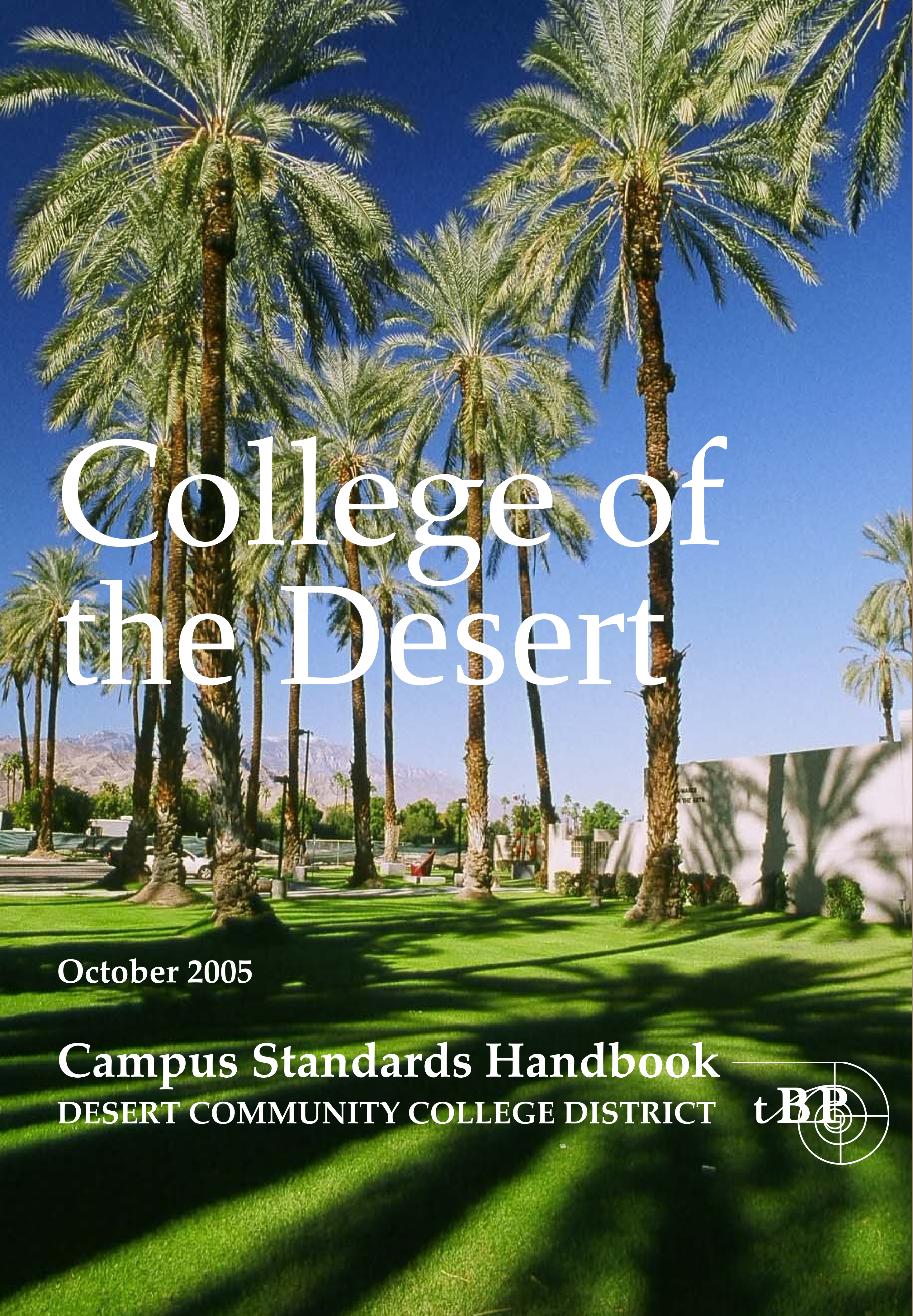

College of the Desert

October 2005

Campus Standards Handbook

DESERT COMMUNITY COLLEGE DISTRICT

COLLEGE OF THE DESERT

College of the Desert

Campus Standards Handbook

DESERT COMMUNITY COLLEGE DISTRICT

October 2005

Campus Standards Handbook Team

Architectural Planning
tBP/Architecture
Newport Beach, CA

Landscape Architecture
SWA
Laguna Beach, CA

Civil Engineering
Kpff Consulting Engineers
Los Angeles, CA

Structural Engineer
Integrated Design Services, Inc.
Irvine, CA

Mechanical/Electrical, Plumbing Engineers
S & K Engineers
Monrovia, CA

Technology/ Audio/Visual
Vantage
Manhattan Beach, CA

Signage Consultant
RSM Design
San Clemente, CA

Security Consultant
Schirmer Engineering Corp.
Torrance, CA

Acoustical Consultant
Schaffer Acoustics, Inc.
Pacific Palisades, CA

Elevator Consultant
Scott Elevator Consultants
Irvine, CA

Hardware Consultant
Ingersoll-Rand Company
Arcadia, CA

1. Introduction

Purpose of Design Guidelines

COLLEGE OF THE DESERT

Introduction

The community of Palm Desert has endorsed the vision of the future defined by the Bond Measure and the Facilities Master Plan. By approving the spending to modernize the College of the Desert Campus, the residents have empowered the District to realize these goals and objectives. By improving Campus Buildings and aging infrastructure, the College will fulfill its commitment to provide a high-quality, academically rigorous instruction responsive to the diversity represented in the student body and served by the Desert Community College District.

Handbook Purpose and Use

The purpose of this Handbook is to serve as a guiding reference for architects, engineers, consultants, college representatives and others to inform decisions and design directions taken during the duration of the Bond Program's implementation. The Handbook will encourage environmental designs that respond to the District's stated Mission by fulfilling the future goals of the College developed during the Planning and Assessment efforts related to the Bond Program's formulation and implementation. The design of engineered systems will respond to standards set forth in the Handbook with the objective of compatible infrastructure components working together in easily maintainable configurations.

Document Organization

The Handbook is not a "how to" reference for design professionals. The typical standards of care and best practices, in particular disciplines, must all be considered. Building code and regulatory compliance are essential. This Handbook sets standards and guidelines for particular campus concerns, not necessarily dictated by industry standards or building codes.

The Campus Standards Handbook is divided into four sections. Section I – *Overview*, Section II – *Campus Design Guidelines*, Section III – *Specific Design Criteria* and Section IV – *Master Outline Specifications*. The document's organizational description follows.

Overview

This section provides a brief introduction to College of the Desert by recalling the Campus History and conveying the College's mission. The Planning and Design Principles are set forth to emphasize College goals and objectives that will influence a broad spectrum of design decisions.

In addition, the organization of the bond program's administration is described in the Overview. The administrative procedures, and roles of consultants, are all set forth in this section to aid design teams while interacting with College of the Desert representatives and government agencies. The objective is to inform the process from programming, through construction, and occupancy in order to facilitate a mutual understanding of expectations and requirements. Finally, the Design Review process is established to ensure the College's goals and objectives are reflected in the design of key projects.

Campus Design Guidelines

The purpose of the Campus Design Guidelines is to inform designers of the college's goals concerning campus architectural style, aesthetics and ambience. This section is primarily addressed to architects, landscape architects and graphic artists commissioned to execute projects that will affect the appearance, feel and spirit of the campus. Site design, landscaping, building exteriors, signage and interiors are all discussed in this section. Materials, colors, proportions, relationships and form are some of the variables that the Campus Design Guidelines are intended to influence.

This section will not describe engineered systems. The design guidelines for plumbing, ventilation, power, technology and other engineering concerns are set forth in the Specific Design Criteria. The Master Outline Specifications will set forth the specifics of the pieces that, in aggregate, form the intent of the design guidelines.

Specific Design Criteria

In contrast to the Campus Design Guidelines, this section describes the pragmatic aspects of the Bond Program's implementation. The Room Design Criteria for common types of spaces are set forth in this section. In addition to describing the engineered systems supporting the campus; various assemblies are described in detail.

The engineered systems are described in order to insure that each project follows the standard criteria set forth by the college. These include design guidelines for structural assemblies, plumbing, fire suppression, telecommunications, multimedia and other systems that must work together within campus wide infrastructure and maintenance protocol.

Master Outline Specifications

The Master Outline Specifications will set forth the specific controlling items that College of the Desert representatives have designated as important to control. In some cases, this involves standardizing a system component by specifying the make and model required. This is only done when a system-wide campus standard is necessary for multiple projects to function within a campus-wide system (e.g. fire alarm, building management system, etc.). In other cases a level of quality or generic material is specified to describe the college's specific objectives for the quality and character of the campus to be achieved during the Bond Program's implementation. The Master Outline Specifications will compliment the other two sections in a level of detail not otherwise conveyed.

College of the Desert

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DIVISION 5 - METALS

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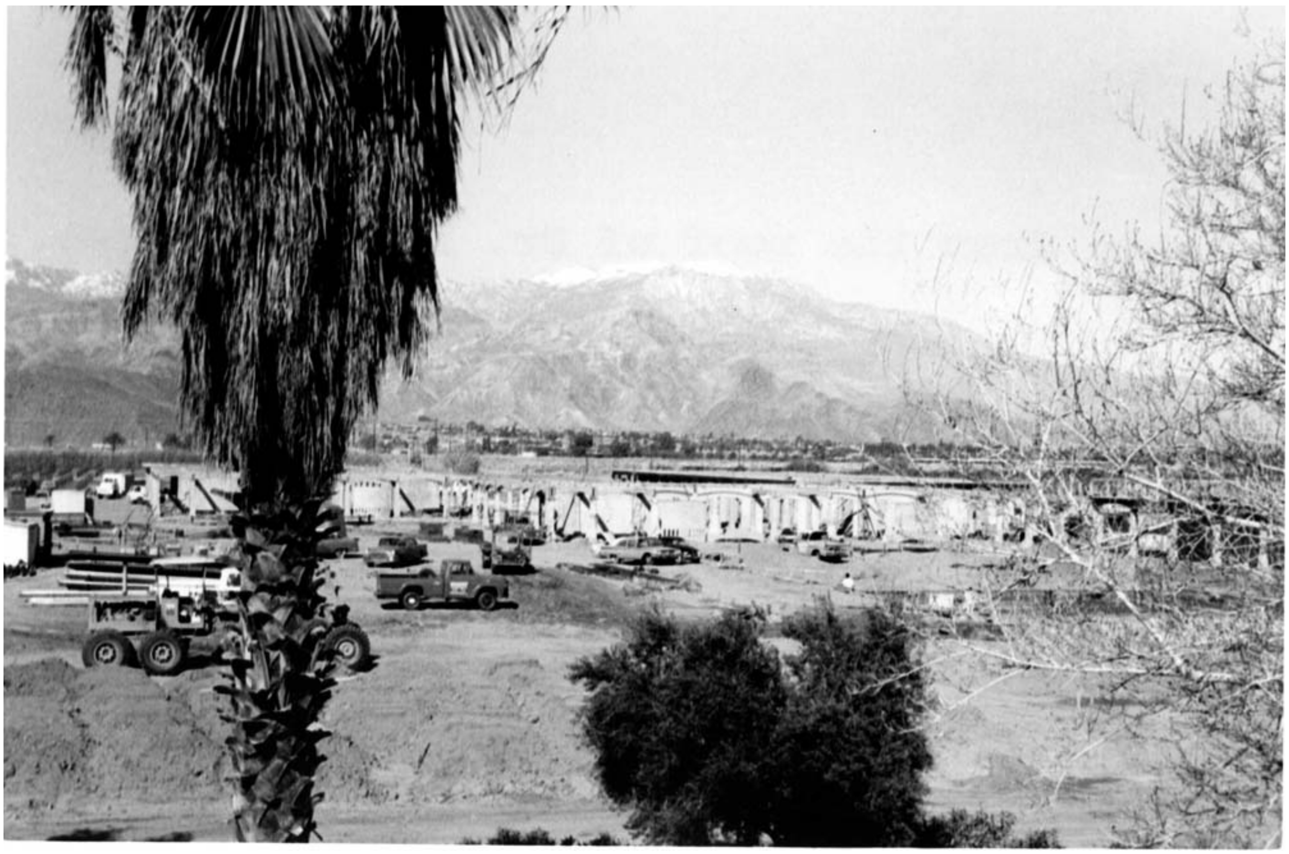
College of the Desert



Section I - Overview

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COLLEGE OF THE DESERT

1. College of the Desert Introduction

Campus History

In 1958 voters approved the formation of a junior college district in the Coachella Valley that resulted in the creation a two year college. A "Name that College" contest, won by Douglas Crocker, gave the two year institution the moniker, "College of the Desert". The district purchased the 160 acre Odell Ranch, site of the Velma Dawson house, to bring the dream to reality. Educational programming and site planning began shortly thereafter by the local architecture firm of Frey and Chambers. Three years later the first nine college buildings took shape to support 3000 full and part-time students.

With the passage of another local bond ($2 million in addition to the original $3.5 million locally funded bond) subsequent buildings were completed between 1966-71 which included the Gymnasium, Hilb Center, Agricultural Science Building, Environmental Design Building, Greenhouse, Engineering Building, Nursing Building, Business Building, Warehouse 1, Warehouse 2, and the Field House. The remaining buildings were built in '75, 1990-98, culminating in the Math and Social Sciences buildings in 2001. The Multi-Agency Library, a joint use Library, built to serve the needs of the City of Palm Desert as well as the college, was completed in 1996.

History of the Architecture

As early as 1946, there was a discernable interest in a college in the Coachella Valley. After favorable feasibility studies were conducted by the California State Department of Education, the junior college district was formed by an election which 90 percent of the voters approved the proposal.

Conditions and circumstances at the time of the founding of the college worked together to make it unique among junior colleges in America. From the beginning, the Board of Trustees decided to build a complete permanent campus before admitting students to the new college.

Site selection

Four sites were reviewed initially to find a site that was as close as possible to being half-way between Palm Springs and Indio, accessible by car, and at least 160 acres.

O'Dell Ranch

The Odell Ranch site was 160 acres (a complete quarter section), cost $608,000 and was the best site because it would not require any special treatment to accommodate a building program. The site had existing windbreaks, 3 producing wells, 2 houses, crops of grapes (60 acres) and dates (20 acres) and the remainder of the site was raw desert. The best thing of all was that it was almost exactly midway between Palm Springs and Indio.

O'Dell Ranch Circa 1959

The Program

Dr. McCall, the first president, began working on the general education needs of the new college as a consultant between February and July of 1959. As a result of his computations and additional suggestions from authorities in school construction, he established an initial increment of buildings which would provide complete facilities for 1,000 students; and in some areas would serve a student body of up to 2500 students. The Board accepted Dr. McCall's proposal and approved his general education specifications in May of 1959. It was on the basis of these general need classifications and other more detailed specifications that the architects worked out their presentations for the overall design of the college.

Hiring an Architect

Each board member realized the necessity of employing a reputable and experienced architect to provide guidance and direction in developing the campus site, and planning and constructing buildings. They agreed that the buildings should be functional and easily maintained, and that the design of the buildings and the development of the site should have a unique orientation to the desert. There was an aversion to the junior college looking like a "row of chicken houses".

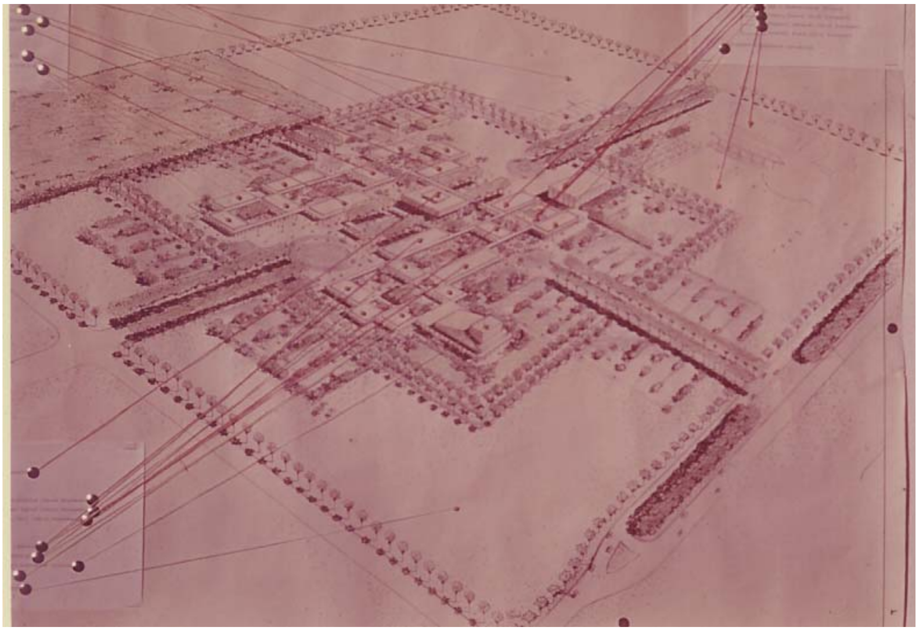
Frey

Williams

Mr. Mason was appointed by the Board to arrange interviews with architects. Beginning as early as July 1958, before the Board had contracted a president, 30 firms were interviewed. The list of architects was narrowed to 6 and then Board members, Brumwell and Mason, came upon a solution. The remaining architects were asked to disassociate themselves from their firm teams. Carl Warneke of San Francisco was selected as design architect, with John Porter Clark of Palm Springs as coordinating local architect. Three local firms, Williams and Williams, Frey and Chambers, and Wexler and Harrison would all work under Clark's direction, and each be in charge of certain buildings on the new campus.

Initial Site Planning

The State Department of Education required some elevation of the buildings since the site was in a low spot on a flood plain. John Warneke chose to resolve any concern over possible flooding by constructing a 13 acre pad three feet above grade whereupon the major buildings would be erected. This also achieved various aesthetic goals. The buildings on this raised plinth would be readily visible and imposing. At the center of campus the library building would be further elevated by an additional three feet above the 13 acre plinth to make it "the one noble building which would dominate the site and give majesty to the campus" suggested by Don Mitchell.



