 1. A.O. Smith  
2. PVI  
3. Rheem |
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 40 00</td>
<td>Plumbing Fixtures</td>
<td>1. Water Closets (WC)</td>
<td>1. American Std. Afwall EL 1.6 (Kohler, Eljer, Crane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. WC Flush Valve</td>
<td>2. Sloan Royal Model 111 (Zurn, Toto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. WC Flush Valve with sensor</td>
<td>3. Sloan Optima Model 111 ES-S (Zurn, Toto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Urinals (flush) (UR)</td>
<td>4. American Standard Allbrook 1.0 (Kohler, Eljer, Crane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Urinals (waterless)</td>
<td>5. Waterless (Falcon)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. UR Flush Valve</td>
<td>6. Sloan Royal Model 186-1 (Zurn, Toto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. UR Flush Valve with sensor</td>
<td>7. Sloan Optima Model 186-1 ES-S (Zurn, Toto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Lavatory (countertop) (LAV)</td>
<td>8. American Standard Aqualyn (Kohler, Eljer, Crane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Lavatory (wall hung) (LAV)</td>
<td>9. American Standard Lucerne (Kohler, Eljer, Crane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. LAV Faucet</td>
<td>10. Chicago Faucets 2200-4 (Delta, Zurn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. LAV Faucet with sensor</td>
<td>11. Sloan Optima ETF-80 (Zurn, Toto)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12. SS Sink (SK)</td>
<td>12. Elkay LR (Just, Kohler)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13. SK Faucet</td>
<td>13. Chicago Faucets 201-AGN8AE3-317CP (Delta, Zurn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14. SK Faucet with sensor</td>
<td>14. Chicago Faucets 652-4 (Delta, Zurn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15. Janitor’s Mop Sink</td>
<td>15. American Standard Florwell (Kohler, Eljer, Crane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17. Hi-Lo Drinking Fountain</td>
<td>17. Haws Model 1119 (Kohler, Elkay)</td>
</tr>
</tbody>
</table>
## Systems

### District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 40 00</td>
<td>18. Emergency Shower/Eye Wash</td>
<td>18. Guardian Equipment GBF2272 (Viking, Haws)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19. Hose Bibb (indoor)</td>
<td>19. Woodford Model B24 Series (Chicago Faucets, Zurn)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20. Hose Bibb (outdoor)</td>
<td>20. Woodford Model B65 Series (Chicago Faucets, Zurn)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24. Floor Clean Out</td>
<td>24. Zurn Z1400 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25. Access Cover and Plug</td>
<td>25. Zurn Z1468 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27. Roof/Overflow Drain</td>
<td>27. Zurn Z100 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28. Floor Drain</td>
<td>28. Zurn Z415 (normal duty), Zurn Z541 (heavy duty) (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29. Area Drain</td>
<td>29. Zurn Z539 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30. Floor Sink</td>
<td>30. Zurn Z1900 and Z1910 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31. Trench Drain</td>
<td>31. Zurn Z883, Z886 (JR Smith, Josam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32. Water Hammer Arrestor</td>
<td>32. Josam, 75000-S (Sioux Chief, Zurn)</td>
<td></td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>22 40 00</td>
<td></td>
<td>33. Washing Machine Supply system</td>
<td>33. Guy Gray B-150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34. Air Gaps</td>
<td>34. JR Smith 3955 (Zurn, Wade)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35. P-Trap insulation</td>
<td>35. Skalgard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36. Labeling</td>
<td>36. Seton Company (MSI)</td>
</tr>
<tr>
<td>22 61 19</td>
<td>Lab Air Equipment</td>
<td>1. Packaged, duplex, integral receiver, oil-free, scroll compressors, air-cooled</td>
<td>1. Powerex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Atlas Copco</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Medaes</td>
</tr>
<tr>
<td>22 62 13</td>
<td>Lab Air and Vacuum Piping</td>
<td>1. Copper Type L Bagged for Oxygen Service (CDA)</td>
<td>1. N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Copper Type L (Vacuum)</td>
<td></td>
</tr>
<tr>
<td>22 62 19</td>
<td>Lab Vacuum Equipment</td>
<td>1. Packaged, duplex or triplex, air-cooled, receiver tank</td>
<td>2. Kinney</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Medaes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Powerex</td>
</tr>
<tr>
<td>22 63 13</td>
<td>Chemical Waste Piping</td>
<td>1. Double contained PolyPro</td>
<td>1. Enfield</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Asahi</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Fischer</td>
</tr>
<tr>
<td>23 05 00</td>
<td>Motors</td>
<td>1. Premium Efficient</td>
<td>1. Baldor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Inverter Duty for VFD driven motors</td>
<td>2. Reliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. TEFC motors in outdoor environments</td>
<td>3. Toshiba</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. ODP in indoor locations</td>
<td>4. General Electric</td>
</tr>
<tr>
<td>23 05 23</td>
<td>Valves and Cocks</td>
<td>1. Gate Valves</td>
<td>1. Milwaukee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Globe valves</td>
<td>2. Hammond</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Ball Valves</td>
<td>3. Nibco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Plug Valves</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Check Valves</td>
<td></td>
</tr>
<tr>
<td>23 05 48</td>
<td>Vibration Isolation</td>
<td>1. Elastomeric Isolation Pads</td>
<td>1. M.W. Sausse Vibrex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Restrained Elastomeric Isolation Mounts</td>
<td>2. Mason industries</td>
</tr>
</tbody>
</table>
### Systems District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 05 48</td>
<td>Vibration Isolation (cont’d)</td>
<td>4. Spring hangers with Vertical Limit Stops</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Thrust Limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Seismic Snubbers</td>
<td></td>
</tr>
<tr>
<td>23 07 13</td>
<td>Duct Insulation</td>
<td>1. Rigid Fiberglass Insulation (Exterior of Ducts)</td>
<td>1. Certainteed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Flexible Elastomeric Closed Cell (Interior of Ducts)</td>
<td>2. Manville</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Knauf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Grease Duct Wrap</td>
<td>4. Owens-Corning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Armacell (Closed Cell)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. 3M (Grease Duct Wrap)</td>
</tr>
<tr>
<td>23 07 19</td>
<td>Piping Insulation</td>
<td>1. Rigid Fiberglass Insulation (Chilled Water, Heating Hot Water)</td>
<td>1. Certainteed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Flexible Elastomeric Closed Cell (Refrigerant Piping, Equipment, Condensate Drains)</td>
<td>2. Manville</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Knauf</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Owens-Corning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Armacell (Closed Cell)</td>
</tr>
<tr>
<td>23 09 00</td>
<td>DDC Controls</td>
<td>1. Native Open Protocol</td>
<td>1. Alerton</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Web Control</td>
<td>2. Andover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Local Control</td>
<td>3. Automated Logic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Wiring</td>
<td></td>
</tr>
<tr>
<td>23 09 13.53</td>
<td>Variable Frequency Drives</td>
<td>1. Fans</td>
<td>1. ABB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Pumps</td>
<td>2. Toshiba</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Chillers</td>
<td>3. Equal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Cooling Towers</td>
<td></td>
</tr>
<tr>
<td>23 21 13</td>
<td>Hydronic Piping</td>
<td>1. Copper Type L (2-1/2” and smaller)</td>
<td>1. Grinnel or Vicatulic for grooved mechanical joints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Sch. 40 Black Steel (All sizes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Welded or Grooved Mechanical Joint</td>
<td></td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| 23 21 13.13            | Underground Chilled/Heating Water Piping | 1. Steel Pipe: Steel ASTM A-53, Grade B., ERW (Type E) or seamless (Type S), standard weight for sizes 2" and larger, and shall be ASTM A-106/A-53, seamless.  
2. Insulation: Polyurethane foam either spray applied or high pressure injected with one shot into the annular space between carrier pipe and jacket. Rigid, 90-95% closed cell polyurethane with a 2.0 to 3.0 pounds per cubic foot density and coefficient of thermal conductivity (K- Factor) of 0.14, conform to ASTM C-591. Maximum operating temperature will not exceed 250°F.  
3. PVC jacketing.  
4. Expansion Loops and Els  
5. Welded Fittings  
6. Anchors  
7. Moisture Barrier End Seals | 1. Ricwil  
2. Thermacor  
3. Rovanco  
4. Perma-Pipe |
| 23 21 23               | Hydronic Pumps                  | 1. In-line  
2. Base Mounted                                                                                               | 1. Taco  
2. Paco |
| 23 23 00               | Refrigerant Piping              | 1. Copper Type ACR                                                                                             | 1. N/A |
| 23 25 00               | HVAC Water Treatment            | 1. Non-chemical treatment system                                                                               | 1. BacComber |
| 23 31 13               | Metal Ducts                     | 1. SMACNA Standards  
2. Galvanized Sheet Metal (Standard)                                                                            | 1. Ductmate  
2. McGill |
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 31 13</td>
<td>Metal Ducts (cont'd)</td>
<td>3. Welded Black Steel (Grease Exhaust or High Temperature Exhaust)</td>
<td>3. Semco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. 304 SS (Chemical Exhaust)</td>
<td></td>
</tr>
<tr>
<td>23 33 00</td>
<td>Duct Accessories</td>
<td>1. Balance Dampers</td>
<td>1. Ruskin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Combination Fire and Smoke Dampers</td>
<td>2. Potteroff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Control Dampers</td>
<td>4. IAC (Sound Attenuators)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Sound Attenuators</td>
<td>5. Vibro Acoustics (Sound Attenuators)</td>
</tr>
<tr>
<td>23 34 23</td>
<td>Power Ventilators</td>
<td>1. In-Line</td>
<td>1. Greenheck</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Centrifugal Upblast</td>
<td>2. Cook</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Mushroom Type</td>
<td>3. Twin Cities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Penn</td>
</tr>
<tr>
<td>23 36 00</td>
<td>Air Terminals</td>
<td>1. DDC</td>
<td>1. Titus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Non-Microbial Growth Lining</td>
<td>2. Nailor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Single Duct CAV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Parallel Fan Powered VAV</td>
<td></td>
</tr>
<tr>
<td>23 52 33</td>
<td>Flex Tube Boilers</td>
<td>1. Gas boiler</td>
<td>1. Cleaver Brooks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Indoor boiler</td>
<td>2. Bryan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Equal</td>
</tr>
<tr>
<td>23 57 33</td>
<td>Closed Loop Ground Heat Exchanger piping</td>
<td>1. High-Density Polyethylene</td>
<td>1. N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. PE 3408</td>
<td></td>
</tr>
<tr>
<td>23 64 16</td>
<td>Centrifugal Water Chillers</td>
<td>1. Centrifugal chillers</td>
<td>1. York</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. VFD</td>
<td>2. Carrier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. McQuay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Trane</td>
</tr>
<tr>
<td>23 65 13</td>
<td>Packaged Cooling Towers</td>
<td>1. Low Sound Fans</td>
<td>1. BAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. VFD’s</td>
<td>2. Evapco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Stainless Steel Sumps</td>
<td>3. Marley</td>
</tr>
</tbody>
</table>