Design Concepts
Gail Brumwell drove John Warneke around the desert area so that he could get a feel for the desert. At one time as they drove past a particularly well cared for date garden, they stopped and Warneke got out of the car and observed the long rows of date palm trees and the covered corridors that they formed with their trunks and fronds. Warneke remarked, "I'm going to incorporate the trees and palm fronds into the design of the college. The hundreds of columns supporting the covered walks have arches that rise from the columns at the same angle as well-trimmed date palm fronds.

Warneke saw the plinth of the campus as a wonderful opportunity to keep persons on the pad from the undue awareness of the automobiles. Instead while walking on the campus, one's site would be drawn to the mountains and palms in the distance.

Opening the Campus
The groundbreaking ceremony took place on October 16, 1961 with the mission of completing the buildings and opening classes in the fall of 1962. On Friday of September 21, 1962 the first classes began.

Factors Governing Historical Architectural Design
<u>Functional Efficiency</u>
Buildings are for the purpose of serving instruction. Therefore every foot of every building should be designed in terms of the subject, or range of subjects, it is to serve. Arrangement, light, heat, sound, cupboards, chalk boards, tack boards, convenience outlet, water, gas, air, safety devices, color texture, flooring, ventilation, size, proportion; everything should be studied in the light of functions which the space is expected to serve.

<u>Economy</u>
In the interests of making dollars give their greatest value for education, and thus also to protect taxpayers against unnecessary expenses, every test of function should carry a corollary test of economy. Economy does not mean “cheap”, nor even the least expensive, but the best, long-range, serviceability for each dollar spent.

<u>Flexibility</u>
Because growth appears to be an inexorably continuing characteristic of California in general, and of school populations in particular, with the first major surges reaching the College level now and apparently continuing and accelerating for the next 17 years at least, it would appear that annual increases in students should be prepared for. The alternative to building the ultimate campus at once is to provide for both expansion and the easy and economical shifting of space and

space relationships as student enrollment increases. This means modular planning, interior partitions which can be readily and economically shifted and knock-out walls or other devices for additions which are compatible with initial designs.

Longevity

Buildings should be of such material, construction and design that they will not unduly deteriorate physically, will maintain functional consistency, and will be esthetically pleasing regardless of vagaries in architectural styles through the passing years. It is realized that these goals are not attainable in the absolute; but it does seem reasonable to set these objectives as relatively attainable.

Low Maintenance Costs

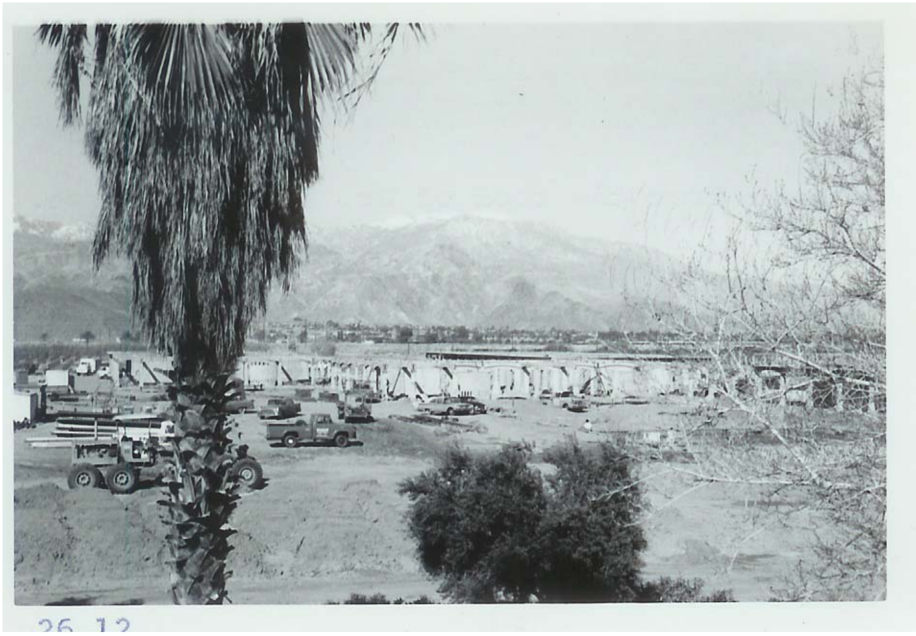
Savings in initial costs should be balanced against long-range maintenance costs, including both daily care and durability.

Beauty

The achievement of artistic beauty has not only value in its own right, but is also compatible with the liberal arts concept of the collegiate education. The price to be paid for esthetic effects is in the last analysis a value judgment. A balance should be struck between emphasis on function, economy, flexibility, maintenance, and the esthetic. In some instances, beauty will cost no more than ugliness; at least often the only price to be paid is ingenuity of design or wise choice of color. Occasionally, ornamentation must be bought in its own right. But this procedure should be used sparingly. It is assumed that the architectural motif of the entire campus will be in harmony with the desert atmosphere and setting, and in particular with the geography of the site selected.

Easy Identification of Buildings

Although sizable, well placed signs should allow each building to be readily identified at a distance from several strategic points, the character of the building itself, to the degree that design can portray function, should enable strangers to identify it from a distance.



Factors Governing Historical Campus Layout

Beauty

Along with the architectural design of individual buildings the overall campus layout should contribute to harmony in mass, form, and color, including opportunities for effective landscaping.

Drainage

Drainage should not only be adequate to care for normal rains without interference with foot traffic within campus boundaries, or auto movement on the campus periphery, but should also be adequate to protect against damage during all extremes of precipitation.

Wind Protection

It is assumed that wind velocities and directions will be studied not only for architectural stability, but also for purposes of employing building masses for protection as well as for avoidance of excessive drafts while encouraging adequate circulation.

Economy of Heating and Refrigeration

In the interests of both construction costs and daily operation, it is assumed that reasonable effort will be exerted to effect maximum economy.

Safety
It is assumed that safety will receive serious consideration in building structure, stop and doorway design, fire protection, walkways and the numerous other factors which apply to public buildings. Special safety and convenience for the physically handicapped should be included.

Accessibility of Auto Traffic
Facility of access to all key points on the campus periphery, adequate dispersal of optimum parking space, rapid exit of quantities of autos following major public events, prevention of auto entry to campus interior except for authorized vehicles, traffic flow and control, are all to be desired. Likewise, protection of classrooms from auto traffic noise should be studied.

Flow of Foot Traffic
Ease movement of students between parking areas and key points on campus, as well as avoidance of congestion or conflicting directions of movement within the campus proper should be effected to the degree feasible.

Atmosphere of Quiet
In addition to protection against auto noise, proper separation, placement and sound treatment should contribute to quiet everywhere. Especially should such activities as physical education, athletic contests, music and student center activities be so arranged as to keep one activity from disturbing another, or from discouraging study or concentration on lectures.

College's Mission Statement

College of the Desert is an open door, public community college serving primarily the Coachella Valley. We provide students, who have the ability to benefit, with the opportunities and encouragement to learn the skills, knowledge and behaviors needed to succeed in their chosen endeavors. We seek to understand and support the educational, economic, ethical, cultural and civic needs of the diverse population we serve.

We emphasize life-long learning and recognize that it applies as much to ourselves as to our students. We offer a wide range of college and pre-collegiate courses as well as certificates, degrees, and transfer programs. These academic services are designed to fulfill the goals of our students, meet the needs of local employers, and articulate well with four year institutions. We are committed to being the primary provider for fulfilling the vocational education and training needs of business and industry, and promoting the economic development of the region. We select and support high quality faculty and staff to provide excellent academic programs, as well as effective student and academic support services.

We are committed to an annual process of planning, assessment, and measurable improvement with the goal of providing the best educational opportunities possible for our students. We commit to an intellectually open and nurturing environment that welcomes and appreciates a diversity of ideas and people. We provide the encouragement, means and professional setting for our faculty and staff to achieve our mission of providing a premier choice for higher education.

Planning and Design Principles

The purpose of the Planning and Design Principles is to set forth the overriding College Goals and Objectives in order to influence future broad design decisions of the development of the campus. In 2003, the College of the Desert prepared the Educational Master Plan to describe the educational goals of the College:

- Effectively prepare students for further education, work, citizenship and community through learning-centered programs and services.

- Provide access to quality education for the diverse residents of a rapidly growing Coachella Valley.

- Help promote a civil, prosperous, and stimulating quality of life in the Coachella Valley

- In the 2004 Campus Master Plan the list of Goals and Objectives for campus development translated into these key concepts:

A Campus to reflect the 21st Century

The COD campus' new buildings should be environmentally responsive, dynamic and reflect COD's commitment to their students, that they are providing the most up to date educational experience that they can possibly provide.

Better Access to the College

Develop distinct unique gateways to welcome students and the community to campus programs and activities. New facilities are conveniently located near existing functions.

Traditional Campus Design

The original buildings have sentimental value and are climatically responsive. There is a good quality to the core campus. New facilities should be stylistically in harmony with the original core campus buildings. Buildings, useable open space, parking and roads should respond to the traditional grid pattern of the COD campus.

Environmentally Friendly Development
Where appropriate, create multi-story developments to minimize building footprints. Landscape improvements should use water more efficiently.

Create buffers to protect outdoor instructional and service areas.

More Parking
Create more parking near destinations.

Energy Efficiency/Sustainability
College Goals and Objectives
One stated objective of the College of the Desert is to encourage designers to pursue sustainability and achieve energy efficiency. This portion of the Overview will discuss sustainable strategies that may lead to facilities which minimize environmental impact, save operation and maintenance costs, and promote health and well being. Through synergistic design coordination between architects and engineers, the building envelope, ventilation, lighting and water systems can work together to reduce use of natural resources and minimize operational costs without substantially increasing construction costs. This is a guiding design principle that College of the Desert embraces for new buildings, renovations and other major projects in the bond program.

Sustainable Design and LEED
The primary objective of the college is to encourage sustainable design on campus. When practical, LEED Certification is a secondary goal of the college. The college recognizes the additional effort required to obtain LEED Certification. When budget, schedule and program facilitate certification, the college will direct design consultants to pursue LEED Certification. In projects that would not lend themselves to LEED Certification, the project designers should still incorporate sustainable design features where practicable.

Benefits of Sustainable Design
Please refer to the Specific Design Criteria “No. 17. Sustainable Design” for a complete discussion regarding the benefits of sustainable design.

LEED Certification and the Design Process
The United States Green Building Council is a national, non-profit organization which has established “Leadership in Energy and Environmental Design” (LEED) as a means for a building to be

certified as being sustainably designed. The LEED rating system has four levels of certification reflecting effectiveness of a project's sustainable design features; certified, silver, gold and platinum.

Conclusion
As a Planning and Design Principle, sustainable design should be considered whenever design decisions are made that will affect the nature of projects on the College campus. The benefits of energy efficiency are important enough to the College to emphasize this as a goal and objective in the Overview of the Campus Standards.

2. Administration

Administrative Procedures

Objective

This portion of the Handbook is intended to provide a brief overview of the Administrative Procedures established for the implementation of the Measure B Bond Program. It is assumed that design professionals are familiar with the Administrative Procedures set forth by the Chancellor's Office for state funded projects on Community College Campuses. This document sets forth a brief of the Administrative Procedures followed for the execution of Bond Program Projects.

Facilities Master Plan Implementation

Subsequent to the passage of the Measure B General Obligation Bond in March, 2004, the college began the process of developing an educational master plan that would project space and type of facilities needed to house the academic programs. From this document, a Facilities Master Plan was prepared with project listings, campus wide programming, general project scopes, scheduling and the establishment of budgets. The result was a list of discrete projects with brief campus wide programs, budgets and a scheduled sequencing of the projects. This information has been incorporated into a Campus Plan and an Implementation Plan for the Palm Desert Campus. A Campus Plan and an Implementation Plan will be developed for both the Eastern Valley Center and the Western Valley Center.

Selection Period

The College's procedure for selecting the Project Team to provide Basic Professional Services is traditional. For each project, a Project Scope, Project Budget, and Project Schedule will be the basis of an advertised RFP for Basic Professional Services to produce design documents for the project. From the submitted proposals responding to the RFP, a short list will be developed. Interviews will be held and after a period of consideration, a Project Team will be selected and a contract negotiated with the College.

Project Programming
The Design Team will develop the Project Program and reconcile the project's scope of work with the available budget. Site considerations (including the Landscape Master Plan), outline of spaces (JCAF31), room design criteria, building systems' basis of design and spatial juxtapositions (diagram of spaces) are some of the program elements. The Program will be reviewed with the Master Architect for verification of space allocations.

The method of project delivery, infrastructure support requirements and other elements of campus support will also be determined in coordination with the Project Programming. During project programming, the District will decide whether or not the project will require Design Review. All new buildings and all renovations that change function or building use will require a design review. This decision will be documented in the Project's Program.

When Project Programming is complete, the College will commission a Soils Report and Geologic Hazard Report. The College will submit these reports to the California Geologic Survey for review and comment. The approved Soils Report and Geologic Hazard Report will accompany the Project Program.

An Environmental Impact Report has been prepared for the entire scope of the 2005 Facilities Master Plan. The College should verify that the approved Environmental Impact Report is inclusive and applies to each proposed Project Program in the Facilities Master Plan. The Project Programming Submittal will be reviewed by the following:

- Building Design Team
- Design Review Task Force
- Facilities Master Plan Committee

Schematic Design Phase

It is expected that the Project Team will schedule initial meetings with College representatives and appropriate regulatory agencies to verify the Project Program's requirements. In general, the contents of each document phase submittal shall conform to the requirements set forth in AIA Document B141 – Standard Form Services. The Schematic Design submittal will be reviewed by the following:

- Local Fire Marshall (fire lanes, fire hydrants, access)
- Building Design Team
- Design Review Task Force
- Facilities Master Planning Committee
- Board of Trustees

Please refer to the other portions of this Overview section for "Design Review Process" and "Description of Roles". The review period shall be set forth in the project schedule. In some types of project delivery a constructability review may also be required.

Design Development Phase

The Design Development Phase will commence when all comments have been received and Design Review Approval has been documented and confirmed by the Board of Trustees. A cost estimate will be provided as part of the Design Development Submittal. Upon completion of this phase, the Design Development Submittal will be reviewed by the following:

- Building Design Team
- Design Review Task Force
- Facilities Master Plan Committee
- Board of Trustees

At the end of the Review Period set forth in the project schedule a complete set of comments will be delivered to the Project Team. This milestone matches the end of the Preliminary Drawing Phase as set forth in the Chancellor's Guidelines and a complete set of drawings are to be submitted to the Chancellor's Office for review and comment.

Construction Document Phase
The Construction Document Phase will begin only after all the review comments are received by the Project Team upon final approval by the Board of Trustees. On large complicated projects, the College may request a 50% Construction Document submittal. Otherwise, the Project Team shall submit the 100% Construction Document package, including a cost estimate, in two review steps. The first step involves review by the following:

- Building Design Team
- Local Regulatory Agencies (e.g. Fire Marshall, Flood Control, City if work is required off-campus, etc.)
- State Health Department (Food service only, if required)
- Design Review Task Force
- Facilities Master Planning Committee
- Board of Trustees

Upon receipt of complete review comments, the Project Team shall make corrections (unless approved by President's Cabinet) and submit the completed Construction Document package to the Division of the State Architect (DSA). A stamp indicating local fire authority approval should be on the submitted plans.

Finally, the State Chancellor's Office of Facilities and Planning Unit shall receive a copy of the approved drawings with the required plan check fee. This is required for all projects, including those not funded by the State.

Bid Document Phase
Once DSA approval has been received, the Bid Package will be prepared and the project advertised for competitive bidding under the Public Contract Code. At the end of the bid period, the contract will be awarded to the successful bidder(s). The form of the contract(s) will depend on the method of delivery employed for the particular project.

Construction Phase
The Project Team will provide Construction Administration services during construction. The procedures will depend upon the method of delivery selected by the College. The specific procedure will be set forth in The Design Professionals Agreement and, the Construction Contract of the bid package. Some of the final steps of the Construction Phase will include punch lists, commissioning and

training. When the Construction Phase is complete, the building will be turned over to the Owner. The Project Team will be required to submit "as-built" documents in paper and electronic formats. At this time there may be a fixture/furnishings and equipment package that is implemented under separate contract. The Project Team may or may not be involved during this move-in phase of the project.

Operation, Maintenance and Evaluation
The College may choose to implement a Post-Occupancy Evaluation on some projects. The Building Design Team, Project Team and Contractors would attend a group meeting, managed by the Program Manager. The objective would be to determine what went right and where improvements could be made in order to refine guidelines and procedures followed in future projects.

Description of Roles
Board of Trustees
- The College's Board of Trustees is composed of elected Trustees from the community served by the District. The Board's composition includes a President, Vice President, Secretary, two Members and a Student Member (appointed by the Associated Student Association).
- The Board of Trustees provides objective oversight of the District's management. Board approval is required for all major capital plans and policy decisions affecting the District.

Bond Program Manager
- The Bond Program Manager is responsible for overseeing the implementation of the bond program. Accounting, schedules, project descriptions and oversight of the bond fund expenditures are some of the Bond Program Manager's responsibilities.

Citizen's Bond Oversight Committee
- This committee is composed of nine members appointed by the Board of Trustees. They are responsible for providing independent community oversight of the Bond Program's Implementation.
- The Board of Trustees has adopted a "by-laws" that provides mission and direction for the Citizens Bond Oversight Committee. These follow the provisions of Proposition 39.

Facilities Master Planning Committee(FMPC)

- The FMPC is responsible for reviewing College of the Desert bond projects affecting campus facilities.
- The FMPC is composed of faculty, staff and consultants and chaired by the College Vice President, Administrative Services.

Building Design Team (BDT)

Each building, new and renovated, shall have a Building Design Team formed in order to oversee, provide input, dialog, and review comments for each individual Building Project.

The BDT will have the following members:

- Program Manager (Chair)
- Director of Maintenance & Operations
- Project Team (design consultants)
- Dean of the Division managing the specific building
- Key faculty members in the Division occupying the building

The BDT will be responsible for providing guidance during Project Programming and Design. The Chair of the BDT will receive relevant documents and distribute copies to BDT members and other College of the Desert representatives, as required by the type of project.

Design Review Task Force (President's Cabinet)

The President's Cabinet will act as the Design Review Task Force to review projects' designs as determined by the District. A more detailed description of the "Design Review Process" follows.

The Design Review Task Force will be composed of the following:

- College President (Chair)
- College Vice Presidents
- Program Manager
- Director of M&O
- Master Campus Architect (as needed)
- Project Team (as needed)

For buildings having an instructional component, the Instructional Cabinet shall also review project's designs to ensure the project fits into the educational master plan. The Project Team will present the project's design to the BDT for evaluation.

General Contractor (GC)
When the method of delivery is "Design/Bid/Build" or "Design/Build" the GC will be responsible for the construction process. In this case, there would not be a Construction Manager.

The College has designated the Program Manager to act as an intermediary between the GC , the District and the Project Team.

In the "Design/Build" process the GC works with the Project Design Team during design, and while the GC is preparing Construction Documents.

Construction Manager (CM)
When the method of delivery is "Multiple Primes", the CM oversees the work of the contractors. In this case there is no "General Contractor".

- The CM may be commissioned to provide constructability reviews of design documents at key milestones of the process.
- The CM is contracted by the District to act as "Owner's Representative" in dealings with subcontractors.
- The CM will serve as an intermediary between the Project Team and subcontractors.
- The CM answers to the Program Manager.

Owner's Representative
The Owner's Representative designation varies depending on the method of delivery. This is covered elsewhere in this section.

In general, the Owner's Representative is the liaison designated by the College to represent the interest of the College in discussions of issues with the Project Team, Constructors, Inspectors and Regulators.

Project Team
For building projects, the Project Team is lead by the Architect who is under contract with the College. For some projects that do not have a significant building design scope, an engineer may assume the lead role in the Project Team.

The remaining members of the Project Team under contract to the Architect are design consultants. This could include Landscape Architect, Civil Engineer, Structural Engineer, Mechanical/Plumbing Engineer, Electrical Engineer and other specialized design consultants.

Design Review Process

Goals and Objectives

The College desires to institute high quality design and construction standards to all bond projects, state capital outlay projects and all scheduled maintenance projects. In addition, the College desires to develop guidelines and standards that will provide consistency in all projects and to provide documentation and communication of design guidelines and standards to all project teams and design teams.

In addition, there are also other goals articulated in the Campus Standards Handbook and shown on the current Facilities Master Plan. The scope of Design Review will include considerations specified in the Campus Design Guidelines as well as the Overview. The District also has the goal that projects' designs appeal to the academic community on campus as well as the broader community served by the District.

There is more information relating to the Design Review Process in the Campus Design Guidelines and other portions of this section.

Design Review Criteria

The primary criteria that will be applied to Design Review Approval are the Campus Design Guidelines. The relationship of the project to the campus will be evaluated using the Planning Guidelines and the current Facilities Master Plan (EIR Campus Plan).

The project's site design will be reviewed with respect to the Site Design Guidelines, which describe design aspects of hardscape, plantings, site structures and exterior signage. In a similar way, a building's design will be evaluated on how well it responds to the Building Design Guidelines. A project's review will also consider how well the design fulfills the programmatic requirements set forth by the District.

There will be consideration of Specific Design Criteria made during the Design Review Process. The use of covered walkways and shade structures as site elements should respond to the Design Criteria. Sustainable design features should be used in a manner consistent with the Specific Design Criteria on Sustainable Design, Building and Site Lighting to name a few.

The Design Review will include evaluation of Site Design and Building Design, with the focus being on the exterior design components. The design review will also evaluate interior design and MEP systems. The evaluation of interior design will be the purview of the Building Design Team.

The District will make the determination of which projects will require Design Review. This will be decided and documented during Project Programming.

Submittal Requirements
A project requiring Design Review will be submitted to the Design Review Task Force at the end of the Schematic Design Phase. In addition to the Schematic Design Package, the Design Review Submittal shall include the following:

- Written description of the project's design. This document will articulate the designer's goals and vision. It should also address how the Design Review Criteria have been addressed.
- Full color renderings of all elevations, perspective compositions are encouraged.
- Scale model of project
- Indicate response to Landscape Master Plan
- Show equipment screening and signage
- Material and color board

Changes in Project's Design
All changes made to the site design and/or building design after Design Review Approval shall be brought to the attention of the Building Design Team by the Project Team Director of M&O and Program Manager. Any concerns about the changes from the Building Design Team shall be submitted to the President's Cabinet and FMPC before the final approval by the Board of Trustees.

College of the Desert

Section II – Campus Design Guidelines

October 2005

COLLEGE OF THE DESERT

1. Introduction

Purpose of Design Guidelines

COLLEGE OF THE DESERT

Purpose of the Design Guidelines

"We commit to an intellectually open and nurturing environment that welcomes and appreciates a diversity of ideas and people"

College of the Desert Mission Statement

In order to realize the College of the Desert's Mission, the Design Guidelines will produce an environment that offers the encouragement, means and professional setting to provide excellent academic programs, as well as student support services. The existing iconic palms and fountains will be improved to continue the classic sense of the College as oasis in the desert. The design Guidelines will open view corridors to the San Jacinto Mountains and San Gorgonio Mountain to improve way finding and enhance campus entrances. New faces representative of the District's future will be provided by strategically located new buildings at key entrances. The outdoor spaces will be renewed with sustainably designed quads sensitive to the desert flora and climate while providing attractive settings for student/faculty interaction. The articulation of Planning and Assessment efforts will produce measurable improvements with the goal of providing the best educational opportunities possible for the students.

The purpose of these *Design Guidelines* is to provide a framework to guide the successful design and construction of the new and renovated facilities as they are delivered over time. No written design guidelines can or should fully dictate strict standards for design. Instead they inform and guide projects to respond to the unique programmatic and site characteristics. The guidelines will shape the projects along a path that will redefine the College and make them a responsible steward of the resources available, whether monetary or environmental.

This document seeks not to be specifically prescriptive of any desired design outcome, but rather to provide boundaries that support creative and individual expression and innovative design solutions. A successful and responsive project will reside among the boundaries between program, site, regulatory restraints, opportunities and guidelines. The purpose of the *Campus Design Guidelines* is to provide a comprehensive strategic framework for these decisions, which will produce an environment supportive of the College's Mission.

2. Planning Design Guidelines

Master Plan Overview
EIR Campus Plan

Master Plan Overview

Master Plan Overview
In 2003, the College of the Desert prepared the Educational Master Plan to describe the educational goals of the College:

1. Effectively prepare students for further education, work, citizenship and community through learning-centered programs and services.
2. Provide access to quality education for the diverse residents of a rapidly growing Coachella Valley.
3. Help promote a civil, prosperous, and stimulating quality of life in the Coachella Valley.

In the 2004 Campus Master Plan, the list of Goals and Objectives for campus improvements were developed as follows:

1. Improve existing space and develop new space to meet current and future needs.
2. Locate related functions together.
3. Develop new facilities on the traditional grid pattern of the campus.
4. Locate Student Services at the front door.
5. Develop multi-story buildings to use land efficiently.
6. Develop increased parking capacity in more convenient locations.
7. Create opportunities for useable open spaces.
8. Maintain the open appearance of the campus to the community.
9. Replace temporaries with permanent construction.
10. Improve campus way finding and signage.
11. Consider the natural desert climate in planning campus development.
12. Provide measures to protect the safety of users and the security of property on campus.
13. Control vehicular access to the site when the campus is closed.

For more detailed information, please refer to the Master Plan document under separate cover.


MAGNESIA FALLS DRIVE
FRED WARING DRIVE
MONTEREY AVENUE
SAN PABLO AVENUE
PARK VIEW DRIVE
ART BUILDING
WATER TANK
CENTRAL PLANT
MUSIC
SCULPTURE YARD
SCULPTURE GARDEN
PLAY YARD
CDC EXPANSION
CHILD DEVELOPMENT CENTER
OUTDOOR INSTRUCTION AREA
POTENTIAL BUILDING SITE
ENV. SCIENCE AND TECH.
APPLIED TECH.
ENV. DESIGN
AGRICULTURAL SCIENCE
USED BY COACHELLA VALLEY WATER DISTRICT
ADVANCED TRANS.
PUBLIC SAFETY ACADEMY
NURSING EXPANSION
NURSING
BUSINESS EDUCATION
SOCIAL SCIENCE
ENGINEERING
MATH
CIS/ INFO TECH
MULTI-USE ARTS
LIBERAL ARTS
SCIENCE LAB
HLS - ACADEMIC SKILLS CENTER
ADMINISTRATION
SHOWER/LOCKER
LEARNING COMMONS
GYMNASIUM
POOL
DINING HALL
FITNESS/ WELLNESS
BUSINESS AND COMMUNITY CENTER
SOCCER FIELD
STADIUM AND OFFICES
ATHLETIC COMPLEX
FOOTBALL FIELD
TENNIS COURTS
SUPPORT
McCALLUM THEATER
MULTIMEDIA LIBRARY
COMMUNITY ROOM
GOLF INSTITUTE
BUS STOP
MONUMENT SIGN
EIR CAMPUS PLAN
College of the Desert
Desert Community College District
tBP
architecture planning interiors
10/03/2005
LEGEND
Existing Buildings
New Buildings
Shade Structures
Landscape
Parking
Path
Sculpture Courts

3. Site Design Guidelines

Introduction

Being the first institution of higher learning within the Coachella Valley, the College of the Desert has established itself as a leader not only in education, but also with their numerous ties to the community. With the robust population growth within the valley, and the continuous growth of the campus, this campus landscape master plan hopes to establish a development strategy that will further enhance the college's identity and utility within the Coachella Valley.

The landscape design guidelines are funded in part by Measure B and were developed during several meetings with the Campus Landscape Subcommittee, Facilities Master Plan Committee, and Citizens Oversight Committee. An extensive survey of existing site conditions including site systems analysis, pedestrian circulation and existing spatial relationships was undertaken. Several ideas were explored in trying to develop a coherent system that integrated existing and proposed buildings with a new circulation and spatial hierarchy strategy. The guidelines and master plan have been derived with the intent on creating a strong and unifying framework throughout the campus that will allow for an eclectic integration of site functions and aesthetics.

A separate book entitled "Landscape Master Plan & Guidelines" was developed in cooperation with the overall campus guidelines and contains further information regarding campus context, site system studies, overall conceptual design, planting and paving selections and strategies.

Goal
To establish guidelines that will guide future development of open space on the campus in a manner that will collectively unify and simultaneously reinforce the unique identity of the college.

Site History

1962 - College of the Desert Opens

Original campus planning began in the early 1950's, and after multiple sites were considered the board decided to choose the Odell Ranch which was centrally located within the Coachella Valley, being the halfway point between Palm Springs to the West and Indio to the South. This site was located along the northern fringe of Palm Desert, and was easily accessible by car being one-quarter mile north of highway 111.


Photo 1 – View of the Hilb Center

The design architect selected for the campus plan was John Carl Warneke of San Francisco. He envisioned raising the 13 acre campus core by three feet above grade level to alleviate concerns of flooding, and to achieve a more dominant appearance for the college being "readily visible and more imposing." Don Mitchell, campus board member, suggested that there "should be one noble building which would dominate the site and give majesty to the campus." Warneke achieved this goal by locating the library (known as the Hilb Center today) in the center of the campus, and further elevating it by three feet above the 13 acre campus pad to create "one noble building." The largest fountain on campus was located at the forecourt to the library along the western entry axis to the site, and was called the "Fountain of Knowledge". The original main entrance to the campus was designed off of Monterey Avenue, and careful attention was paid to preserve clear views into the heart of the campus. This strong axis simultaneously reinforced the significance of the library as a symbol of higher education, while establishing a clear visual link to the community.


Photo 2 – Covered Walkways

A noteworthy architectural element is the prevalence of shaded overhead walkways. During John Carl Warneke's initial visit to the site, he became enthralled with the existing Date Palm grove. Warneke observed the "long rows of palms and the covered corridors they formed with their trunks and fronds." He adapted this existing structural character in designing hundreds of columns for the covered walkways. The columns have a slightly wider base and support gently curved arches that are reminiscent of Date Palm fronds.

Photo 3 – College of the Desert (c. 1963)

A significant portion of the original Date Palm grove was left intact at the Northwest quarter of the campus, along with portions that were preserved to frame Alumni Road. Open space for staff and students were primarily located to the West of the Hilb Center with the exception of the large circular turf area just East of the Hilb Center. The original campus plan was designed to create an "Atmosphere of Quiet" (Cheeves, 1971) that should prevent one student activity from disturbing the other, or from discouraging study or concentration.

Map 1 - Current Campus Plan

Today

Several new buildings have been added since the campus opened in 1962, with the most notable being the new library building and the McCallum Theater, both located at the Southern edge of the campus along Fred Waring Drive. (Map 1) These buildings serve both campus and community needs, and currently lack a connection (either physically or visually) to the campus interior. Within the core of the campus, six prominent courtyards have been created adding to the outdoor quality of the college. These spaces serve as informal gathering areas for students, however there is little differentiation and hierarchy between them, contributing to a sense of "placelessness" on campus.

The community context in which the college sits, has changed as well. The Western and Southern edges of the campus have seen significant residential growth, and a large civic center has been constructed just East of the campus. The Civic Center houses the City Hall and other government offices, as well as a YMCA and a large community park with baseball, basketball, tennis and volleyball. The entrance to the Civic Center is aligned on axis to the Eastern entrance of the college along San Pablo Avenue. It is anticipated that the college's recreational amenities will be shared by the community and programmatically linked to the Civic Center. Therefore, a strong pedestrian and visual link is necessary between the campus and the Civic Center because a majority of the parking will be on the Eastern side of San Pablo Avenue.


Photo 4 - Current Aerial of Campus

In 2002, the college drafted a new Educational Master Plan and Facilities Master Plan which led to the passage of Measure B on March 2, 2004, a $346.5 million bond to expand the district's educational centers. Part of the guiding vision for the Educational Master Plan is for the college to play a vital role in the "civic and cultural, as well as economic development of the Valley, through its programs and the interaction between students, faculty, staff and other members of the community." Other goals include "promoting a civil, prosperous and stimulating quality of life within the Coachella Valley… [by] acting as a good neighbor, and taking responsibility for its impact on the community and becoming an active partner in community improvements, celebrations and overall development."


Photo 5 - Southwest Courtyard


Photo 6 – Northeast Courtyard

Another goal of the Educational Master Plan is to adopt a pedagogy of "Active Learning." This method will combine lecture and hands-on lab work, group problem-solving, and heavy use of new technologies, which will require classrooms designed with functional flexibility. However, this flexibility does not need to be confined to interior classroom space, but may spill out into the landscape as well.

Landscape Design Goals

The landscape design goals seek to establish clear and consistent guidelines that are comprised of three principles: Civic Responsibility, Clarity and Quality of Life.

Civic Responsibility

Being the first institution of higher learning within the Coachella Valley, the campus should lead by example. With the growing population of the valley, energy costs have increased and water is scarce. Therefore, more sustainable forms of energy must be found, and dependence on natural resource consumption should be limited. The College of the Desert has been a leader in this area since the 1992 opening of the Energy Technology Training Center, which is nationally recognized as a leader in alternative fuel training. The campus also has the opportunity to not only lead in the *research* of alternative fuels, but also in the *practice* of preserving and limiting natural fuel demands. The landscape can play a vital role in this preservation by helping to shelter buildings from the harsh desert sun, and mitigating the solar gain on the buildings surface, thus reducing air-conditioning demands. The landscape can also work hand-in-hand with the architecture in framing windows and skylights that allow for maximum levels of natural light, which will help reduce lighting demands.

Photo 1 – Mexican Pebble

Photo 2 – Cactus in Decomposed Granite

Furthering this idea of reducing resource demands, the landscape itself can provide an immediate, visible example to the community about the benefits of using sustainable plant material. Selecting plants that have adapted to the desert environment will help reduce watering and fertilizer demands, and selective pruning will reduce maintenance demands and further promote the aesthetic of the desert vernacular. Furthermore, the landscape master plan incorporates an integrated storm water drainage plan that significantly reduces the amount of pollutants that flow off-site by containing storm water in retention basins, increased planting areas, and the addition of permeable paving throughout the campus. (See Section II.4 - Hardscape Elements)

Another part of civic responsibility lies in creating a landscape of learning not only for the students, but for the larger community as well. The landscape master plan tries to reinforce this idea in a number of ways, such as making the campus an arboretum where native plants are celebrated and used in provocative ways. Also, the functional attributes of specific plants can be showcased such as shade provision, medicinal & cultural value, habitat for native fauna, and minimal resource needs (both water and plant maintenance).

Showcasing some of the natural processes that occur on site is another way of promoting a landscape of learning. By calling attention to the natural processes that occur on site such as the hydrology strategy (storm water retention & aquifer recharge) and vegetative resource mitigation strategy (reducing overall water and energy requirements), students and the community will have a tangible laboratory where they can learn about processes that support their urban environments. These outdoor areas will be especially useful for the environmentally related classes, where real world examples are illustrated outside of the class room, furthering the schools pedagogy of “Active Learning”.

Clarity

Clarity, both interior wayfinding and campus identity, is a major concern for the College of the Desert. The current campus plan lacks any type of definition within its surrounding residential context, and a lack of spatial and circulatory hierarchy makes navigating the campus somewhat difficult, especially for first time visitors. The Landscape Master Plan proposes the implementation of both a visual and physical linkage throughout the campus to establish identity and clarity.