Systems District Standards
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
</table>
| 23 72 00               | Air-to-Air Energy Recovery Units | 1. Double Wall Construction  
2. Internal Insulation  
3. Internal Fan Isolation  
4. VFD’s  
5. Direct Driven Fans  
6. Pre-Filter and Final Filter  
7. Bypass Damper | 1. Innovovent  
2. Temtrol  
3. Haakon |
| 23 73 13               | Air Handling Units | 1. Double Wall Construction  
2. Internal Insulation  
3. Internal Fan Isolation  
4. VFD’s  
5. Direct Driven Fans  
6. Pre-Filter and Final Filter  
7. Copper/Copper Coils  
8. Outdoor units with corrosion protection | 1. Temtrol  
2. Haakon  
3. Energy Labs  
4. Governair (Large Units)  
5. Haakon (Large Units)  
6. Climate Craft (Large Units) |
| 23 81 26               | Computer Room A/C Units | 1. DX Units  
2. Hot-gas Reheat  
3. Low-Sound Outdoor Condensers with Low Ambient Temperature Controls | 1. Stulz  
2. Liebert  
3. APC |
| 23 81 26               | Split System Air Conditioning Units | 1. DX Units  
2. Low Sound Outdoor Condensers with Low Ambient Temperature Controls | 1. McQuay  
2. Trane  
3. Carrier  
4. Mitsubishi  
5. Sanyo |
| 23 81 46               | Closed Loop Geothermal Heat Pumps | 1. High Capacity Units  
2. BacNet Controls  
3. Low Sound Package | 1. Climate Master  
2. Water Furnace  
3. Mammoth |
| 26 05 13               | Medium Voltage Cables | 1. Medium Voltage cable  
2. Cable Terminations | Cable  
1. Okonite  
2. Cablec  
3. Pirelli  
4. Kerite  
Cable Terminations  
1. G&W  
2. MAC Products  
3. 3M Company |
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 05 19</td>
<td>Wires and Cables (600V &amp; Below)</td>
<td>1. Building Wire and Cable (Copper Conductors only) (No Aluminum, #10 and smaller – solid) 2. Armored Cable 3. Metal Clad Cable (MC)</td>
<td>1. General Cable 2. Rome Cable 3. AFC</td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>26 11 00</td>
<td>Unit Substation</td>
<td>1. Unit Substation</td>
<td>1. Square D 2. Cutler-Hammer 3. Siemens</td>
</tr>
<tr>
<td>26 24 19</td>
<td>Motor Control Centers</td>
<td>1. Motor Control Centers</td>
<td>1. Square D</td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>26 27 26</td>
<td>Wring Devices (cont’d)</td>
<td>5. Occupancy Sensors</td>
<td>Occupancy Sensors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. Wattstopper</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Levitron</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Novitas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Hubbell Building Automation</td>
</tr>
<tr>
<td>26 32 00</td>
<td>Packaged Engine Generator Systems</td>
<td>1. Packaged Engine Generator Set.</td>
<td>1. Cummins – Onan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Weatherproof enclosure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Sound Attenuating enclosure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Caterpillar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Kohler</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Generac</td>
</tr>
<tr>
<td>26 33 53</td>
<td>Three Phase Uninterrupted Power System</td>
<td>1. Uninterrupted Power System (UPS)</td>
<td>1. APC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Liebert</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Powerware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. MGE</td>
</tr>
<tr>
<td>26 36 00</td>
<td>Enclosed Transfer Switch</td>
<td>1. Automatic Transfer Switch with Bypass Isolation.</td>
<td>1. ASCO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Zenith</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Cummins – Onan</td>
</tr>
<tr>
<td>26 43 00</td>
<td>Transient Voltage Surge Suppressor System</td>
<td>1. Transient Voltage Surge Suppressor (TVSS) System</td>
<td>1. Current Technologies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Liebert</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Levitron Manufacturing</td>
</tr>
<tr>
<td>26 51 00</td>
<td>Building Lighting</td>
<td>1. Lighting Fixtures</td>
<td>Lighting Fixtures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. Cooper Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Fluorescent Luminaires</td>
<td>1. Halo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Recessed Downlight Luminaires</td>
<td>2. Metalux</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Exits Signs (LED)</td>
<td>3. Neoray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. Emergency Egress Lighting</td>
<td>4. Shaper Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Energy Efficient Lamps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Compact fluorescent</td>
<td>1. Columbia Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Fluorescent T8 lamps</td>
<td>2. Alera Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Color correlated temperature: 3500 degrees K</td>
<td>3. Prescolite</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Ballasts</td>
<td>4. Lithonia Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Electronic</td>
<td>1. Lithonia Fluorescent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. HPF</td>
<td>2. Peerless</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Program Start</td>
<td>3. Gotham</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Voltage</td>
<td>4. Thomas Lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. 277 (New Bldgs.)</td>
<td>1. Daybrite Fluorescent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Omega downlighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Capri downlights and tracks</td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 26 51 00               | Building Lighting (cont'd) |                    | 5. Finelite Lamps  
1. General Electric  
2. Osram Sylvania  
3. Philips Lighting  
Ballasts  
1. Advance  
2. Universal  
3. General Electric  
4. Bodine Emergency ballasts |
| 26 56 00               | Exterior Lighting    | 1. Exterior Luminaries and accessories  
2. Poles  
3. Lamps  
   a. Metal Halide or HPS  
   b. Color correlated temperature: 3200 degrees K | Lighting Fixtures  
1. Cooper Lighting  
   a. Invue  
   b. McGraw Edition  
2. Hubbell Lighting, Inc.  
   a. Hubbell Outdoor  
   b. Kim  
   c. Moldcast  
3. Thomas Lighting, Inc.  
   a. Gardco  
4. Lithonia Lighting  
5. Holophane Lamps  
1. General Electric  
2. Osram Sylvania  
3. Philips Lighting Ballasts  
1. Advance  
2. Universal  
3. General Electric |
| 27 51 16               | Public Address System | 1. Public Address System  
   a. Mixers/Amplifiers  
   b. Speaker Enclosures  
   c. Speakers and Speaker transformers. | 1. Rauland  
2. Dukane  
3. Bogen  
4. Soundolier |
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 84 00</td>
<td>1. Central Control System 2. Cluster Control Unit</td>
<td>Rainbird Maxicom 2 Rainbird Maxicom 2 CCU Series Rainbird Maxicom 2 Satellite ESP-SAT Series Controller Rainbird Maxicom 2 Satellite Maxicom 2 Weather Station WS-PRO</td>
<td>Rainbird Rainbird Rainbird</td>
</tr>
<tr>
<td></td>
<td>Irrigation</td>
<td>3.39 Systems</td>
<td></td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>32 84 00 - Irrigation</td>
<td>13a. Irrigation Pipe, Mainline 2” and larger - Purple</td>
<td>ASTM D2241, NSF Type 1, Grade 1 Purple color “Caution Reclaimed Water“ printed every 24” along pipe</td>
<td>PW Pipe Spears</td>
</tr>
<tr>
<td></td>
<td>13b. Irrigation Pipe, Mainline 1.5” and smaller - Purple</td>
<td>ASTM D1785, NSF Type 1, Grade 1 Purple color “Caution Reclaimed Water“ printed every 24” along pipe</td>
<td>PW Pipe Spears</td>
</tr>
<tr>
<td></td>
<td>13c. Irrigation Pipe lateral – Purple PVC Schedule 40</td>
<td>ASTM D1785, NSF Type 1, Grade 1 Purple color “Caution Reclaimed Water“ printed every 24” along pipe</td>
<td>PW Pipe Spears</td>
</tr>
<tr>
<td></td>
<td>13d. Irrigation Pipe, Lateral, connection between mainline &amp; RCV - Purple PVC Schedule 80</td>
<td>Schedule 80 PVC solvent weld one end, thread other</td>
<td>PW Pipe Spears</td>
</tr>
<tr>
<td></td>
<td>14. PVC Solvent welded fittings</td>
<td>ASTM D2466, Schedule 40, 1-2, II-I NSF Schedule 80 PVC</td>
<td>Dura Lasco</td>
</tr>
<tr>
<td></td>
<td>14a. PVC Threaded fitting</td>
<td></td>
<td>Dura Lasco</td>
</tr>
<tr>
<td></td>
<td>15. Solvent Cement &amp; Primer for PVC solvent welded pipe and fittings</td>
<td></td>
<td>Permatex Rector Seal</td>
</tr>
<tr>
<td></td>
<td>16. Pipe &amp; Joint compound</td>
<td>Permatex #51, Low VOC</td>
<td>Permatex</td>
</tr>
<tr>
<td></td>
<td>17. Swing Joints: sprinklers &amp; bubblers</td>
<td>pre-assembled PVC with single ‘O’ ring, 125 PSI rating</td>
<td>Dura Lasco</td>
</tr>
<tr>
<td></td>
<td>18. Swing Joints: quick coupling valves</td>
<td>pre-assembled PVC with double ‘O’ rings, ACME threads, min. 200 PSI rating, with quick-lock to receive stabilizing rod. Dura Quick Lock</td>
<td>Dura Lasco</td>
</tr>
<tr>
<td>Specification Section</td>
<td>System</td>
<td>Reference Standard</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>32 84 00 - Irrigation</td>
<td>19. Boxes for Remote Control Valves</td>
<td>Rectangular, size to fit, min. 11&quot; x 16&quot; Plastic, green color - in planting areas Concrete, H/20 load - in paved areas Lid, non-hinged, bolt-down marked &quot;IRRIGATION&quot; Valve box lids to identify Controller &amp; Station</td>
<td>Ametek / Armor Brooks Carson Christy</td>
</tr>
<tr>
<td></td>
<td>20. Boxes for Isolation Valves, Quick Coupling Valves</td>
<td>Circular, size to fit, min. 10&quot; dia. Plastic, green color - in planting areas Concrete, H/20 load in paved areas Lid, bolt-down, marked &quot;Irrigation&quot;</td>
<td>Ametek / Armor Brooks Carson Christy</td>
</tr>
<tr>
<td></td>
<td>21. Controller Enclosures</td>
<td>Stainless Steel, top mounting, NEMA Type 3 rated, with back panel, and protected padlocking hasp and padlock</td>
<td>United Green Tech Strong Box LeMeur</td>
</tr>
<tr>
<td></td>
<td>22. Controller Ground</td>
<td>8’ Length, 5/8” copper clad rod U.L. approved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23. Control wires</td>
<td>Underground Feeder, 14-AWG-UF 600 volt minimum size No more than 5 wires of a single color White common wire Extra wires single separate color</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24. Wire connectors</td>
<td>copper crimp-type connector 3M DBY Direct Burial Splice Kit</td>
<td>3M</td>
</tr>
<tr>
<td></td>
<td>25. Pipe Tracer Wire</td>
<td>Bare # 12 copper wire or greater, install on top of PVC supply line</td>
<td></td>
</tr>
</tbody>
</table>
## Systems