To establish visual continuity throughout the campus, the landscape master plan has designated a series of locations to house the college’s extensive art collection. These pieces will terminate vistas, and act as focal points. Organic elements such as planting, paving, stone walls, and boulders along with signage and graphics will be arranged in a repetitive orientation that will compliment the art collection and create a since of continuity while navigating the campus. However, it is important to note that this orientation does not have to be a literal axial one, rather a more informal, exploratory orientation can be just as effective. Also, by creating a uniform border along the campus periphery through a dominant tree species, and creating significant gateway entries will help identify the campus and establish its unique identity within the community.

A physical system that includes spatial hierarchy and a clear circulation framework, will complement the visual linkages to establish a strong organizational pattern that will add clarity and identity throughout the campus. The master plan calls for the implementation of a dynamic circulation system, accompanied by a series of courtyards, that can extend adjacent building typologies (academic, recreational, social, meditative, and ceremonial), and begin to establish a hierarchical system that breaks down space throughout the campus, and provides a more cognitive environment for the staff and students.

Photo 4 – Campus Quad Precedence

Quality of Life

Creating a comfortable and engaging environment for the staff and students of the College of the Desert, is a significant component of the landscape master plan and guidelines. Generating outdoor space that can accommodate active social gatherings, will maximize the opportunity for interaction between students. Furthermore, the master plan also calls for smooth transitions to more passive and meditative space, adding to the spatial dynamics of the campus.

Being a community college, the College of the Desert is the first exposure of the collegiate experience for a majority of the student body. Therefore, it is important to celebrate this experience and have the college engage the students as much as possible, in hopes that students will continue to pursue the path of higher education. The proposed quad in the landscape master plan aims to accomplish this sense of collegiality, by serving as both the geographical and symbolic heart of the campus. The quad should be framed by significant buildings and connected to primary circulation routes. This formal framework may be reflected with interior hardscape paths, but should allow for a more informal layer of circulation and planting that "floats" throughout the quad, and provides shelter and shade from the summer heat. This space should accommodate passive as well as ceremonial uses, such as graduation, lectures, concerts and organized student assemblies.

Photo 5 – Campus Quad Precedence

Existing Conditions

Campus Edges and Views

The existing conditions of the campus offer both opportunities and constraints, will help formulate the future landscape master plan. The western edge of the campus currently does not contain any planting with the exception of the main entry and the McCallum Theater at the southwest corner. This corner is the "greenest" area of the campus and sees the most visitors from the outside community, aside from the Street Fair (see *Parking Lots* below). The campus has expressed concern about frequent pedestrian crossing all along the Monterey edge and has expressed a desire to build up an edge buffer that restricts access down to selected points, but will not seem overbearing or unwelcoming to the community. The Street Fair personal have also requested a buffer from the traffic along Monterey that preserves clear views into the campus. The southern and eastern edge of the campus is predominately turf, with a fountain in front of the theater, and an art sculpture south of the library. The northern edge of the campus is presently considered back of the house for campus maintenance and utilities, with the exception of the Child Development Center. Interior campus views are mostly oriented in an east-west direction, with several view corridors west to the Santa Rosa and San Jacinto Mountains. The Hilb Center blocks major north/south views, adding to its symbolic merit, which diminishes views down to narrow pathways that occur between buildings.

Photo 1 – Mountain Views

Photo 2 – Northwest Parking Lot

Parking Lots

The northwest parking lot which stages the Street Fair was recently planted in July 2005, and contains three north/south rows of Tipu Trees (*Tipuana tipu*), and two north/south rows of Chilean Mesquite's (*Prosopis chilensis*). Temporary turf was planted along the perimeter of the parking lot to help soften the desert climate, however there is still a perceived disconnect between many of the parking lots and the rest of the campus, adding to way-finding difficulties for new visitors.

Photo 3 – View of Campus from Civic Center

Recreation and Community Facilities

The college offers several recreational amenities that mostly occur along the eastern half of the campus, including a baseball field, softball field, soccer/football field, and six tennis courts. The southeast quarter of the campus is comprised of the golf institute, which houses a driving range and short game teaching facilities. Two pools that are presently located in the campus interior, are tentatively planned to be moved east of the tennis courts along San Pablo Avenue. These recreational facilities are open to the community and tie in with some of the uses in the adjacent Civic Center.

Photo 4 – Alumni Road

Community facilities include the McCallum Theater, a Multi-Agency Library and the Child Development Center. These three buildings are located on the extreme northern and southern edges of the campus, and offer little opportunity for community integration with the campus staff and students.

Interior Campus

The interior campus is framed by Alumni Road, and contains most of the academic classrooms with the exception of the Arts and Music Buildings and the Environmental Science Buildings. The current ceremonial heart of the campus is the large, formal, open plaza located just west of the Hilb Center. Beside serving the forecourt to the most significant building on campus, this plaza also contains the largest fountain on campus. Hitherto, a severe lack of shade and character preclude any type of significant student activity within the plaza. Instead, students seem to prefer the smaller, shaded courtyards that serve as enclosed refuges from the sun, where students can gather and socialize. Furthermore, the large circular turf area just east of the Hilb center seems to be underutilized, and lacks any type of visual connection to Civic Center.

Photo 5 – View of Existing North / South Axis

Circulation

Existing pedestrian circulation around the site periphery is somewhat unclear. Most pedestrians currently enter the site at either the Monterey Avenue/Fred Waring Drive corner, or from the bus stop along Fred Waring Drive adjacent to the McCallum Theater. Campus signage is scarce, and pedestrian scaled "gateways" are noticeably lacking.

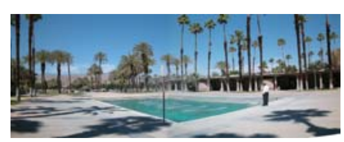


Photo 6 – Fountain of Knowledge

Most of the vehicular circulation occurs along the edges outside of the campus interior, with the exception of a handful of parking lots. The Alumni Road is the current dividing line between vehicular and pedestrian right-of-ways, and pedestrian crosswalks along this road are limited. Accentuating major pedestrian routes along Alumni Road will help alleviate pedestrian confusion while navigating the campus.

Interior pedestrian circulation predominately follows the building grid with eight major east/west routes and four north/south routes. Almost all of the paving is natural gray concrete, with the exception of some integral color banding. The current circulation network lacks a hierarchical definition, which adds to a sense of spatial monotony. The new master plan will propose to use varying paving types, along with planting and other urban design elements, to establish a clear pedestrian network which will initiate a framework to help differentiate spatial function and identity.

Photo 7 – Northeast Courtyard and Alumni Park

Plazas and Courtyards

The campus presently contains one formal plaza, which serves as the forecourt to the Hilb Center. This large open space is mostly paved and contains the Fountain of Knowledge in the center. This plaza is framed on the south by the Administration Building and on the north by the Liberal Arts Building. These two building typologies, administration and classrooms, along with considerable shade deficiency, may contribute to the plaza's lack of vitality and character.

Photo 8 – Northwest Courtyard

Four courtyards are located around the campus and currently serve as the primary gathering spaces for the students. The two courtyards west of the Hilb Center are mostly hardscape with several above grade planters. The northeast courtyard has the most landscape and contains the Alumni Park, a small recessed area which is heavily shaded by trees. This courtyard also contains several shaded picnic benches which are heavily used, especially during the hot summer months. The Southeast courtyard contains two pools which are anticipated to move east of the tennis courts (along San Pablo Drive), which will free up space for an additional courtyard. Most of the vegetation within the courtyards is similar, and the hardscape has little variation, adding to a lack of courtyard identity. However, being that the courtyards share similar attributes, the adjacent building uses differ greatly. The southwest courtyard is located adjacent to the campus dining hall, which sees significant use during lunch time. The southeast courtyard is located adjacent to the campus Gymnasium and Locker Rooms which has the potential of

Photo 9 – Southwest Courtyard

accommodating a more active and dynamic use. The northeast and northwest courtyards share similar building uses; however the classroom typologies differ greatly. The northeast courtyard is framed by science and math classes while the northwest courtyard is framed by liberal arts and business classes. These differences present an opportunity to help distinguish a unique character and function between each courtyard.

Landscape Design Principles

The landscape master plan and guidelines seek to reinforce the unique identity of the College of the Desert, and guide future development in a way that collectively unifies the campus. This goal will be achieved through the implementation of three design principles: 1) Establish a clear framework that organizes circulation and spatial hierarchies, 2) Implement a planting functionality strategy that will subsequently lead to three planting zones throughout the campus, and 3) Formulate a network of unifying elements that will visually unite the campus.

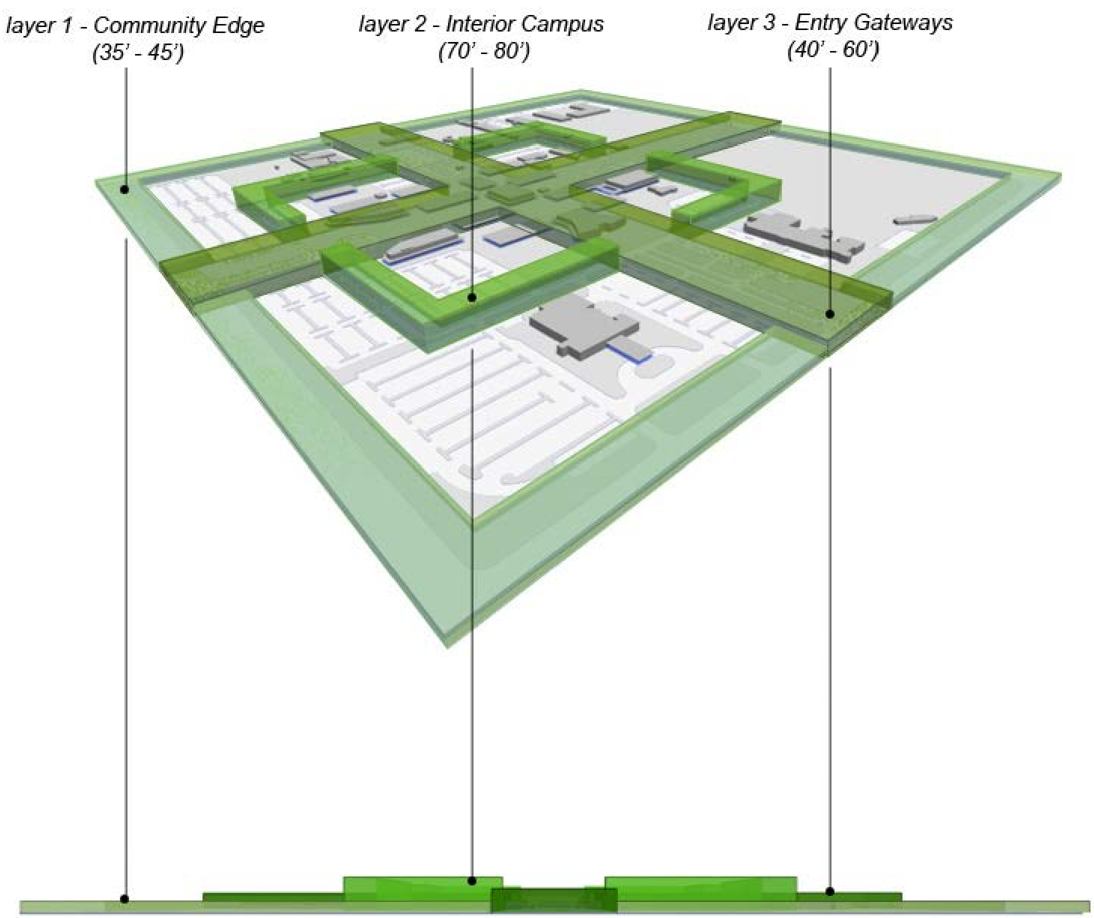


Diagram 1 - Vegetative Layering Strategy

Campus Framework

The campus framework strategy is the primary organizing element which identifies overall campus identity, circulatory hierarchy and spatial networks.

Overall Campus Identity

Being that the College of the Desert rests within a residential context, it is important to identify the campus within the community. The landscape master plan uses a vegetative layering strategy that consists of three layers to identify the campus edge, interior and entries (Diagram 1). The campus edge should be wrapped with a unifying tree that is at a larger scale than the immediate residential edge (35′-45′ high). This tree should have an open structure with a high canopy so that views to the interior will be preserved. The next layer will consist of Mexican Fan Palms (*Washingtonia robusta*), that follow Alumni Road and identify the campus interior (70′ – 80′ high). The third layer, a bosque of Date Palms (*Phoenix dactylifera*) which calls back to the agricultural history of the site, will identify the campus entry gateways (40′ – 60′ high). With this layering strategy, a low edge tree, tall interior palm, and an overlaying medium entry palm, the campus will seamlessly rest within the surrounding residential community while maintaining its unique identity.

Photo 1 – View through Date Palm Grove

Circulatory Hierarchy

The landscape master plan aims at creating a clear circulation system that extends outside of the campus interior, and reaches out to the community edges. The first layer will consist of three clearly delineated pedestrian promenades which will run the entire length of the campus. Two promenades will run north / south, and one large promenade will run east / west. The north / south promenades will differ based on the existing campus building use. The western north / south promenade will connect the McCallum Theater along Fred Waring Drive, to the main interior campus plaza and new Multiuse Arts and Learning Commons Buildings, up to the Music and Arts complex at the northern edge of the campus. Because of the two heavily weighted artistic/cultural endpoints, this promenade should convey a character of looseness and creativity. Furthermore, the campus has an opportunity to cross-pollinate uses between the theater and the arts complex in an effort to involve the community with campus life and culture. On the contrary, the eastern north / south promenade should have more of a utilitarian character because it connects the campus/community library on the south to the environmental science complex located along the northern edge of campus. This promenade is almost entirely framed by classrooms and will help facilitate efficient student circulation.

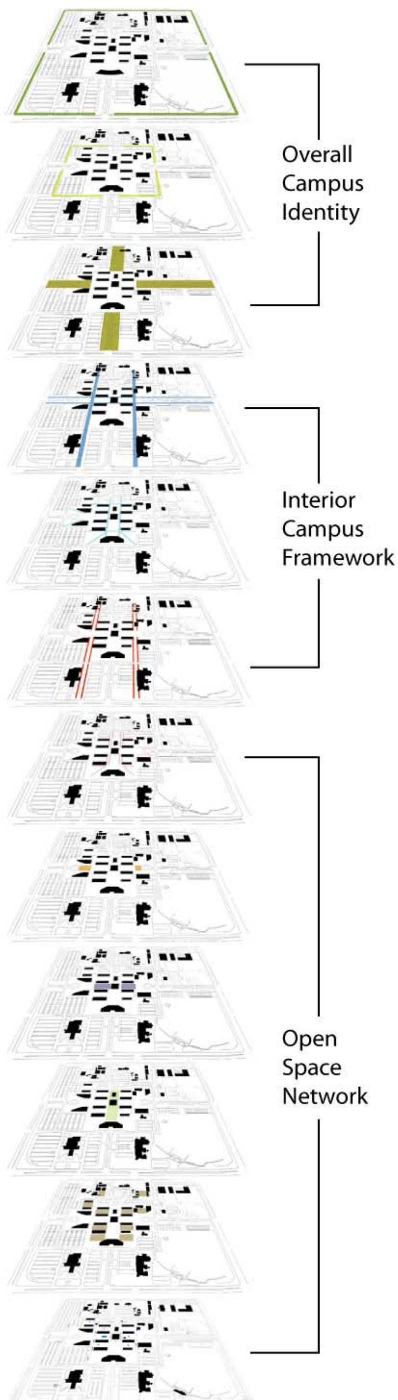


Diagram 2 – Framework Layering

The east /west promenade will connect the residential community to the west, through the campus interior to the Civic Center on the east. This promenade will also contain two plazas, the Fountain of Knowledge, and the Hilb Center. Therefore, the east / west promenade should evoke more of a celebratory character, which will preserve clear views west to the mountains and east to the Civic Center.

A secondary layer of integrated paths and sidewalks that connect classrooms, plazas and courtyards will complete the pedestrian network.

The landscape master plan proposes a slight change in the existing topography of the site (See Landscape Master Plan & Guidelines for further detail). This change will occur at the plus four foot from grade elevation, which creates a podium level that all classrooms will sit on. The campus currently has large ramps on all four sides that provide a transition from the perimeter parking to the interior campus. The master plan purposes to replace these ramps with large ceremonial stair cases that accentuate the grade change and further the original concept of "stepping up into a world of knowledge." To do this, the plus four foot elevation level will extend east and west to engage the two primary north / south promenades. This enables these major pedestrian thoroughfares to occur at the same elevation as the surrounding classrooms.

The grading on either side of the proposed Business and Community Center should allow for a dynamic assemblage of spatial qualities throughout the quad, by allowing for either multiple uses or one overall use. The master plan shows two small amphitheaters on either side of the Business and Community Center that can allow for individual functions separate from the activity of the main quad. However, the steeper slopes on the west and east sides face inward and allow them to be used in concert with the main quad during larger events, such as graduation.

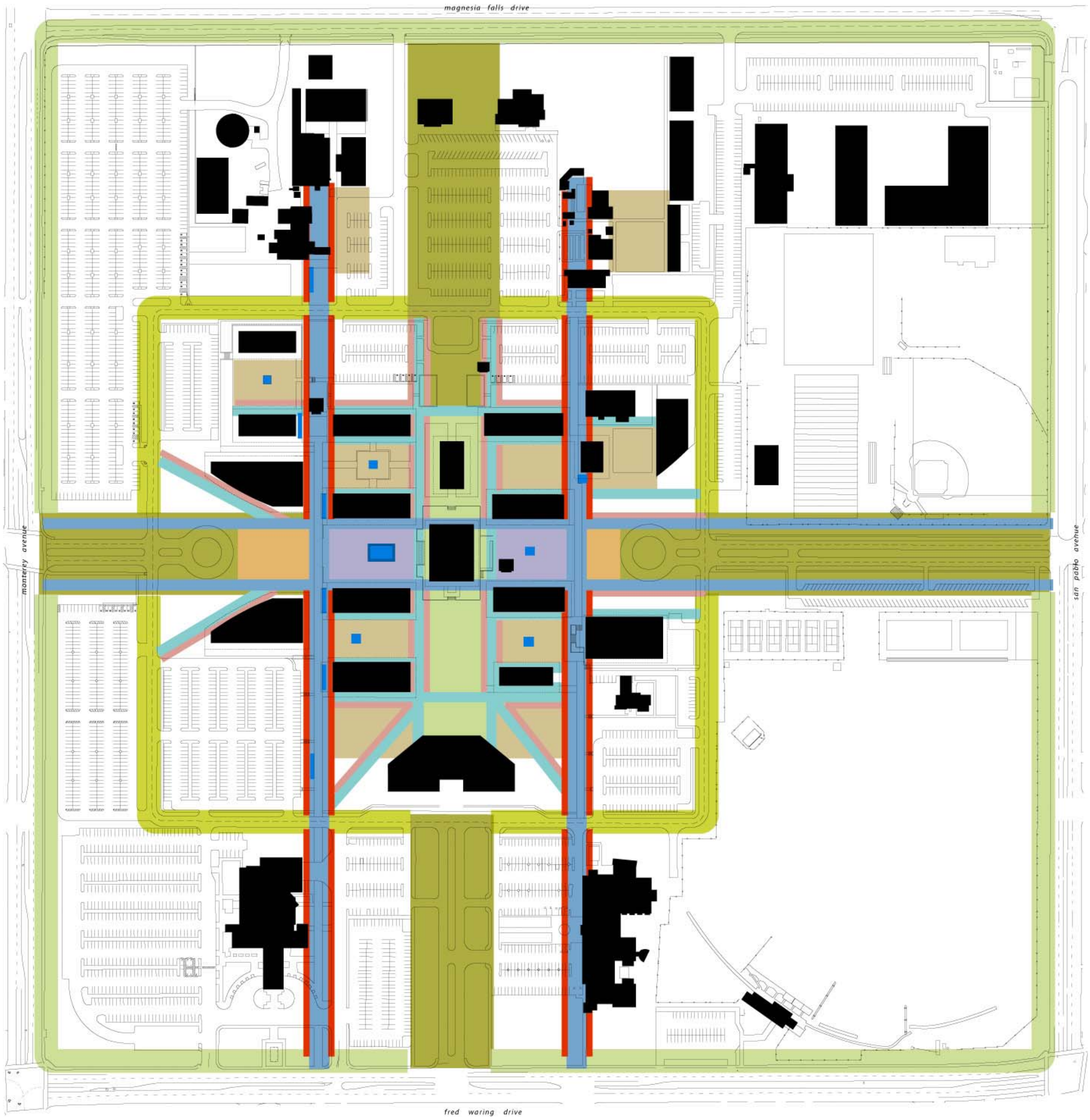


Diagram 3 – Conceptual Framework Composite

Spatial Networks

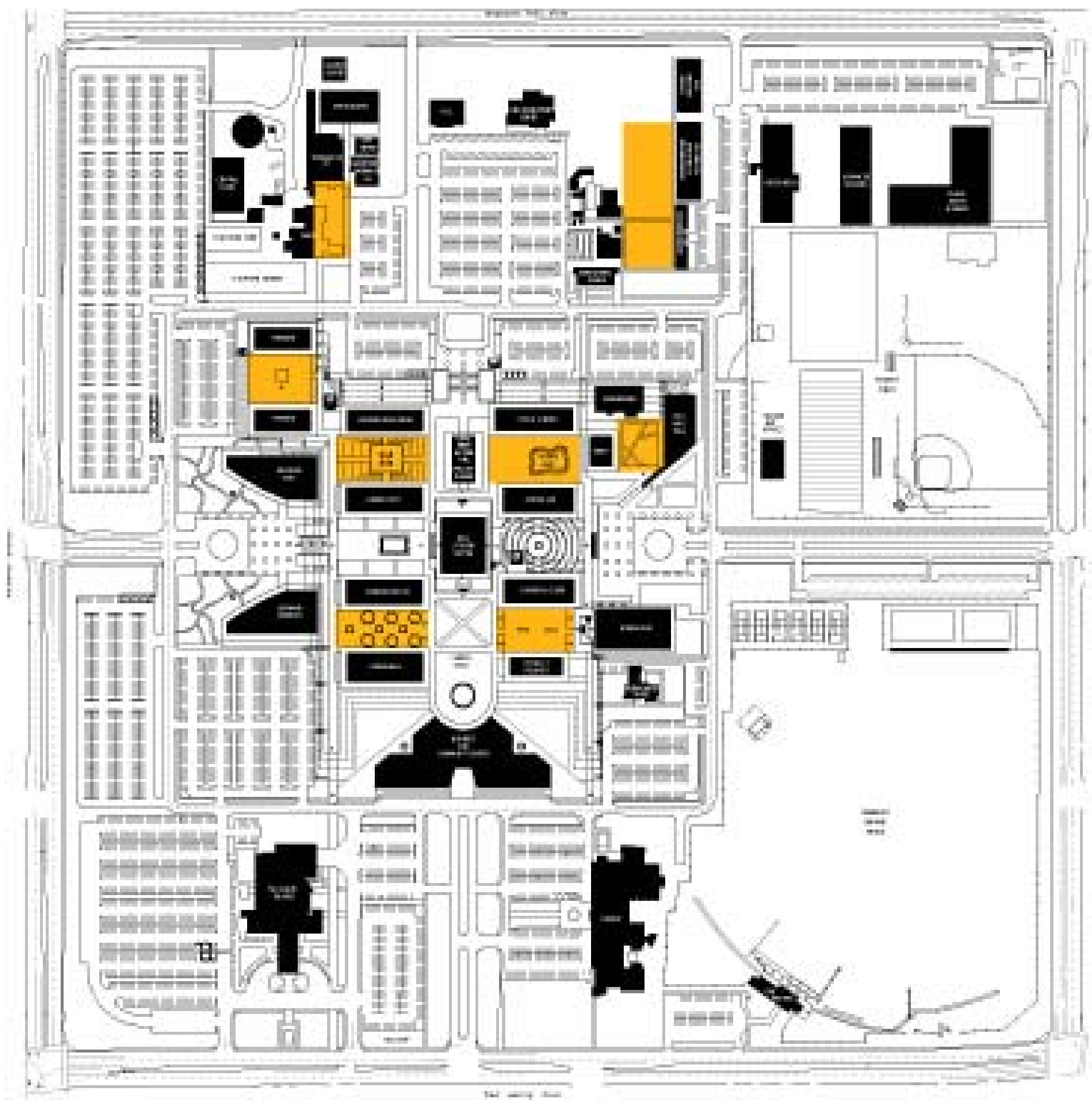
The pedestrian network provides a framework for three spatial categories: Plazas, Quad and Courtyards. All of the plazas occur along the east / west pedestrian promenade, and as mentioned above, are predominately ceremonial in character. The area between the new Multiuse Arts and Learning Commons Buildings will serve as a primary drop-off point and entrance into the campus. This area should be predominately hardscape to accommodate large student functions that may spill over from the adjacent buildings, and preserve eastern views to the Hilb Center.

In order to encourage more student vitality within the Hilb Center forecourt plaza, more planting and shade should be introduced that adds to a pedestrian scaled microclimate. This is achieved by extending the adjacent building arcades with small canopy trees that frame the fountain and the entrance to the Hilb Center. A similar treatment should also occur east of the Hilb Center that will help create more of a pedestrian gathering space.

The east entry plaza is envisioned to be a very active pedestrian space due to the adjacency of the gymnasium, and the drop-off that may be used in the future for a campus tram system and public transportation. Therefore this plaza must maintain openness, while simultaneously accommodating passive seating areas. The grand scale of the Date Palms will help add to the ceremonial character of the space.

As part of celebrating the collegiate experience, the master plan proposes the addition of a campus Quad located between the existing Hilb Center and the proposed Business and Community Center. This area is well situated for a quad because it is framed by signature buildings, and flanked by the two north / south pedestrian promenades. A formal layout of pedestrian pathways should carry adjacent building circulation into the quad, while a more informal layer of planting and secondary paths encourages dynamic circulation and multiple uses. The area just east and west of the new Business and Community Center will take advantage of the existing four foot grade change, and integrate two amphitheaters that face towards the central quad area. The amphitheaters should maintain an informal character so that multiple uses within the quad can occur simultaneously. However, all areas within the quad should assemble into a communal space that can accommodate most of the student body during major events such as graduation, concerts or lectures.

The last spatial typology, and most flexible in terms of size, use and character, are the individual courtyards. The courtyards should each carry an individual identity based on adjacent building function, microclimates, materiality, academic enrichment, social dynamics and passive sanctuaries. The master plan contains eight courtyards, six of which are in the campus core, and two along the northern Arts and Environmental Science Complexes.



Map 1 – Proposed Courtyards

4. Site Elements

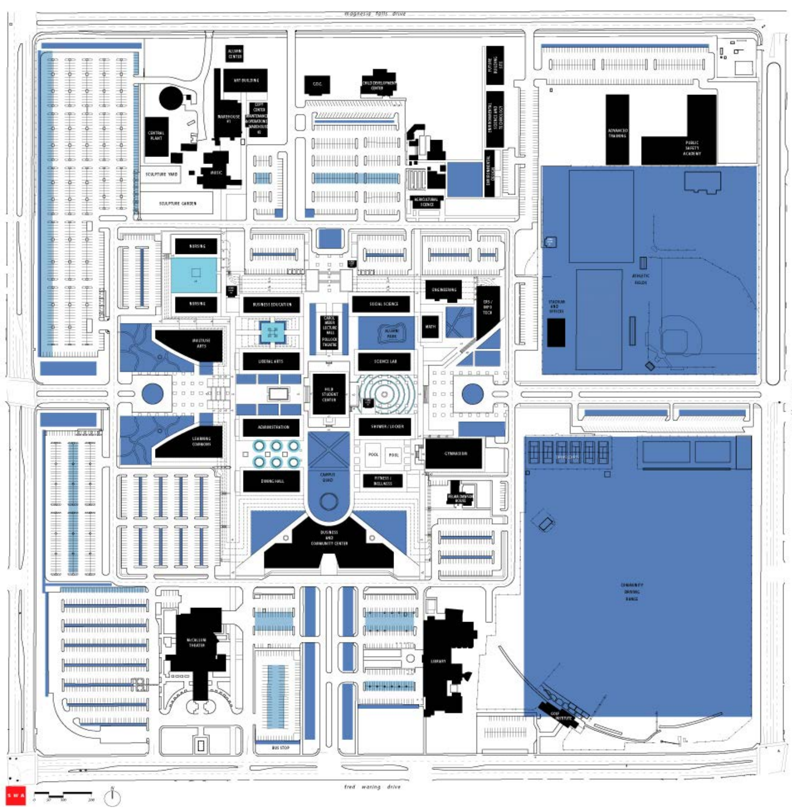
Hardscape Elements
Landscaping
Site Furnishings and Lighting
Site Signage Guidelines

COLLEGE OF THE DESERT

Hardscape Elements

The master plan has defined seven pedestrian paving types throughout the campus. The campus periphery will have a more organic treatment consisting of decomposed granite which ties into the City of Palm Desert's adjacent streetscape treatments. The parking lots throughout the campus are envisioned to continue the arid aesthetic of plant material in decomposed granite. The decomposed granite will terminate at the three campus entries and change into a larger organic material with more texture and color such as gravel or rocks; which will call attention to the entries and create a uniform experience for all three entries.

Photo 1 – Porous Concrete Unit Pavers



Planting Areas Suitable for Retention

Pourus Asphalt

Concrete Unit Pavers

Map 1 – Landscape Hydrology Strategy

In keeping with the master plan goal of Civic Responsibility, the campus landscape hydrology concept will move towards a storm water containment strategy that alleviates pressure on the city's storm drainage system and captures on site pollutants before they can contaminate down stream areas. Some of the largest paved areas on campus are the numerous parking lots, and incorporating porous paving will significantly increase the sites storm water absorption rates. Porous concrete and asphalt contains between 15-25% voids that can soak up three to five gallons of water per minute per square foot, or between 270 to 450 inches per hour. (See outline specifications for more technical information) Being that this capacity far exceeds the annual rainfall of Palm Desert (3.38 inches) only certain sections of the parking lots need to be comprised of porous paving, such as the outer row of parking stalls and some interior areas. Specific capacity and drainage strategies should be worked out closely with the project Civil Engineer. Furthermore, by providing for zero curb conditions in selected areas, linear bioretention basins or bio-swales can be incorporated along the parking perimeter, which will allow pollutants to be captured and filtered before they reach overflow catch basins.

The campus interior will have a more eclectic mix of paving types that are overlaid by the main pedestrian promenades which were established in the Campus Framework Section. These promenades should contain higher-end materials than any other part of the campus, thus furthering their prominence throughout the campus. The two north/ south promenades will have the same paving type of integral color concrete, with hand seeded aggregate and a medium sandblast finish. Other additives, such as silica carbide and "pixy dust", can be added for further enhancement. This enhanced paving should carry through Alumni Road in the form of vehicular concrete crosswalks, to further the idea of a continuous promenade that connects the northern classrooms to the Library and McCallum Theater to the south. The main east / west promenade will be composed of similar material; however it should maintain a separate identity from the two north / south promenades. This paving type covers the largest open hardscape areas on the campus, therefore ,careful attention should be paid towards paving jointing to prevent any cracking or warping. Also, drains should be reduced within these large plazas and sheet flow into the perimeter landscape should be maximized. Furthermore, large areas of concrete can be broken up with an intermix of porous paving such as decomposed granite or concrete unit pavers.

The courtyards are envisioned to be the eclectic spaces within the campus, and can contain a variety of paving types. However, being that the courtyards accommodate a more static activity, porous paving should be maximized within these areas such as concrete unit pavers with permeable joints, unstabilized decomposed granite, or concrete with through-cut jointing. Also, some of the courtyards contain existing seatwalls which can incorporate slot drains or weep-holes at their base to allow for more drainage.

Map 2 – Paving Areas

The pedestrian paths that run north / south on either side of the Hilb Center and connect the quad to the north drop-off along Alumni Road, will be the third type of paving. These paths should be soft earth-toned integral concrete made from Type III Portland Cement, with a light sandblast finish. This paving type does not have to carry through the turf areas, but it is important that the quad is framed with a unifying paving material.

Landscaping

Planting Zones

The campus master plan is designed to use plants, not only for aesthetics and screening/buffering, but also to exploit their more functional uses as well. As mentioned in Section 3, Civic Responsibility is one of the overriding goals of this master plan, and using plants in innovative ways promotes this by setting an example and teaching the community about sustainable processes. Examples of this include maximizing planting along the southern and western edges of buildings to reduce solar gain and air conditioning demands. Also, by maximizing the planting area where possible, more pervious surface is added to the campus, which aids in storm water collection and recharging the aquifer. Similarly, these increased planting areas should group together plants with similar hydrological needs, which will help cut down on unnecessary watering. Plant species that require minimal maintenance should be preferred, which cuts down on college resources demands, and allows plants to achieve their natural character without the need for heavy pruning and manicuring.

Photo 1 – Understory Shrubs in Decomposed Granite

Strategic planting should also be used to increase microclimates throughout the campus by maximizing shaded pedestrian space. These shaded areas can provide protection from the harsh desert climate, and facilitate lush understory planting areas with little additional irrigation and minimized evapotranspiration.

Photo 2 – Planting in Decorative Gravel or Rock

Continuing with the goal of Civic Responsibility, the educational aspects of the campus landscape should be realized through an arboretum type approach that not only calls attention to individual plant origins and climates, but also other values such as medicinal, erosion control, habitat, culinary, inks/dye, phytoremediation, sustainable fuels/materials and more. This can be done through the implementation of plaques or other signage types throughout the campus, along with larger areas designed to showcase these functions through diverse planting types. An example would be to frame the Nursing Center courtyard with medicinal plants, or to incorporate a phytoremediation garden within the Environmental

Science Complex where students can incorporate classroom teaching with an outdoor laboratory; furthering the schools pedagogy of Active Learning.

The master plan has designated four planting zones that range from an arid periphery to a more densely planted interior, furthering the idea of having an interior oasis within a desert landscape.