### District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 84 00 - Irrigation</td>
<td>26. Backflow preventer</td>
<td>to be specified by Civil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27. Backflow preventer insulation</td>
<td>size to fit</td>
<td>Polar Parka Frost Guard</td>
</tr>
<tr>
<td></td>
<td>28. Backflow prevention device enclosure</td>
<td>Strong Box Smooth Touch</td>
<td>Strong Box</td>
</tr>
<tr>
<td></td>
<td>29. Valve identification tags</td>
<td>Polyeurthetane Tags marked with controller &amp; station #</td>
<td>Rainbird</td>
</tr>
<tr>
<td></td>
<td>30. Padlocks &amp; keying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 05 16.13</td>
<td>Vaults/Manholes</td>
<td>1. Precast Concrete Boxes - Metal cover preferred.</td>
<td>1. Brooks Products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Christy</td>
<td>2. Christy</td>
</tr>
<tr>
<td>33 11 16 - Site Water Utility Distribution Piping</td>
<td>1. Plastic Pipe (Water, 4&quot;-12&quot;)</td>
<td>AWWA C900 (Class 200 PVC)</td>
<td>P.W. Pipe</td>
</tr>
<tr>
<td></td>
<td>(Water, 14&quot;- 48&quot;)</td>
<td>AWWA C905</td>
<td>J.M. Manufacturing</td>
</tr>
<tr>
<td></td>
<td>2. Plastic Pipe (PE-fused)</td>
<td>AWWA C901</td>
<td>Certained CP Chem</td>
</tr>
<tr>
<td></td>
<td>3. Reinforced Concrete Pipe (Storm Drain, 12&quot; - 48&quot;)</td>
<td>AWWA C906 (PE 3408)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Plastic Fittings (Water, 4&quot;-8&quot;)</td>
<td>ASTM C76 “O” Ring B-Wall Design</td>
<td>Hydro Conduit</td>
</tr>
<tr>
<td></td>
<td>5. Plastic Pipe and Fittings (Water, 3/4&quot;-3&quot;)</td>
<td>AWWA C907</td>
<td>PW Pipe</td>
</tr>
<tr>
<td></td>
<td>6. Service Pipe (Water, 3/4&quot;-2&quot;)</td>
<td>ASTM D-1785 (Sch 40/80 - PVC)</td>
<td>JM Manufacturing</td>
</tr>
<tr>
<td></td>
<td>7. Ductile Iron Pipe (Water, 4&quot;-16&quot;)</td>
<td>ASTM B-88 (Copper, Type K)</td>
<td>Certained Spears</td>
</tr>
<tr>
<td></td>
<td>8. Ductile Fitting (Water, 4&quot;-12&quot;)</td>
<td>AWWA C151</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Welded Steel Pipe (Water, 4&quot;-12&quot;)</td>
<td>AWWA C110</td>
<td>B &amp; K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AWWA C200</td>
<td>Cerro</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>US Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tyler Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tyler Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>US Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ameron</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pacific Pipe</td>
</tr>
</tbody>
</table>
## Systems