Photo 3 – Kniphofia uvaria *(Red Hot Poker)*

Arid Periphery

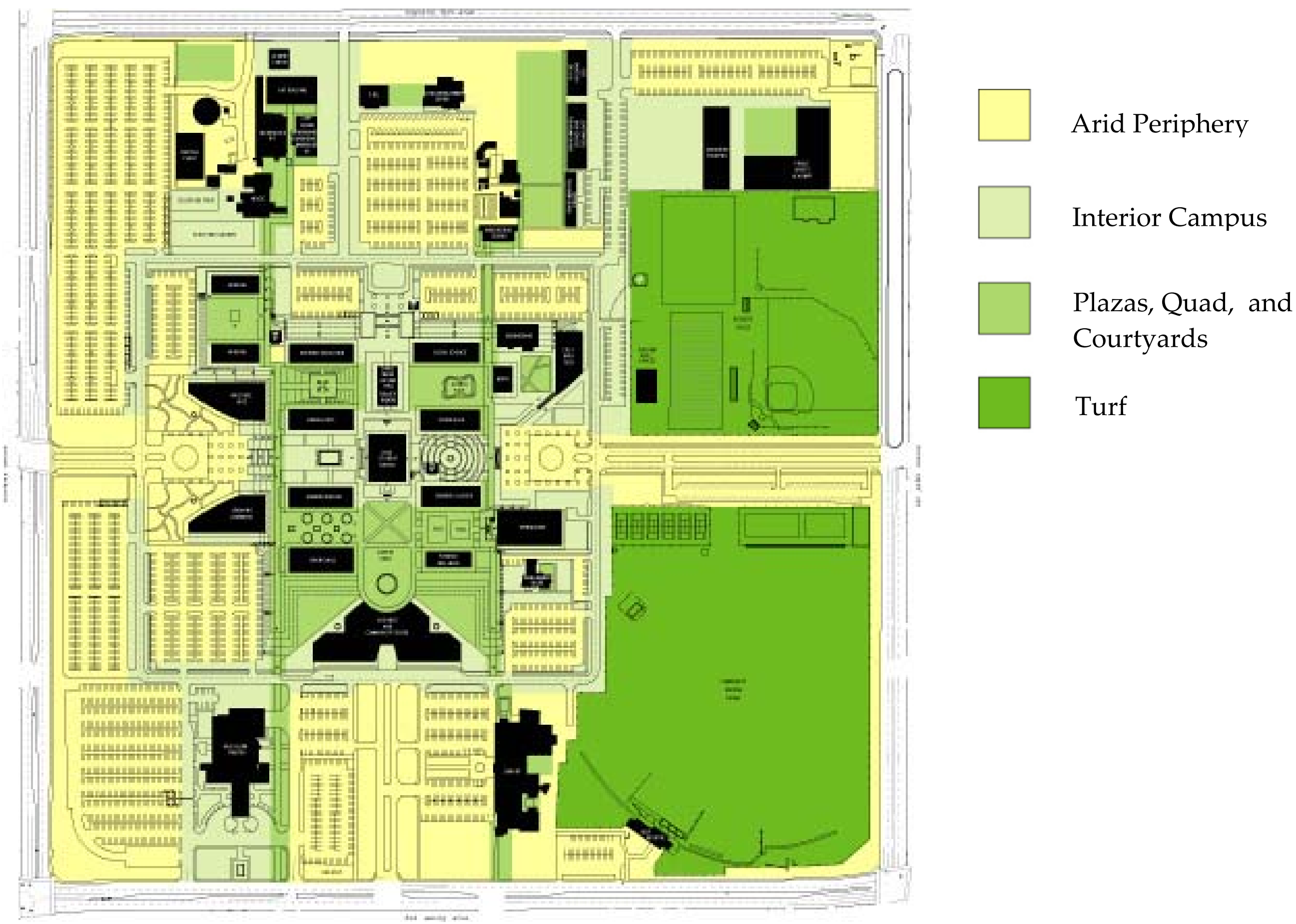
The campus periphery is envisioned to tie into the city of Palm Desert's streetscape treatment of native species; however this connection will not be an aesthetic duplicate. The city's methodology is to plant native species in the same aesthetic as found in deserts, with plants spaced four to five feet on center with plenty of decomposed granite in between, and minimal groupings of the same species. As part of establishing an identity for the college, this arid / native aesthetic will change along the campus periphery by using the same materials but in more artful and provocative ways. This zone should showcase the character of native desert plants through their unique color and textures. This not only calls attention to the college, it also displays different ways of using native plants within the community, thus breaking the stigma that using native plants must convey a desert vernacular of dirt and cacti.

The college is concerned with an increasing number of pedestrians that cross Monterey Avenue between Fred Waring and Magnesia Falls Drive. Presently, a majority do not use the designated crosswalks which is dangerous for both pedestrians and drivers. Therefore, the edge along Monterey Avenue should be densely planted to prevent random pedestrian crossings except for designated entry points. This dense planting should comprise a layered effect using multiple species of groundcover and shrubs that impedes east / west pedestrian access.

To prevent the effect of a visual barrier from the community, a tree species that has a high canopy height should be used along with the layered ground plane so that clear views into the campus will be preserved.

The second zone within the arid periphery is the three campus entries that will be lined with five rows of Date Palms, and call back to the agrarian history of the site. (See Landscape Master Plan & Guidelines for further detail about site history) These Date Palm bosques are envisioned to be quite minimal, with an elegant repetition of a handful of understory species in decorative rock or gravel. This shrub should have a sculptural quality such as an Aloe or Agave, and be no larger than four feet in height so that views into the campus are preserved and the vertical effects of the Date Palms are accentuated.

The Alumni Road landscape is the final zone within the arid periphery and will be lined with Mexican Fan Palms, the tallest tree on campus. This zone will be a continuous band that serves as the gateway or transition from the outside community to the interior campus. This zone also separates the perimeter parking from the interior campus, which will need an understory shrub that is a minimum of three feet in height to help screen the cars and asphalt from view.



Map 4 – Planting Zones

Athletic Field
The eastern third of the campus is athletic fields comprised of a community driving range to the south and baseball, football and soccer fields to the north. These fields should be maintained because they are recreational amenities within the community.

Interior Campus
The interior campus landscape should be planted with higher density and more groundcover than the periphery zone. This area includes the two main east / west ceremonial plazas, Hilb Center forecourts and the northern drop-off along Alumni Road. These areas should have a unique character, however, being that one can view these plazas from both Monterey Avenue and San Pablo Drive there should be some visual tie from the plazas to the arid periphery. This will enforce the idea of an exterior gateway that continues into the heart of the campus.

The two plazas are envisioned to be very active spaces, so the character of the landscape should allow for this by being open and providing shade. These areas are also comprised of many small planters allowing for a variety of understory trees and specimen or accent planting. This understory planting combined with the extension of the Date Palms provides for a transitional space between the grand scale of the entries and the pedestrian scale of the forecourts.

The two forecourts are the terminus of the gateway axis and provide a more passive, pedestrian space adjacent to the Hilb Center. These forecourts should be heavily planted with low canopy trees and dense shrub massings, which will help create a more comfortable gathering space for students.

Promenades, Quad and Courtyards
The two north / south promenades are envisioned to be quite distinct from their surroundings in an effort to acknowledge their prominence throughout the campus. These promenades will be lined with the same canopy tree from Fred Waring Drive, through the campus to the northern Arts and Environmental Science Complexes, which reinforces the linear connection between both sides of the campus that extends out to the community edge. With the strength of a single, linear tree species, the ground plane planting may differ between each axis. As mentioned in the Circulatory Hierarchy section (3. Site Guidelines, Page 14), the western north / south

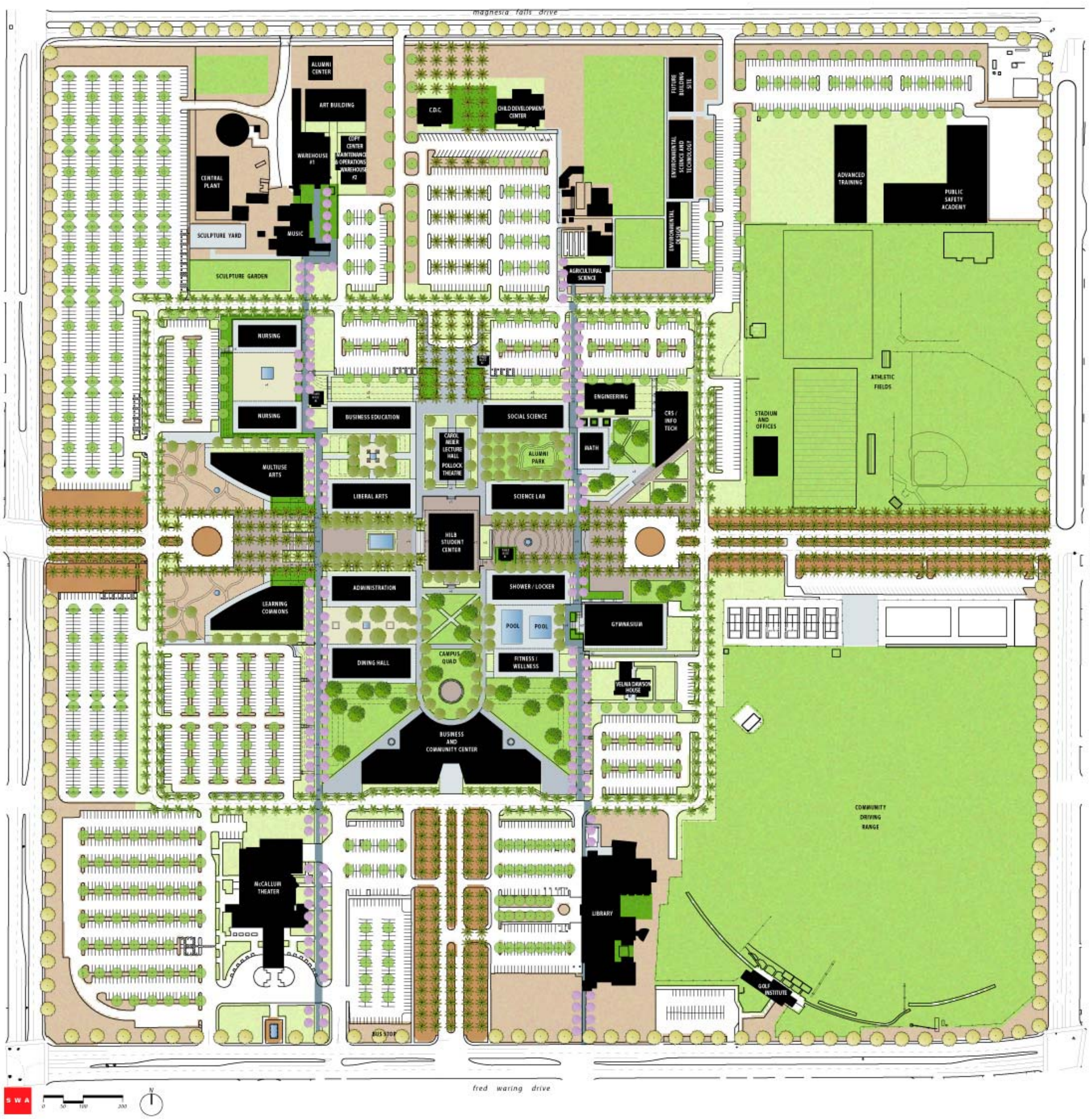
promenade should convey a character of looseness and creativity, while the eastern promenade will be more formal and utilitarian. These two delineations can be furthered through a creative ground plane planting scheme that will help create a unique experience along each promenade.

The campus quad will stand out as the symbolic heart within the campus core by both its function and aesthetic. The quad will be the largest area of turf on campus (with the exception of the athletic fields) that promotes a variety of uses, and will be heavily shaded by large canopy trees that help protect staff and students from the harsh summer temperatures. The tree species selected for the quad is Chinese Pistache (*Pistacia chinensis),* which is a deciduous tree that will loose its leaves in the fall and allow for maximum levels of natural light during the cooler fall and winter months. To accentuate the quad's linear character, a formal upright tree should be used to frame the space and help transition it to the taller Hilb Center and new Business and Community Center.

The courtyards are envisioned to be the most eclectic parts of the campus that offer a variety of uses to the staff and students, such as gathering, refuge and instructional space. Planting here should try to reflect what the adjacent building typologies are and what uses they require of outdoor space. Many of the courtyards have existing planting that may need to be replaced based on its performance, appropriateness to the desert climate and future courtyard program.

Irrigation

The College of the Desert currently does not have a campus-wide Central Control Irrigation System. The implementation of a computerized Central Control Unit (CCU), linked with project-specific Irrigation Control Units (ICU's), will efficiently control and monitor the use of supplemental water for irrigation. This technology will allow the College to closely and effectively monitor irrigation use, by providing customized watering schedules and water distribution for each automatic remote control valve; minimize excessive watering, and reducing staff maintenance time. Furthermore, the use of additional water-saving irrigation devices (master valves, flow sensors, moisture sensors, rain sensors, low-flow water emitters, check valves, and remote weather stations (monitoring ambient air temperature, relative humidity, wind speed and enviro-transpiration rates), coupled with a more native and drought-tolerant landscape plant palette, will collectively and dramatically reduce the College's potable water demands and in turn save a significant amount of money.



Map 3 – Proposed Campus Landscape Plan

Site Furnishings

Unifying Elements
To improve clarity throughout the campus, an overall system of unifying elements that "link" one end of the campus to the other should be implemented. This system should work together with the Circulatory Hierarchy strategy (3. Site Design Guidelines, Page 14) to create a coherent campus environment for the staff and students. A finer grain of materials will help differentiate space within select locations that are defined by the campus Spatial Network strategy (3. Site Design Guidelines, Page 18).

Campus Wide Art Program
The College of the Desert currently has a large outdoor sculpture collection, with sizes and locations varying throughout the campus. To further the goal of improving clarity on campus, the landscape master plan proposes moving existing sculpture locations to more strategic areas on campus, which will help with wayfinding, terminate vistas and create focal points throughout the campus. The master plan has designated two types of art/sculpture: Primary and Secondary. Primary art pieces are considered those that are large and can maintain a presence from a distance. These pieces will serve as campus focal points, and are proposed to be located at the four corners of Alumni Road, the two entry plazas, select areas along the community/campus edge, and several other locations within the campus interior. The secondary sculptures are considered as those that are smaller, unique to individual spaces, and rely more on a finer grain of texture and materials. These sculptures can be comprised of many smaller pieces that visually connect long distances, telling a story or artistic concept along the way. The western north / south promenade has been programmed as the Arts Promenade, and is well suited for many secondary art pieces, as well as a few primary ones.


Photo 1 – Outdoor Sculpture Precedence

Temporary installations should also be promoted and can have more flexibility in locations throughout the campus. Temporary installations can include those from the outside community, along with student work from the arts department, environmental engineering, architecture, and landscape construction classes. These temporary structures/sculptures allow the students to apply classroom knowledge through on site "mock-ups" and help give students pride and ownership of their surrounds while furthering the schools approach of Active Learning.

Map 1 – Proposed Art Locations (Orange-Primary Sculptures, Yellow-Secondary Sculptures)

Fountains

A key part of the landscape master plan are fountains that work together with the surrounding landscape to enrich the pedestrian quality of the plazas and courtyards. The largest existing fountain on campus is the Fountain of Knowledge and is located in the western Hilb Center forecourt. This fountain dates back to the original campus design and is very ceremonial in its placement being located along the western entry axis that creates a visual connection between the community and the campus. The fountain is currently in use, however in quite poor condition. The fountain rests in a large concrete plaza that gets very hot during the summer months, and a sign located next to the fountain prohibits student from coming into contact with the water. Redesign of this fountain to allow for more interactivity with the students along with increased planting and shade on both sides will help stimulate activity within the western forecourt to the Hilb Center.

Photo 2 – Passive Water with Organic Elements

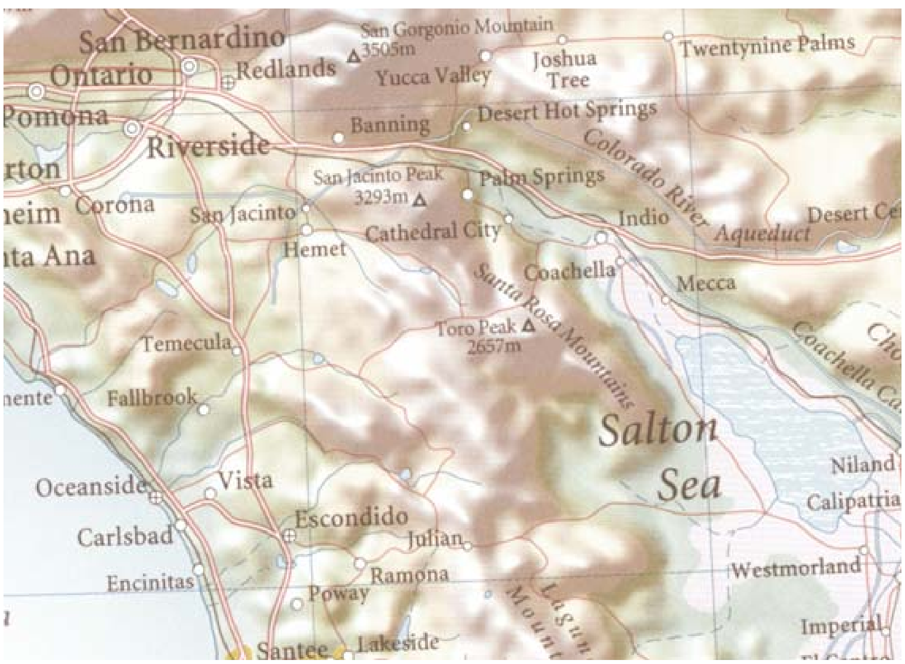
Photo 3 – Fountain of Knowledge with the Hilb Center in the background

Two other existing fountains are located in the northwest and southwest courtyards and have a more passive character. The landscape master plan proposes the addition of three new fountains that continue this passive character, and allow the Fountain of Knowledge to remain as the primary fountain on campus. Creating smaller water features help continue the landscape master plan goal of Civic Responsibility, by trying to preserve natural resources and celebrate the desert climate. Other possible fountain locations, not specified, are areas along the western north / south promenade that allow for a series of linear water features and help create a more unified experience along the promenade.

Site Signage Guidelines

Introduction

Signage communicates location and identity. At the campus entry, monuments mark the outer boundaries of College of the Desert. These signs can create a sense of welcome and express the quality of the campus. The exterior sign family includes a broad range of signs that are the first impression of the campus for most users. As such, site signage is essential in creating a comfortable, and ideally seamless, use of the campus. In creating the site signage guidelines, the priority it to create a place that serves the needs of its broad range of users.



How can graphics communicate the identity of a college campus? Durable materials and timeless typography convey the permanence of the institution. The public use of the campus dictates the use of standards of universal accessibility. This determines the size of type for both vehicular and pedestrian signage for legibility. In addition to legally mandated standards, we believe in using type with good contrast, which means using light type on a dark background. For vehicular directionals, either internal or external illumination will be used. Finally the signage needs to reflect the college as a place of culture and learning. The use of a cohesive, thoughtful and sophisticated design is a key part of sending this message.

By looking at the differing needs of user groups, a clear criterion is established for deciding appropriate sign messaging. Signage should be tailored to the distinct needs of two groups. First time visitors such as prospective students, special guests, community members and Street Fair guests. By listing a few key destination on vehicular directionals (admissions, guest parking, library, child development, Street Fair) signage can insure that the first impression of the campus is welcoming. Returning users include students, faculty, staff, community members, and alumni. These groups are more familiar with the layout of the campus and will generally be looking for more detailed information.