### District Standards

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 11 16 - Site Water Utility Distribution Piping (cont'd)</td>
<td>10. Control Valves/Air Releases (Water)</td>
<td>AWWA C-512</td>
<td>Cla-Val</td>
</tr>
<tr>
<td></td>
<td>11. Backflow Assemblies</td>
<td>AWWA C510, AWWA C511</td>
<td>Ames, Crispin</td>
</tr>
<tr>
<td></td>
<td>12. Gate Valves (Water, 4&quot;-12&quot;)</td>
<td>AWWA C509, AWWA C550 (Epoxy Coat)</td>
<td>Ames, Febco, Mueller</td>
</tr>
<tr>
<td></td>
<td>13. Pipe Couplings (2&quot;-24&quot;)</td>
<td>AWWA C219 (W/Stainless Steel Bolts)</td>
<td>Baker, Smith-Blair</td>
</tr>
<tr>
<td>33 31 16 - Industrial Waste Utility Sewerage Piping</td>
<td>1. Plastic Pipe (Sanitary Sewer, 4&quot; -12&quot;)</td>
<td>ASTM D-3034 (SDR26 (PVC))</td>
<td>PW Pipe, J.M. Manufacturing, Certainteed, Diamond</td>
</tr>
<tr>
<td>33 39 13 - Sanitary Utility Sewerage Manholes</td>
<td>1. Manhole (Sanitary Sewer)</td>
<td>SD-2 (RVSD)-KFD, SD-2(NSD)-IVC</td>
<td>Central Precast Hydro Conduit</td>
</tr>
<tr>
<td>33 41 13 - Public Storm Utility Drainage Piping</td>
<td>1. Plastic Pipe (Storm Drain, 12&quot;-48&quot;)</td>
<td>AASHTO M252 (Tubing), AASHTO M294 (12&quot;-24&quot;) ASTM F 667 &amp; F405 (HDPE CORR), N12-WT</td>
<td>Advanced Drainage Systems Hancor</td>
</tr>
<tr>
<td>33 44 00 - Storm Utility Water Drains</td>
<td>1. Inlets (Storm Drainage)</td>
<td>UCS-220, UCS-221, UCS-222, UCS-223, UCS-224, UCS-225, UCS-230, UCS-232</td>
<td>Central Precast Hydro Conduit</td>
</tr>
<tr>
<td></td>
<td>2. Area Drains</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Curb Inlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Drop Inlets</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Catch Basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 44 10</td>
<td>1. Meter/Valve Boxes</td>
<td>National Precast Concrete Association</td>
<td>Christy Products Brooks</td>
</tr>
<tr>
<td>33 49 13 - Storm Drainage Manholes, Frames, Covers</td>
<td>1. Manhole (Storm Drainage, 6&quot;-18&quot;)</td>
<td>UCS-202</td>
<td>Central Precast Hydro Conduit</td>
</tr>
<tr>
<td></td>
<td>2. Manhole (storm Drainage, 21&quot;-72&quot;)</td>
<td>UCS-203</td>
<td>Central Precast Hydro Conduit</td>
</tr>
</tbody>
</table>
Note: Please reference Volume 1 - ‘Facilities Development Plan and Guidelines’ for this information.
5 | INFORMATION TECHNOLOGY
<table>
<thead>
<tr>
<th>Specification Section</th>
<th>System</th>
<th>Reference Standard</th>
<th>Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>17100</td>
<td>Racks</td>
<td>1. 19” x 7’&lt;br&gt;2. UL Listed&lt;br&gt;3. RMU Markings on both sides</td>
<td>1. Chatsworth&lt;br&gt;2. Panduit&lt;br&gt;3. B-Line</td>
</tr>
<tr>
<td>17100</td>
<td>Interbuilding Backbone Copper Cable</td>
<td>1. OSP Gel Filled Cable&lt;br&gt;2. 24 AWG&lt;br&gt;3. Category 3</td>
<td>1. Systimax&lt;br&gt;2. BerkTek&lt;br&gt;3. Superior Essex</td>
</tr>
<tr>
<td>Code</td>
<td>Component</td>
<td>Technology Specifications</td>
<td>Manufacturers</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
</tbody>
</table>
| 17400 | AV Wall Plates             | 1. VGA and QCGA Graphics Cards Compatibility  
2. 300 MHz RGB Video Bandwidth  
3. Female 15 pin HD and 3.5 mm mini stereo jack inputs  
4. Female BNC Output | 1. Valcom  
2. Bogen |
| 17500 | Wireless Access Points     | 1. IEEE 802.11 a/b/g  
2. Support PoE  
3. Indoor and Outdoor Applications | 1. Cisco |
| 17500 | Wireless Access Point Cable| 1. Category 6  
2. 24 AWG  
3. Plenum  
4. 4-Pair | 1. Systimax  
2. Panduit  
3. BerkTek  
4. Superior Essex  
5. General  
6. Mohawk |
| 17700 | Paging Speaker Cable       | 1. Category 5e  
2. Plenum  
3. 4-Pair 4. 24 AWG | 1. Systimax  
2. Panduit  
3. BerkTek  
4. Superior Essex  
5. General  
6. Mohawk |
| 17700 | Page Control               | 1. One way paging  
2. Programmable Zone Groups  
3. Multiple Zones | 1. Valcom  
2. Bogen |
| 17700 | Paging Speaker             | 1. Recessed Ceiling Mounted  
2. Back Box  
3. Volume Control  
4. Built in Amplifier | 1. Valcom  
2. Bogen |
The purpose of this document is to begin capturing the requirements and establish a design criterion for the Telecommunications Infrastructure. Upon approval of the proposed design criteria we will develop a more comprehensive Basis of Design to be submitted to the Architect to support and guide the design phase.

<table>
<thead>
<tr>
<th><strong>Design Item</strong></th>
<th><strong>Requirements / Criteria</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MPOE Located in Main Electrical Room</td>
<td></td>
</tr>
<tr>
<td>Local Exchange Carrier (LEC)</td>
<td></td>
</tr>
<tr>
<td>Copper Entrance Cable (100) (200) (300) Pair</td>
<td></td>
</tr>
<tr>
<td>LEC Responsible for Entrance Cable</td>
<td></td>
</tr>
<tr>
<td>Each Floor Shall Have 1 Telecommunications Room (TR)</td>
<td></td>
</tr>
<tr>
<td>Copper Backbone from MPOE to TR</td>
<td></td>
</tr>
<tr>
<td>TR Minimum 8’ X 10”</td>
<td></td>
</tr>
<tr>
<td>TR 24/7 HVAC Temp. Range 64°F to 75°F. Humidity Range 30% to 55%</td>
<td></td>
</tr>
<tr>
<td>TR Fire Protection Should be Minimum Required by Code</td>
<td></td>
</tr>
<tr>
<td>TR Ceiling Height Should be Minimum 9’ AFF</td>
<td></td>
</tr>
<tr>
<td>TR Lighting 50 footcandles</td>
<td></td>
</tr>
<tr>
<td>TR Located in Center of Building</td>
<td></td>
</tr>
<tr>
<td>Work Area Outlet (WAO) Shall be Four (3) (4) UTP Cables</td>
<td></td>
</tr>
<tr>
<td>WAO Cable shall be Category (5e) (6)</td>
<td></td>
</tr>
<tr>
<td>WAO Cables Shall Terminate on Patch Panels (Voice and Data)</td>
<td></td>
</tr>
<tr>
<td>WAO Cables Shall be Installed in a J-Hook System Above the Ceiling</td>
<td></td>
</tr>
<tr>
<td>4” Conduits From MPOE to TR (2) (3) (4)</td>
<td></td>
</tr>
<tr>
<td>WAO Cable (Plenum) (PVC)</td>
<td></td>
</tr>
<tr>
<td>Preferred Manufacturer for Connectivity</td>
<td></td>
</tr>
<tr>
<td>Preferred Manufacturer</td>
<td></td>
</tr>
</tbody>
</table>
DATA CENTER

AUDIT AND EVALUATION OVERVIEW
DESIGN AND MIGRATION PROCESS OVERVIEW
DESIGN ENGINEERING SCOPE OF WORK OVERVIEW

Prepared By:

ALFATECH
CAMBRIDGE

ALFA TECH CAMBRIDGE GROUP
97 East Brokaw Road, No 300
San Jose, CA 95112
(408) 487-1200

©2006 Alfa Tech Cambridge Group, All Rights Reserved
# Table of Contents

**Data Center Audit and Evaluation** ........................................................................................................ 1  
  Purpose and Objective ............................................................................................................................... 1  
  Findings Report ....................................................................................................................................... 1  
  Scope of Evaluation ................................................................................................................................. 2  
    General .................................................................................................................................................... 2  
    Mechanical Systems ............................................................................................................................... 3  
    Electrical Systems ................................................................................................................................ 3  
  Evaluation Checklist – Typical for Most Environments ....................................................................... 4  

**Data Center Design and Migration Process Overview** ..................................................................... 8  
  Design Phase ........................................................................................................................................... 8  
  Design Criteria – Typical ........................................................................................................................ 8  
  Interview / Information Gathering ....................................................................................................... 10  
  Inventory / Audit .................................................................................................................................. 10  
  Technical Room Design .......................................................................................................................... 10  
  Graphics Design - Visio/CAD .................................................................................................................. 10  
  Technical Specifications ......................................................................................................................... 11  
  Contract Negotiations ............................................................................................................................ 11  
  Customer Review and Approval ........................................................................................................... 11  
  Procurement Activities .......................................................................................................................... 11  
  Database Design Development .............................................................................................................. 11  
  Planning / Coordination .......................................................................................................................... 12  
  Pre-Installation ...................................................................................................................................... 12  
  Disconnect/Reconnect - Move .............................................................................................................. 13  
  Relocation Sequence of Events .......................................................................................................... 14  
  Post Move Support ................................................................................................................................ 14  

**Design/Engineering Scope of Work** ............................................................................................... 15  
  General .................................................................................................................................................... 15  
  Schematic Documents Phase ............................................................................................................... 15  
  Design Development Phase .................................................................................................................. 16  
  Construction Documents (CD)/Permit Phase ...................................................................................... 16  
  Pricing and Scheduling Phase .............................................................................................................. 17  
  Construction Administration .................................................................................................................. 17
Data Center Audit and Evaluation

Purpose and Objective

Most often Data Center Audits are requested in an effort to better understand the current capabilities and deficiencies of a Data Center environment. Many Data Centers evolve over time and often develop limitations or points of failure that no longer support the business requirements associated with safeguarding business critical applications and data. The findings are often used to help justify expansion or remediation efforts. The objective is to deliver an independent and unbiased evaluation of the current Data Center operating environment in contrast with industry best practices.

Findings Report

The Findings Report is the final deliverable for a Data Center Audit project. The purpose of the report is to clearly communicate findings and recommendations. This report will typically include the following sections.

- Introduction
- Executive Summary
  - Overview
  - Tier Level Summary
  - Summary of Critical Findings
  - Summary of Recommendations
- Considerations
- Evaluation Summary
  - Scope of Evaluation
  - Single Point of Failure Summary
  - Risks and limitations Summary
- General Findings
  - Evaluation Checklist
  - Telco Facilities
  - Structured Cabling
  - Cabinet Enclosures
  - Environmental Monitoring
  - Operations Documentation
  - Main Distribution Frame
- Electrical Findings
  - Electrical System Review – Single Line
  - Site Survey Information Summary
  - Risks and Limitations – Detail
  - Single Points of Failure – Detail
  - Options and Recommendations
Mechanical Findings
- Mechanical System Review – Single Line
- Site Survey Information Summary
- Risks and Limitations – Detail
- Single Points of Failure – Detail
- Options and Recommendations

Tier Level Matrix
- Tier Level Definitions
- Current Tier Level
- Recommended Tier Level
- Gap Analysis

Capacity Timeline and Current Utilization

Scope of Evaluation

General
- Review existing environmental statistic monitoring system in comparison to best industry practices. Provide gap analysis showing deficiencies or limitations along with recommended solutions.
- Review the current layout of the Data Center space. Evaluate functionality and efficiencies of the current space. Identify hazards or areas of concern.
- Evaluate the cabling distribution system in the Data Center. Identify risks and limitations that may impact operations or further expansion.
- Review Tier levels in contrast to installed infrastructure.
- Review existing Data Center Operations Documentation and make the necessary recommendations related to the quality and completeness of this documentation.
- Review Telco Entrance Facilities and physical layer distribution of carrier services into the Data Center. Identify possible risks and limitations in current design and potential single points of failure.
- Present design capacity (watts/sf) and current loading.
- Assessment of points of failure in the systems and where we see the operations relative to industry standard Tier classifications.
- Provide a list of options to increase reliability along with approximate budget cost and affect on reliability for each option.
- Discuss definitions of Tier levels and in general how to look at the levels relative to these projects.
- Recommendations on how to approach the upgrades/expansions in order to minimize potential down time of existing operations.
- Provide recommendations on how to approach high density requirements.
- Provide gap analysis to specifically identify critical components or design considerations missing from the existing environment, points of failure and recommendation options for mechanical and electrical systems.
Mechanical Systems

- Review existing drawings for the Data Center.
- Review location of existing HVAC units and air distribution relative to location of data processing equipment layout. Provide summary analysis of air flow and report on potential problems and recommendations especially related to increased power density.
- Evaluate present mechanical design capability vs. present loading based on electrical PDU readings. The purpose of this is to determine your present installed available capacity and compare it to the present loading and thus arrive at the available capacity for future growth. This would be done for the occupied area and the total area and would be provided in total watts and watts/sf.
- Discuss any past failures of mechanical equipment and recommend course of action.
- Evaluate the environmental control and monitoring systems, based on drawings provided and on-site evaluation as well as discussions with Owner.
- Provide options to increase reliability.
- Provide options to expand mechanical capacity to meet desired heat load densities.