In addition to providing wayfinding information, signage will locate an important destination for a large portion of the community— a place they should feel proud to point out as they drive by. Signage sends key messages about the quality, accessibility and openness of the College of the Desert as a local institution.

Goals

The site signage master plan guidelines has two goals:

1. To make wayfinding information clear

- By identifying existing vehicular and pedestrian circulation patterns, as well as problem areas that need to be enhanced through new signage.
- By using circulation analysis to locate signs by sign type so that users receive information according to a logical sequence, with increasing levels of detail as one approaches the campus interior.
- By prioritizing wayfinding information with the number of destinations per sign type and the size of type by sign type and in accordance with the needs of different user groups. (For specifications by sign type see SECTION III, Chapter 16: Signage Design Criteria)

- By incorporating the principles of universal access in the sizing requirements of each sign type. The ADA and ABA Accessibility Guidelines for Buildings and Facilities are available via the internet at

http://www.access-board.gov/ada-aba/final.htm#pgfId-1010471

2. To use signage to reinforce the overall identity of College of the Desert as an educational institution located in the Coachella Valley.

- By requiring materials and sign forms designed to withstand the extreme environmental conditions of the area and that appropriate measures against vandalism and theft be taken. (For more detailed material specifications see Division 10, Section 10431-1).
- By making quality design a priority in order to communicate the deeper values of College of the Desert as an institution of higher learning.
- By addressing the unique role of signage to identify the campus as a valuable resource to the campus community, broadly including students, faculty, staff, alumni and the City of Palm Desert.
- By using palettes of materials, forms, color, light, pattern and type that draw upon indigenous cultural and ecological resources such as iconic architecture, desert plants and the fundamentals of modern design that dominate the existing infrastructure of the campus. (For font specifications see SECTION III, Chapter 16: Signage Design Criteria)

Circulation Patterns and Sequence of Entry
In mapping circulation patterns, one can identify the key locations and assure that users are getting the right information at the right time. The following diagrams identify points of vehicular (fig. 4d.1) and pedestrian (fig. 4d.2) entry and key decision-making points.

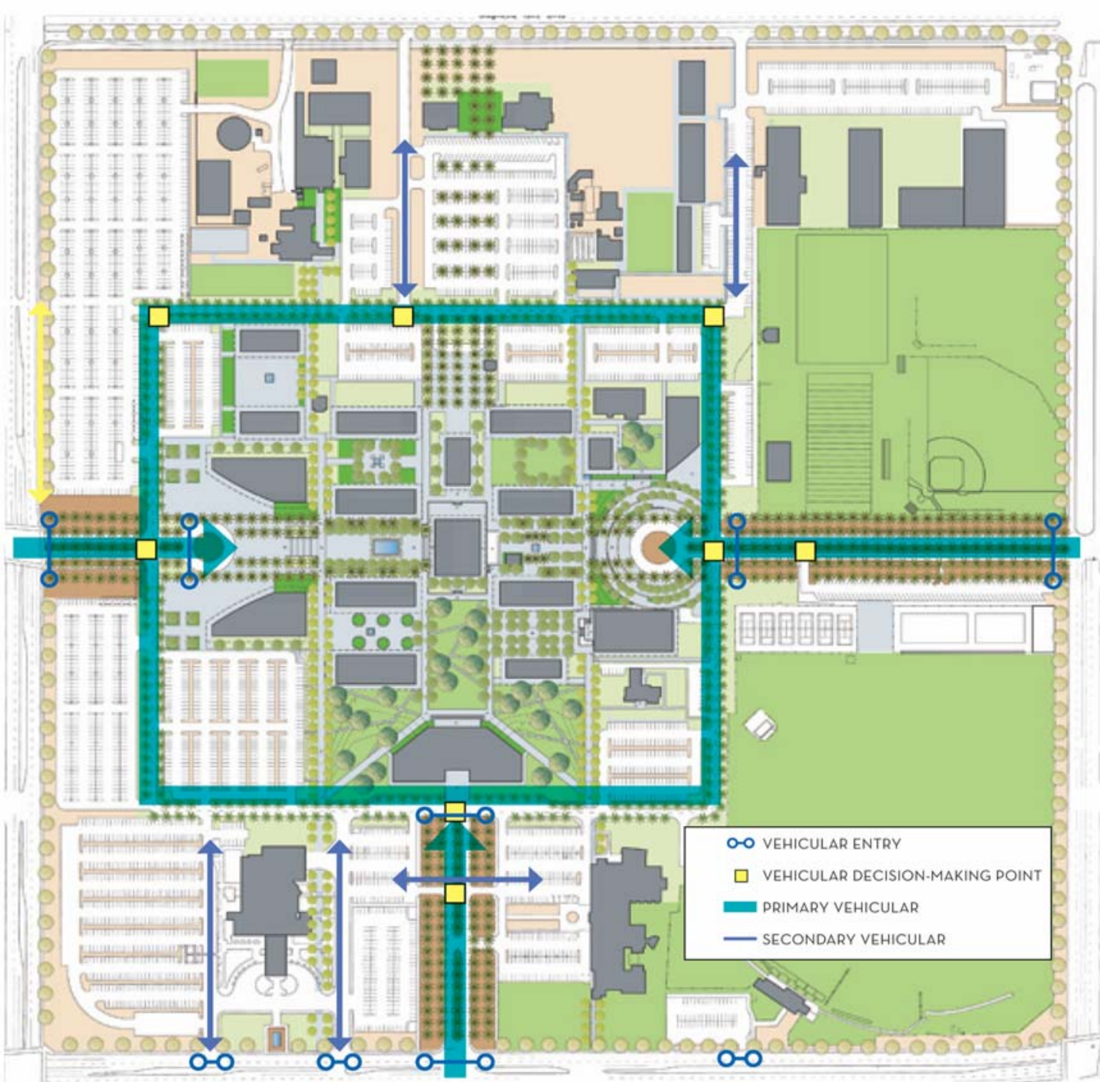


Figure 4d.1
Vehicular Circulation Patterns

Site Signage Locations
By identifying these circulation patterns, the location of each sign is part of a larger strategy to make the sequence of entry accessible, logical and comfortable. In addition, wayfinding information is organized so that primary destinations for first –time users are balanced with the wayfinding needs of students, faculty and staff. Following this program establishes major entry points along the campus perimeter at Monterrey Avenue, Fred Waring Drive and San Pablo Avenue. There are special considerations along Fred Waring with the entry to the community library, which should be taken into account when developing the messaging.

With final implementation of the master plan and the construction of new buildings, these circulation patterns may change. With changes in circulation patterns, sign locations and quantity should change accordingly.

Along the vehicular circulation sequence, primary vehicular directionals direct drivers to 4-6 primary campus destinations. They are located on the right side of the access roads, before the Alumni Ring Road to allow users time to position their vehicles for a left or right turn. Secondary directionals include a greater number of destinations, including destinations of particular interest to prospective students and community users. These are located to the right of major traffic flow, adjacent to these secondary destinations. Street signs identify North, East, West and South Sections of Alumni Road. These orient the user and are invaluable for giving verbal directions. Parking lots should be given unique numbers. Parking lot signs are located along Alumni Road. Each sign includes the lot number, adjacent building(s), and any exclusive use information, such as student parking only.

For pedestrian circulation, the entry into the interior campus is marked by a directory sign located to the right of the major access corridor. The directory acts as a welcome center for guests to familiarize themselves with the whole campus layout as well as find specific destinations. The directory includes space for student flyers as well as a changeable case for campus information. Pedestrian directionals are located in several destinations throughout the campus. They supplement the directories by pointing out up to 6 destinations. The messaging should include nearby destinations, such as restrooms and other campus amenities, but may also include other important campus destinations, like the Learning Commons. The directional also includes a case for a small campus map. The footprint of the directional is small to accommodate areas of heavy pedestrian traffic.

These guidelines recommend careful consideration of the location of the visitor parking kiosk(s). The kiosk(s) should be easily accessible to entering guests, but the numerous campus entries complicate the decision. There are two possible solutions:

- Multiple parking kiosks, one along each entry throat to the left of vehicular traffic to allow easy access for drivers from their cars.
- One parking kiosk easily from the main Alumni Ring Road, possible in to circular drive on the West side of the campus.

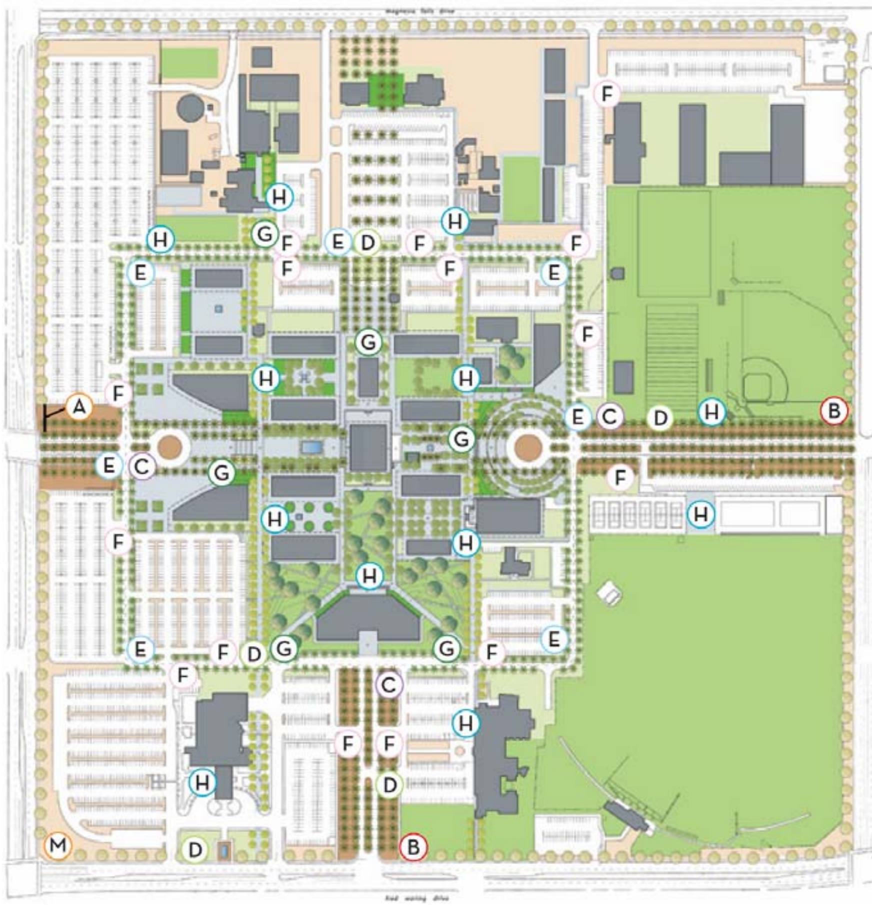


Figure 4d.3
Site Signage Plan:
A. Primary Entry Monument (Internally illuminated)
B. Secondary Entry Monument (Internally illuminated)
C. Primary Vehicular Directional (externally illuminated)
D. Secondary Vehicular Directional (externally illuminated)
E. Street Signs (Optional lighting)
F. Parking Lot Signs (Optional lighting)
G. Directory (Internally Illuminated)
H. Pedestrian Directional M. Electronic Readerboard (Optional)

Additional Design Considerations: Palettes

Site signage is intended to grow out of the College of the Desert, its needs, its personality and unique attributes of its location. A key part of expressing these qualities is using a palette of materials, forms, color, light, pattern and type. The following guidelines draw upon indigenous cultural and ecological resources such as iconic architecture, desert plants and the fundamentals of modern design that dominate the existing infrastructure of the campus.

Materials

Materials were chosen for their connection to local traditions and the need to balance a traditional and modern appearance. The entry monuments will be the most referential in their adherence to the local architectural heritage, with a combination of stone and brushed stainless steel. The directory also incorporates formal elements of desert modernism with an angled trellis of parallel wood slats. The remaining sign types acknowledge local conditions through durable painted metal.

Form

Forms will echo the local tradition of geometric planes, minimal lines and a careful attention to proportion. Vehicular signs will be horizontal. Pedestrian directionals will be vertical with a small footprint.

Color

The color palette is inspired by the local landscape both in specific colors and in terms of the use of proportion. Like wildflowers, color will be used to draw attention and is an important element in creating visual hierarchies. Neutral hues will dominate. All colors will be drawn from the local landscape.

For exterior signs, a warm monochromatic palette of neutrals is recommended with tan, browns and accents of orange. Bright colors are isolated to the edges of signs, as an accent. On dimensional letters, the returns are painted bright colors. Sign types C through H should employ the same palette so that guests become accustomed to looking for wayfinding information according to a coordinated set of signals, including color. Additional sign types, should use a related and overlapping palette, but may add additional colors in order to clarify information. One such sign type is a secondary parking sign that mark areas for visitor, student and faculty and staff parking.

A color coded system that draws upon local flora is recommended as follows:

- Visitors: red ocotillo
- Students: light green cholla
- Faculty and Staff: purple chia

Light

Light transforms the mood of an environment. At sunset, the desertscape is transformed into dramatic silhouettes and shadows. This model inspires the idea of how the campus can remain a vibrant environment after dark. In the cool summer evenings, people can enjoy the evening walks without the worries of a blazing sun.
In accordance with City of Palm Desert Lighting Ordinances, lights are used sparingly. All internally illuminated signs are light only from the edge of the letter, with a minimal glare. Other sign use external illumination in concealed fixtures.

Type Guidelines

Neutraface is the dedicated font for the entire College of the Desert sign family (SECTION III, Chapter 16: Signage Design Criteria, Fig. 4d.4). This choice is a good match to the campus' location in the Coachella Valley, where the modern architectural pioneer Richard Neutra lived and built some of his most famous buildings, using a similar type style.

Neutraface was designed by Christian Schwartz in 2003, and is available from House Industries. This face has a large family of weights for creating visual hierarchies.

5. Building Design Guidelines

Architectural Design Guidelines
Interior Space Planning
Signage Guidelines

COLLEGE OF THE DESERT

Architectural Design Guidelines

Architectural History
Architectural history of the campus and its relationship to a new vision for the campus as discussed below.

In Section I the overview contains a very detailed history of how the campus came into being and how the architecture was begun. The text intends to explain what the decisions and strategies were that the architects used to invent College of the Desert. A rich and appropriate architecture to the desert was formulated and with the passage of time exists and still works well. The architects themselves, have also proved lasting, in that they have all been identified as important in the continuum of the development of architecture both regionally and nationally.

Palm Springs Visitor Center, 2005

The college has identified that College of the Desert's rich architectural history is a legacy that should be continued. The architectural traditions must be respected and at the same time one must look toward the future. The original architects developed a style that is a variation of modernism uniquely formulated for the Coachella Valley. It is an inclusive style of clarity and economy. It is a style that reflects all cultures, by not referring to a specific style or historical reference.

Sustainable architectural concepts were foremost in the minds of the original architects. The desert climate is one which is extremely harsh in the summer and mild in the winter. The campus buildings are oriented on a north/ south grid to minimize their exposure to the harsh western sun. A key architectural feature of the buildings is the colonnade which surrounds every building. The colonnade provides both an aesthetic effect, and it provides a practical effect in its ability to allow students to retreat from the sun while walking to classes. The colonnade also shades the exterior walls of the building from the high angled summer sun and allows the lower angled winter sun to hit the building providing warmth. The inspiration for the design of the colonnades' column and beams supports which are expressed clearly in the palm tree. Concrete was chosen as the primary building material because of its relatively low cost (in the 1960's and 1970's), its' durability (it doesn't break down in the hot dry climate) and its ease of maintenance (it doesn't need to be refinished). Concrete as a building material is a great choice in a desert climate. Concrete can be integrally colored as it is at the college, so that it does not need to be painted. The color of the integrally colored concrete was derived to allow the campus to fit in with the colors of the rugged local hills.

"Respect the architectural traditions and look toward the future."

Relationship to the Master Plan

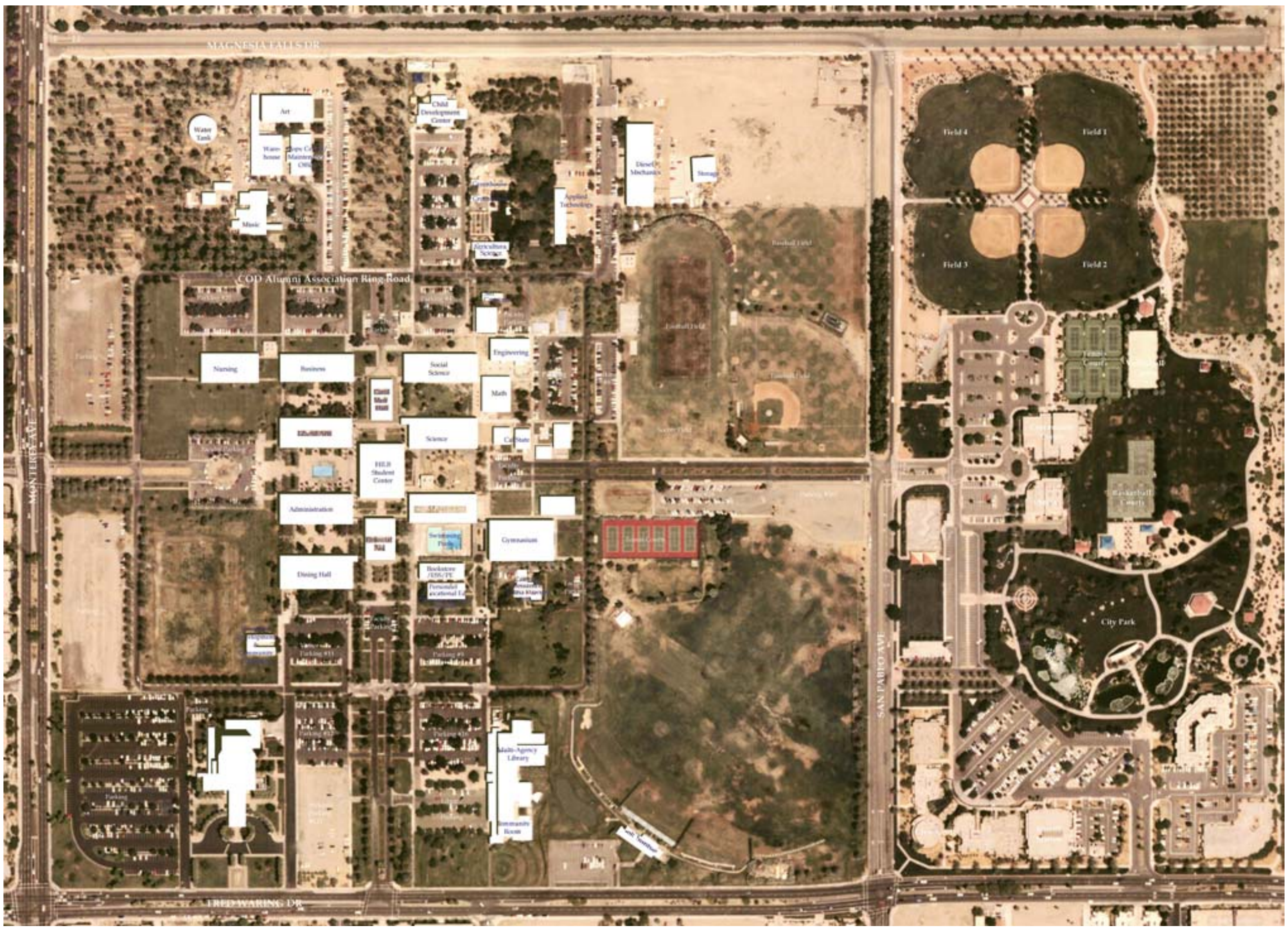
The newly Proposed Campus Plan illustrates buildings that strengthen and reinforce the intent of the original campus. Way-finding is the overarching principle. How can identities be established? There are buildings that should play the role of supporting buildings, and buildings that will assume the role of objects. The plan promotes a new vision for a campus wherein each entrance has a different and unique expression or character. A new visitor should understand exactly where he or she has arrived because it is different than any other part of the campus.