Electrical Systems

- Review existing drawings for each project.
- Determine present power draw based on readings at each PDU and UPS units. Where PDU display readings are available for individual circuits being monitored, those readings shall be collected at that point in time, evaluated and incorporated into the analysis.
- Evaluate remaining UPS capacity based on current readings of existing PDU and UPS meters and historical data where available.
- Evaluate the capacity of emergency generator from the existing single line diagram, and existing PDU and UPS readings.
- Contact the local utility and collect the existing facility incoming transformer size installed, historical peak load information, distance of next closest separate feeder circuit in the area, and current utility feeder circuit capacity. Provide evaluation of utility options and limitations with regards to increasing reliability and expanding power feed for the two data centers to the owner provided future peak load demand for the spaces.
- Provide simplified single line diagram indicating recommended upgrade options to increase reliability, to handle planned expansion or increase in power density.
- Evaluation of the electrical configuration will also include examination of UPS primary and secondary distribution options to increase reliability from the UPS to the source, from UPS units to the critical loads, options in coordination with the mechanical system recommendations to increase electrical reliability for data center mechanical components, and a matrix of options with recommendations for owner review.
Evaluation Checklist – Typical for Most Environments

1. Are there up to date equipment floor plans?

This is important to determine how the space was constructed if you were not part of its original construction.

2. What type of wall is used to create the envelope: sheetrock, masonry or metal?

Most walls are constructed using sheetrock; however this information is important to renovations you may be planning.

3. Is the computer room envelope fire rated?

This is a critical item and should be verified to protect your data processing equipment. Having up to date drawings may help you determine this question. Field verification is recommended.

4. Have all penetrations been fire/smoke sealed?

This is an important factor to maintain the integrity of a fire rated envelope. Once again up to date drawings will help verify this question. We must add that field verification must also be performed.

5. What type of building: masonry or steel?

This is important for structural strength and integrity.

6. Is there evidence of roof or other leaks?

This can be a major issue if moisture begins to rain down upon your computer room.

7. What type of roofing system is installed?

Most office facilities where data centers reside are within a slow slope or more commonly known as a flat roof. Understanding the type and age will give you an idea as to the potential to leaks, lifespan and costs for replacement reserves.

8. What is the raised floor to suspended ceiling height?

This measurement should be maintained at a minimum of 8’ to keep with required codes, equipment height requirements and optimal cooling.

9. Does the data processing space have windows to the exterior?

Windows should be avoided. If they cannot you will need to investigate what option works best for you: break glass alarms, seal off windows or leave as is.
10. What is the clear height above your suspended ceiling?

This will provide you an idea as to how much additional space you may have to work with if you require a taller raised floor system. We recommend that you carefully note the lowest obstruction in the ceiling cavity such as structure or mechanical equipment.

11. What is the deck to deck height?

Understanding this dimension will allow preplanning or expansion of a space to provide the proper raised floor and room heights.

12. Are there any windows in the envelope excluding exterior walls?

All interior walls that contain windows shall be fire rated.

13. Does the space comply with Americans with Disabilities Act (ADA)?

Proper ramp lengths, handrails, door levers, etc should be investigated to comply with this law.

14. If an existing data processing room, has it had a pressurization test?

This determines how well sealed the room is to contain both cooling and fire suppression gas.

15. If an existing raised floor system is in place- what type is it? Bolted stringer or snap in? Hollow metal, wood or concrete filled? Zinc plated? Basket weave stringers?

Understanding your existing raised floor system is important Particularly its load capacity and whether the material was constructed with zinc. Zinc plated raised floor panels are known to cause zinc whiskers which can be harmful to electronic equipment when it is passed through the air stream and then through data processing equipment.

16. Is the under floor (floor below raised floor) sealed?

This will help maintain humidity and control dust.

17. How clean and organized is the space beneath your raised floor?

A dirty sub-floor can cause dust to be filtered through the data processing space which can cause harm to sensitive equipment. Proper organization of under floor cables and piping helps to manage cabling and avoid under floor dams when using down flow cooling.

18. What type of suspended ceiling system is in place?

Suspended ceiling tile when moved or removed can create unwanted dust. Clean room type suspended ceiling tile provide protection against dust and provide a vapor barrier.
19. What is the floor loading capacity of the existing floor?

*This is extremely important considering the weight of most data processing, electrical and mechanical equipment. The minimum floor load capacity for a data center should be 150-200 psi.*

20. Are the envelope doors fire rated?

*A fire rated envelope with inserts such as doors, windows and dampers shall be fire rated with a UL listing number.*

21. If an existing space, does the space between equipment meet the required manufacturer clearances?

*Maintaining proper clearances is important for servicing and mobility through a data processing facility.*

22. Is there a freight elevator within close proximity of the data processing space?

*Are the doors adequately sized along the path between the space and the elevator to allow large pieces of equipment to pass through them?*

23. Is there any existing sewer or domestic water pipes that pass through the space?

*Are there any floor drains? Keeping moisture away from your data processing equipment is important.*

24. Does the space require segregation for tape, print or paper storage?

*These spaces generally require fire segregation from the data processing room.*

25. Does the lighting meet the requirements?

26. If gas suppression is within the space is there door bottoms and gaskets at the perimeter doors?

27. Are exiting signs placed in locations that can be viewed from throughout the space?

28. Are the Emergency Power Off (EPO) buttons installed with alarmed covers to avoid accidental shut downs?

29. Is a phone located near the fire suppression abort button?

*This is important because an abort button can not be released or the discharge countdown will continue unless the system is reset.*
30. Is an alpha-numeric system been placed on the walls to help locate equipment on the floor to a drawing?

*This is a useful system for laying our electrical or network cabling. It is also useful in trying to find a certain piece of equipment in a sea of homogenous boxes.*
Data Center Design and Migration Process Overview

This section describes a typical Data Center design and migration process and methodology used to plan and move a production Data Center. The following describes the typical phases of the process.

Design Phase

The design phase is intended to identify the functional requirements based on current environment, future growth expectations and business needs. Based on this information we determine the size, location, Tier Level and initial budget estimates for the project to create a conceptual plan. Upon conceptual approval we then create the detailed design including the architectural layout, mechanical and electrical systems and the technology infrastructure to support the Data Center.

Design Criteria – Typical

<table>
<thead>
<tr>
<th>Design Item</th>
<th>Requirements / Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier Level</td>
<td>II</td>
</tr>
<tr>
<td>Maximum Power Load</td>
<td>80 Watts/SF</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>72 Degrees</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>50% RH</td>
</tr>
<tr>
<td>Outside Air</td>
<td>0.15 CFM/SF</td>
</tr>
<tr>
<td>HVAC System Design</td>
<td>In Room CRAC Units</td>
</tr>
<tr>
<td>HVAC Redundancy</td>
<td>N+1</td>
</tr>
<tr>
<td>Electrical Redundancy</td>
<td>Filtered Utility Power</td>
</tr>
<tr>
<td>Grounding</td>
<td>TMGB #6</td>
</tr>
<tr>
<td>UPS with Metered PDU</td>
<td>YES</td>
</tr>
<tr>
<td>UPS Redundancy</td>
<td>NO</td>
</tr>
<tr>
<td>Emergency Generator</td>
<td>YES</td>
</tr>
<tr>
<td>Emergency Generator Redundancy</td>
<td>NO</td>
</tr>
<tr>
<td>Raised Floor</td>
<td>YES – 18”</td>
</tr>
<tr>
<td>Raised Floor Grounding / Bonding</td>
<td>#6 AWG Bonded Every 4’</td>
</tr>
<tr>
<td>Lighting – Data Center</td>
<td>50 FC</td>
</tr>
<tr>
<td>Lighting – NOC</td>
<td>Dimmer Control Can Lights</td>
</tr>
<tr>
<td>Emergency Lights</td>
<td>All lights on Generator</td>
</tr>
<tr>
<td>Fire Detection and Suppression System</td>
<td>FM200 / VESDA</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Sprinkler System Type</td>
<td>Interlock Pre-Action System</td>
</tr>
<tr>
<td>Leak Detection</td>
<td>YES</td>
</tr>
<tr>
<td>Floor Seal / Vapor Barrier</td>
<td>YES</td>
</tr>
<tr>
<td>Seismic Importance Factor</td>
<td>1.0</td>
</tr>
<tr>
<td>Seismic Support Systems</td>
<td>YES</td>
</tr>
<tr>
<td>Outside Plant Conduit Required</td>
<td>YES</td>
</tr>
<tr>
<td>Outside Plant Cabling – Fiber</td>
<td>12 Strand to each IDF (50 um Multi-Mode)</td>
</tr>
<tr>
<td>Outside Plant Cabling – Copper</td>
<td>25 Pair to each IDF (OSP – Fuse Protected)</td>
</tr>
<tr>
<td>Telco Facilities – Copper</td>
<td>YES</td>
</tr>
<tr>
<td>Telco Facilities – Fiber</td>
<td>NO</td>
</tr>
<tr>
<td>Physical Security Requirements</td>
<td>Card Access</td>
</tr>
<tr>
<td>Video Surveillance</td>
<td>YES</td>
</tr>
<tr>
<td>BMS Integration – System Type</td>
<td></td>
</tr>
<tr>
<td>Environmental Monitoring System</td>
<td></td>
</tr>
<tr>
<td>Number of Equipment Cabinets</td>
<td>xx Initial – xx Future Max</td>
</tr>
</tbody>
</table>

**Design Considerations**

- Environmental Control Panels to be located in the NOC
- Control Station (EPO, FM200 Hold, Pull Station, Phone) located at each exit in the Data Center, Staging and NOC rooms.
- Tape Media Storage required in the Data Center – Open Rack for tapes

**Budget Considerations**

- KVM (Keyboard, Video and Mouse) Solution
- Monitoring Systems and Applications
- Telco Services Install / Migration
- Equipment Racks and Cabinets
- Seismic Base Isolation System
- Structured Cabling System
- UPS and PDU Systems
- Temporary Generator
- Equipment Migration
Interview / Information Gathering

The Data Center hosts a wide variety of systems, applications and auxiliary devices used to monitor and maintain production equipment. The information gathering process is intended to identify each of these systems and applications that will be utilized in the production environment. These systems typically include:

- Data Network Equipment
- Keyboard/Video/Mouse (KVM)
- Racks and Cabinet Enclosures
- Furniture Systems
- Network Operations Center (NOC)
- Audio Visual Systems
- Security and Surveillance
- Network and Server Monitoring Software
- Environmental Monitoring Systems
- Staging and Storage Spaces

Based on the combination and requirements of these systems the requirements for the physical layer cabling infrastructure can be defined. Upon completion of the information gathering process the requirements are documented in a Design Criteria documents for the owner’s review and approval.

Inventory / Audit

A physical inventory of the existing Data Center is performed to gather detailed information about each device within the existing environment. This inventory is performed by trained technical staff familiar with Data Center environments. This information is entered into a master database described later in this document. The objective of the inventory process is to obtain a comprehensive understanding of what needs to move and to identify and specific or unique requirements. For example some systems under a maintenance contract or requiring specialized expertise may need to be moved by the maintenance or service provider. At the time the physical inventory is performed a change control process is initiated. This is intended to keep track of any changes to the environment from the time the inventory is completed and the actual move of the Data Center. Change control is a critical part of the process to ensure the accuracy of the final execution plan and design.

Technical Room Design

During the technical room design process all of the requirements that were defined in the approved Design Criteria are incorporated into specific solutions. In some cases many systems are simply moved with no modifications required. In other cases pre-existing systems must be upgraded or expanded to support the new Data Center requirements. The technical design process is where all interdependencies between systems are identified and incorporated into each solution to meet the overall design objectives. After the design of each required solution is complete they are documented using a combination of drawings and specifications defined below.

Graphics Design - Visio/CAD

Some systems and solution require a visual representation to effectively communicate the concept and installation details. Drawings will typically include:
Plan View: Showing the physical layout of the proposed Data Center space
Single Line: Showing how individual solutions are connected and/or integrated with other solutions
Elevations: Show the actual placement of equipment within Racks and Cabinet Enclosures
Details: Show specific installation details as required

Technical Specifications

The technical specifications are intended to meet three objectives. First to facilitate an RFP/RFQ process required obtain pricing from vendors and sub-contractors that may be required to provide and install the individual solutions. Second, this documentation serves as technical instructions to the implementation team. Lastly this documentation is intended to provide reference documentation for the owner to be incorporated into the overall Data Center Operations Documentation. Typically these specifications are defined by using the industry standard Division 17000 CSI Master Format.

Contract Negotiations

To facilitate the procurement of the individual solutions pricing must be obtained from a variety of vendors and/or sub-contractors. This often results in further negotiations with the selected vendors to clearly define their scope of work, finalize pricing and establish the expected delivery and implementation schedule.

Customer Review and Approval

After the design, specifications and contract negotiations are complete we perform a final review and approval process with the owner to ensure they understand and agree to the proposed solution and associated costs.

Procurement Activities

Upon review and approval we then execute the procurement process that includes signing contracts/agreements and issuing necessary purchase orders. This information is documented in the budget tracking form.

Database Design Development

At this point in the process it is assumed that all systems/solutions have been finalized and purchased. Now we create the detailed database that will identify exactly where and how each device being installed into the Data Center will be installed and connected within the environment. The Database is created using Microsoft Excel allowing the data to be imported by the owner into a wide variety of applications following the migration process. The database is then used to create the necessary cut-sheets to be used during the move to facilitate the installation of patch cords, disconnect/reconnect of equipment and complete testing procedures. The database is also used to create an individual move sheets for each production server. This move sheet is physically attached to each machine and provides a checklist of activities required to complete the relocation of that particular device. Upon completion of the move, the database is
reconciled with any changes made during the move to accommodate field conditions and then turned over to the owner.

**Planning / Coordination**

With the number of interdependencies between systems found in a Data Center environment there is a significant amount of planning and coordination required between disciplines, vendors, carriers and contractors. The planning and coordination occurs throughout the entire process. There are three main tools used to keep track of the project and communication with the team. We develop a detailed Project Plan, Budget Tracking Form and facilitate Project Status Meetings throughout the Data Center construction and migration process. The project plan allows us to define the specific tasks to be completed, interdependencies with other activities, resources assignments, schedule of events and completion status. The budget tracking form allows us to keep track of the approved budget as expenditures are made. We can keep record of issues purchase orders, approved change orders and received invoices to reconcile against the original contracts. Project status meetings occur as required to communicate with the project team as we move through the project. Each meeting is documented with meeting minutes that include specific action items, due dates and status.

During the planning phase we will also create the necessary contingency plans to adequately protect business operations. This will consist of a series of checklist used to determine if the facility and infrastructure and ready for production use. It will also include plans for potential problems that can often during the relocation of a Data Center facility. It will include contingencies for spare equipment, vendor resources, escalation procedures and fall back plans as required.

The necessary user communications will be drafted and published to inform the business of the shutdown necessary to complete the move. This often required coordination with key users to ensure the activity is well coordinated and does not impact critical business functions or events.

We will work with the owner to develop the specific sequencing of the shutdown, move and startup process. Servers and Network equipment must be shutdown in an orderly and specific sequence. In addition to the sequence of events a test plan for each system will be defined. In many cases this can be performed by the IT staff while with specific applications this may require the participation of key users during the downtime window.

**Pre-Installation**

The pre-installation activities include the physical installation and commissioning of the infrastructure that will support the Data Center. These systems are required to be complete and approved before production equipment is moved into the new Data Center. At a minimum this includes electrical systems and distribution, mechanical systems, fire detection and suppression systems, security and cabling. In addition there will be some active equipment and pre-terminations to be completed in advance. This may include Telco Facilities and Services, Network Equipment and Patch Cords. The objective with the pre-installation process is to reduce the necessary downtime by doing as much in advance as possible.
Disconnect/Reconnect - Move

The actual move will occur during the scheduled downtime. This move is coordinated by the Project Manager who will have overall responsibility during the move process. It is important to establish this chain of command given the fact there will be many vendors and technicians on-site. The Project Manager will assign teams to focus on specific systems and installation activities. These teams are typically divided by technical discipline. The common denominator is the Database. Each team will be performing their installation based on the drawings and cut-sheets provided. Since all drawings and cut-sheets originate from the master database this will ensures a cohesive installation. The teams are typically divided into the following groups:

- **Data Network Team** – Responsible to install and configure all network equipment including port level configurations. They will coordinate with the Telco Services team to complete the installation and testing of carrier services.

- **Telco Services Team** – Responsible to complete the installation of Telco Facilities, delivery of new Telco Services and will manage the migration of existing carrier services for those lines requiring a coordinated cut-over.

- **Server Disconnect/Reconnect** – This team of technicians are responsible for the physical disconnect of equipment in the originating facility and for the mounting and reconnecting of equipment in the new facility. This team will not power off or on any equipment.

- **Systems Admin Team** – Responsible for the sequential shutdown and powering off of equipment in the originating facility and for the startup and testing process in the new facility.

- **Movers** – Movers are often required to provide the physical transportation of equipment from the originating facility to the new facility. They will provide the necessary carts to carry and protect the equipment during transport.

- **Database Administration** – Responsible to monitor the progress of each device being moved and to resolve any conflicts that may arise with equipment placement or physical connections. They are responsible to track the completion and testing approval for each device during the move process. Lastly they are responsible to reconcile the database and rack elevations against the actual finished installation.

- **Vendors** – Specific vendors may be required to move larger or more complex systems. Typically they will be responsible for a specific device.

- **Infrastructure Support Team** – This team typically includes a technical resources form the cabling contractor, electrician, general contractor, facilities staff, etc. that may be called upon to troubleshoot and or resolve a facilities infrastructure issue that occurs during the move process.

- **Project Manager** – The Project Manager is responsible to coordinate all activities between all teams and is overall responsible for sequence of events. They make the final decision to initiate a fall back or contingency plan in the event of an unforeseen problem occurs. They are responsible to communicate with the owner.
throughout the move process. In the event that any change to the implementation plan needs to be made, it must first be approved by the Project Manager.

## Relocation Sequence of Events

The typical sequence of events during the physical move for each device is:

1. Complete an Inventory Form for each device to be moved.
2. Label each connection on each device (LAN, KVM, SCSI, Fiber, etc)
3. Perform orderly shutdown of the device
4. Power off the device
5. Disconnect and dismount the device
6. Attach copy of the move form to the device (Not possible in all cases)
7. Package device on moving cart
8. Transport equipment to the new location
9. Reinstall the device – making necessary modifications to rails if required
10. Reconnect the device per the database instructions (LAN, KVM, SCSI, Fiber, etc)
11. Power on the equipment
12. Perform system level testing – Hardware, Connectivity, etc.
13. Perform application level testing
14. Sign Off – Agree that the install, testing and acceptance is complete
15. Update the Database to note install and testing is complete

## Post Move Support

During the first business day following the move a select group from the move team will be on-site to ensure the successful operation of the Data Center. They will conduct performance monitoring to verify each solution is operating as intended. This team will be immediately available to respond to any issues that may occur.

Following the post move support the production copy of the database and all related documentation will be turned over to the Data Center Operations Manager. This will facilitate the official hand-off from the project team to the production operations staff.
Design/Engineering Scope of Work

General

1. Design the heating, ventilating, and air conditioning systems as well as building management systems (controls) for the data center space.
2. Design the electrical normal and emergency power for the data center space.
3. Locate security devices, backboxes, and conduit for security systems based on the input from the Owner. This includes provisions for card access and surveillance integration with existing systems.
4. Provide prescriptive method Title 24 compliance calculations and forms.
5. Provide options and complete architectural design for the data center space.
6. Provide structural design for any roof reinforcement required for new HVAC equipment if required.
7. Provide the design and required specifications for telecommunications infrastructure including Telco Facilities, Structured Cabling and active equipment necessary to support data center operations.
8. Assist the Owner with the development of the necessary qualifications methods and supporting documentation.

Schematic Documents Phase

1. Attend meetings during the design phase to obtain functional requirements and review the schematic design upon completion.
2. Review and comment on the program requirements set forth by the Owner.
3. Provide Electrical and Mechanical systems concept design for the Owner to review.
4. Provide a code search and analysis and meet with the Authority Having Jurisdiction (AHJ) as required to get their input on any crucial items.
5. Develop the concept design that addresses the design parameters and objectives of the Owner.
6. Provide space requirements to support our systems’ equipment and distribution. This includes shafts, risers, and equipment rooms.
7. Prepare Schematic Design documents which will be a systems narrative of each discipline for use in conceptual level cost estimation. Prepare drawings as requested, which will at a minimum include a conceptual space plan and electrical single line diagrams.
8. Prepare written design criteria for review and approval by Owner. This document will include the architectural, electrical, mechanical and technology sections.
**Design Development Phase**

1. Following Owner’s approval of Schematic Design documents, prepare Design Development drawings and preliminary CSI specifications. Drawings at the Design Development stage will include:
   - Developed floor plans including major equipment locations, main mechanical equipment and duct, and main electrical pathways, risers, shafts, electrical device layout, lighting fixture schedule, lighting layout, and mechanical/plumbing equipment schedules.
   - Complete electrical single line diagrams
   - Complete mechanical single line diagrams
   - Develop structured cabling single line/riser diagrams
   - Develop technology single line diagrams that may include:
     - KVM Solution
     - Telco Facilities
     - Network Topology
     - Audio/Visual Systems
     - Environmental Monitoring Systems
     - Security and Surveillance Systems
   - Preliminary construction details as required

2. Coordinate work with the utility companies as required and provide them with the documentation they require at this stage for review and acceptance.

3. Meet with Authority Having Jurisdiction (AHJ) to review the design and confirm their requirements.

4. Attend design review meetings as required to communicate design concepts, coordinate between disciplines and obtain owner approval.

5. Provide preliminary budget and schedule.

**Construction Documents (CD)/Permit Phase**

1. Following Owner’s approval of Design Development documents prepare contract documents and permit drawings and specifications. These drawings and specifications will include all items described for the Design Development phase plus all branch ductwork, branch piping, zoning, finalized equipment schedules, controls, circuiting, panel schedules, cable distribution, etc.

2. Identify equipment requiring structural anchorage. Provide structural engineering for all required retrofits to the existing facility.

3. Complete prescriptive method Title compliance calculations and forms one time at the Permit Documents submittal.

4. Attend design review meetings as required to communicate design concepts, coordinate between disciplines and obtain owner approval.

5. Provide preliminary budget and schedule.
Pricing and Scheduling Phase

1. The objective in this phase is to develop a firm budget and schedule for construction. Work with the Owner and or designated General Contractor to obtain qualified bids from the necessary sub-contractors to establish the initial budget.

2. Obtain pricing from qualified sub-contractors necessary to develop a comprehensive budget.

3. Respond to RFI’s as necessary to ensure bidders have accurate information.

4. Evaluate bid responses and submittal packages to ensure the completeness of bid packages and validate proposed products and methods.

5. Develop a milestone based project schedule based on input from sub-contractors.

Construction Administration

1. Continue to respond to requests for information from the contractor to provide clarification or address unforeseen field conditions.

2. Review submittals and shop drawings as required during construction.

3. Perform site observation visits during the construction period and provide a field observation report at the conclusion of each site visit.

4. Provide a final punch list during the last site visit. Follow up as needed to resolve punch list items.

5. Review contractor’s As-Built Drawings and Turn-Over Package at the conclusion of construction.
6 SECURITY
SECURITY STANDARDS ARE IN PROCESS
7 SIGNAGE
SIGNAGE STANDARDS ARE IN PROCESS