Each entrance should, looking in an introverted manner, have buildings that support the buildings that are planned as objects. Also, each entrance has a role in an extroverted manner that allows focus from within the campus to the distant dynamic natural landscape of the San Jacinto and San Gorgonian Mountains. At the individual building level, the architecture should have a fundamental relationship to the natural environment. The natural views, both distant and near, should be captured carefully with the intent of creating uniqueness for the inhabitants viewing from the room.

Building Mass and Proportion

The campus massing was planned clearly and directly. To speak of the campus massing however it cannot be separated from the massing treatment of the land. First the buildings were all raised on a plinth, elevated to rise slightly above the single story residential housing that bounded two sides of the site. The plinth allowed the building complex to have unrestricted access to cooling desert winds from any direction. The plinth idea also worked well to satisfy the desire of the college to convey the concept that the building complex is located on a grand plinth which signifies "higher education".

Compact shapes are ideal in a hot arid climate with some elongation on the east-west axis. The optimum shape for a building in this region is of a proportion of 1:1.3. The original buildings all conform to this ideal. The masses are single story, low to the ground and all very similar. The building massing corresponds with the buildings' role. The role of buildings in the central campus including the Liberal Arts and Administration Buildings are single story flat roofed buildings completely surrounded by a colonnade. The building massing is not differentiated in any substantial way. The buildings look identical. The only exceptions are the Hilb Center, and the McCallum Theater. The Hilb Center was identified early on the colleges formulation as the "one noble building" which would dominate the site and give majesty to the campus. The McCallum's shape reflects the unique nature of a performing arts venue.



Campus Aerial Photo, 2004

New building massing should be used as an aesthetic device to express strong spatial character, add new elements to the architectural vocabulary and illustrate to the community, regional consciousness. This regional consciousness can express itself in many ways and can be responded to as a direct and concerted effort of the college to be good stewards of the communities' funds and long term goals.

Expression to the community will occur by realizing the goals of the Master Plan to reinforce the campus axis and create welcoming "front door" building complexes. The entry from Monterey Ave. will have two new buildings, part of the Learning Commons. These buildings should be sympathetic to the older buildings, but can have a new identity unto them. The buildings will likely be two stories high and can have a unique form and roof structure. The Learning Commons buildings are the beckoning buildings that are intended to be the first place that a new student visits upon entering College of the Desert.

Expression to the community is the responsibility of the buildings of the business and community center at the other "main entrance" to the campus, at Fred Waring Drive. Again the placement and massing of the building is to enhance and strengthen the original campus. The Business building will be two stories high and can have a unique form and roof structure. The building will be the lasting impression of the campuses regard for the student.

Building massing, should also allow the reading and transference of interior functions. This can occur by varying the dimensions of the massing to achieve variation. Any variation in mass should occur for a good reason, and be sympathetic with the existing architecture.

Exterior Material and Color Palette

Existing Campus Materials

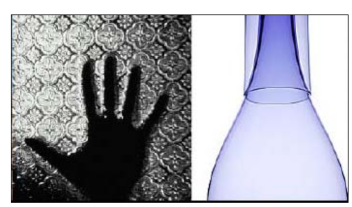
When one thinks of the COD campus, one material and color comes to mind. The original architects chose concrete as the material for structure and solid wall panels because of its ability to withstand the punishing sun and extreme temperatures. They chose an additive color that they mixed with the concrete mixture that provided a color to match the native color of the rocks. This was a great choice because the original materials have withstood the climate, normal use and the campus looks almost as good as it did when the buildings were constructed. Other materials have been used on campus to lesser degrees of success, mostly for economic reasons, such as metal panels, stucco and wood. As is evidenced by the many improper placements of these materials, proper placement is key. Metal panels now can be finished with a Kynar finish which will withstand the punishing direct sun. Wood should only be used in areas like eaves or in building interiors. The other materials are window systems that exist within the concrete framework. The window and door systems have held up well.

Material Selection for Future Projects
Materials and colors selected for future projects should be appropriate to the hot and arid climate, sympathetic with the existing buildings, intended to last 50 years, and consistent per quadrant of the campus. The appropriateness of the materials and colors can be defined by how well the materials and colors contribute to creating harmony in mass, scale, form and color, to the context, thus establishing desirable learning environments and creating memorable experiences.

The direction for new construction and modernization materials is to follow what works well in the desert and corresponds with the Desert Modern style. A combination of raw stone, glass, stainless steel, concrete and wood is the hallmark materials of the "desert style". These materials have proven to last well in the desert climate. The materials can be expressed in their natural states and resultantly will strike at the heart of the intent of the original campus design concepts of clarity, economy and truthfulness. These materials convey a sense of pride in the history and uniqueness of the community. They correctly echo indigenous architectures. These durable materials convey legacy. A balance must be achieved by using the cool modern materials of concrete, metals and glass with richly textured and comfortable natural stones and wood.

Interior Wood

Materials for the Future
Appropriate materials will be ones that can withstand the elements with little or no maintenance. As mentioned, poured in place or pre-cast concrete is an excellent choice, but it can be cost prohibitive. A related material, the concrete masonry unit, has the same attributes as the pre-cast or poured in place concrete, but at a substantially lower cost. Metal panels finished with a Kynar 500 painted finish or a poly-modified plaster with an integral color are good choices. Another material that is used on campus is natural stone veneer. Care must be taken in its' installation and in its' appropriate positioning on the façade with the correct orientation. Natural stone veneer can be an expensive material. The overall guiding principal is that the material type, use and color should be consistent with the intent of the campus quadrant and sympathetic with the adjacent buildings.



Campus Exterior Building Colors

Existing Colors

The College of the Desert campus has an extremely consistent color and material palette which give the college a sense of unity, and clear identity. The coloration imparts a feeling of permanence and quality. These are great attributes for a campus. However, the campus aesthetic has been criticized for the very same points as being too much the same.

Colors for the Future

Coloration can be used to affect way-finding and provide function differentiation. Generally, the exterior colors should be highly reflective in tone on surfaces facing the sun (east, west, south). The colors should be lightly toned muted colors such as the desert sand or the light green Palo Verde plant. The color palette must originate from a natural Coachella Valley source. Dark absorptive colors or deep bright hues can be used in areas where reflection from the surface to the interior of the building will occur (eaves, building alcoves). These colors again need to be rooted in the Coachella Valley hues and used sparingly.

Bright colors that are rooted in the desert flower colors can be used in a similar way to the way desert flowers bloom in the desert. The desert is predominantly colored with light sand or very light sage colors. Then occasionally, there is a desert flower that is in striking contrast to the blandness and sameness of the overall tone. The bright bloom draws attention to itself because of its uniqueness. Special building features such as a few entry columns or a special roofs' fascia can mark the campuses unique qualities and aid in way-finding.

Facades and Fenestration

The desert climate is hot and arid. Heat gain from the direct sun will be the largest energy burden that the buildings will have to overcome. It is vitally important to utilize sustainable concepts for every decision concerning any aspect of the envelope of a building. This is especially true for the facades, and fenestrations.

Facades

Currently, the campus building facades are sedate, very horizontal in nature, and scaled to students. The ubiquitous covered walkways are scaled to be comfortable for pedestrians. When the observer is a distance from the buildings the building scale becomes scale less. The buildings seem to stretch out and continue forever. The building facades also give no indication of what building functions occur within them. The master plan identifies the need to change this perception of the college.

There is a great opportunity to bring vitality and life to the facades of new buildings by allowing them to perform various tasks. The first task and probably most important, is the imperative to keep the hot sun off of the buildings in the spring, summer and fall. The heat energy needs to be absorbed outside the envelope of the building. This can be accomplished by employing various types of sun-breakers. Sun-breakers can take the form of colonnades, (as they do now) sun shading devices, both within the building as well as outside the building, trellises, and vegetative shading (trees and bushes). Sun-breakers can be used as aesthetic devices to express strong spatial character, add new elements to the architectural vocabulary and illustrate to the community, regional consciousness. This regional consciousness can express itself in many ways and can be pointed to as a direct and concerted effort of the college to be good stewards of the communities' funds and long term goals.

Care should be taken to shape the shading devices according to the changing seasonal sun path for both summer shading and winter heat gain.

The second task of the building facades is to reflect and promote the functions that occur within the buildings. Building massing, coloration and visual connection to building interiors can allow the reading and transference of interior functions. This can occur by varying the dimensions of the massing to achieve variation. Any variation in mass should occur for a good reason and be sympathetic with the existing architecture. Compact shapes are the ideal in a hot arid climate with some elongation on the east-west axis. The optimum shape for a building in this region is of a proportion of 1:1.3.

The third task of the façade is to be responsive to its orientation. Of course external shading of a façade is optimal, however if this is not possible relatively small openings are preferred. Windows should be set high in the wall to protect from ground radiation. Openings should be tight-closing as protection against high diurnal heat. Openings should be located on the south, north and eastern building sides. The largest openings should be placed on the north side.

Fenestration

Existing Fenestration

The existing building fenestration is systematized and consists of small openings presumably to limit heat transference through the window systems. The fenestration patterns are predictable and eventless. There seems to be no priority given to views in or out of the buildings. There are great opportunities to change the approach to fenestrations to reflect the master plan goal of revealing interior functions.

Approach to Fenestration in New Buildings

Great strides in creating window systems that limit heat gain and transference have been made in recent years. Now it is possible to provide large expanses of glass in a building to allow visibility both into the buildings and out of the buildings satisfying master plan goals. In this hot and arid climate it is important to shield windows from direct radiation. Various types of window shading systems must be employed including awnings, sunscreens in the horizontal and vertical planes, perforated screens and roof overhangs or projections. Window shading elements should be separated from the walls or structure to expose them to wind convection. Window shading elements vary enough that this can be utilized as an aesthetic to help differentiate each building. This will be discussed further in the Sustainability Section.

Window opening size should be appropriate for each window orientation. Southern, eastern, and western facing window openings should be limited in terms of opening size, while northern facing window openings can be expansive. Care must be taken to limit windows from touching the ground because heat radiates from the earth or hard paved surfaces through the window system into the building.

Window and Door Mullions

In order to give definition and way-finding to the central campus buildings, a strategy was developed to paint the window and door mullions and door panels a specific color per building. The colors range from natural finished aluminum, to turquoise, to burnt orange. Future remodeled and new buildings should use clear finished aluminum door and window mullions or in the event of the use of metal systems utilize a gray paint color that can approximate clear finished aluminum anodizing.

Glazing Color Definition

The consistent window color on campus is Graylite 14. This was due to the ability of the dark window color to limit transference of heat. The dark color works effectively to reduce the suns effect, however it limits direct visibility. Recently, green reflective glass has been used reaping the same heat reduction benefit as the gray glass, but it has somewhat better visibility.

The best option is to use green colored 1" insulating units with a low e coating. This glazing system offers a high performing shading coefficient important in reducing/limiting heat absorption, heat transference and glare, while providing almost complete transparency which satisfies the colleges desire to allow visibility of the college's program offerings.

Arcades

The primary iconic image of College of the Desert is the arcade. Arcades surround almost every building. John Carl Warneke, the planning architect for the campus, instigated the use of the surrounding colonnade whose form echoes the Date Palm groves that were so prevalent in the surrounding area. He realized that if he surrounded the building with this device it would serve many purposes. Primarily the colonnade serves to shelter students and staff as they negotiate between buildings. The device also serves to shade all the vertical surfaces of the building reducing the direct heat gain. Aesthetically, the device gives rhythm and modulates what could otherwise be a dull façade. The device also serves as a transitional element allowing occupants to move from inside to outside smoothly. Finally, in the desert colonnades equal shade and a welcomed respite.

Future Arcades

Every future building should be surrounded by arcades. Arcades are the most direct way to be environmentally sensible. The original campus arcades are constructed of pre-cast concrete columns and beams. This style and material choice can be employed once again for all buildings in the original campus area. Arcades can also take a different tact. On the planned gateway buildings for instance, the arcades could be constructed of different materials and have different unique forms. The arcades need to provide shelter, rhythm, scale, hierarchy and shade building walls. The only other dictate is that the arcades must be constructed of materials that will withstand the climate.

Sun control devices

All windows need to be shaded with horizontal or vertical shading devices depending on the openings' orientation. Shading devices will be employed whenever there is not an arcade. Sun control devices act as a filter to absorb and control solar radiation. Sun control devices should also be used to refract light into a space so that no direct sun enters a building. Sun shades are most effective when they intercept and halt heat radiation before it enters the building envelope. Radiation must be stopped outside the building envelope and dissipated into the outside air. The most effective sun shading devices are ones which are separated from the building structure and exposed to wind convection. Sun shading devices can take many forms and shapes. Hybrid solutions incorporating horizontal and vertical sunshades are most effective.

Horizontal Sunscreens

Horizontal sunscreens can take many shapes. As mentioned above the best type of shade is one which is disassociated from the buildings structure so that heat can not transmit from the exterior shade into the interior of the building. Horizontal sunscreens can take many shapes. Horizontal sunscreens can be solid cantilevered elements placed directly over the window opening. The sun shade can be constructed of louvers so that wind can dissipate the build-up of heat. And the best solution is a sunscreen that is positioned just below the top of the window both inside the building as well as outside. In this position the sunshade can directly shade the majority of the window while allowing some light to hit the internal sunshade and diffract upon the rooms' ceiling. In this manner the diffracted light can reduce substantially the amount of direct light and therefore the necessary electrical load.

Vertical Sunscreens

Vertical sun screens grew out of the necessity of reducing heat gain and glare in the Coachella Valley. The sun shade can express strong spatial character, add new elements to the architectural vocabulary and phrase a truly regional consciousness. The chosen pattern should be reflective of the campus quadrant that the building lays within further promulgating the concept of way-finding.

Interior Shading Devices
A secondary method of sun shading that should also be employed is the interior sunshade. Inside shading protection devices can only intercept the solar energy which just passed through the glass surface and can eliminate only that portion of the radiant energy which can be reflected through the glass again. Some of the energy striking the interior device is absorbed, convected and reradiated into the room. There are many types of interior shading devices. As a rule, white colors must be used. Dark colors absorb up to 40% more energy than a white or off-white color. Roller shading devices are slightly more effective than Venetian blinds.

Natural Light
The desert environment's best asset is the profundity of natural light. Cloudy days are a rarity. Taking advantage of this natural light is an imperative. However, care should be taken to make sure that no direct light enters a space and that the indirect light drawn in does not adversely effect the functions performed there-in. Natural light can be drawn into the building in various ways.

The simplest way is to draw the light into the space from a window. As addressed above in the sun shading section, light can be diffracted off of a sun shading device and reflected onto the ceiling. This is a most effective way to bring in a lot of light with little or no heat gain.

A second option is to use a skylight that penetrates through the roof. There will be heat gain in the skylight shaft, and using a diffraction screen is a must so that no direct light enters the space. A third option is to use light monitors to bring light into the space. Ideally the light monitor should be oriented so that the windows face north and no direct light/ heat gain can occur through the glass. The light monitor also provides the ability to have operable windows or vents placed in the monitor shaft allowing heat to vent outside.

Natural light incorporation is extremely important to, not only reduce electrical loads but also to create an enjoyable environment for students and staff to work. It has been proven that buildings that incorporate natural light into a space versus building spaces without natural light actually increase student test scores.

More information is presented in "Section III, 17. Sustainable Design Criteria".

Evening Use

At College of the Desert, night time classes account for more than half of the entire courses offered. So, special attention must be paid to creating an environment at night that is safe and attractive. In the cool summer evenings people can enjoy the evening walks without the worries of a blazing sun.

Light can transform the mood of an environment. Much like the desertscape's transformation into dramatic silhouettes and shadows at dusk, the evening provides a palette to further express campus offerings and reinforce way-finding. Colored lights will transform the campus into identifiable, memorable parts.

Interior Space Planning

Space Planning Guidelines
The success of architecture lies in achieving a balanced relationship between the site, the building's mass and the interior. This section focuses on the interior of a building. The interior has a direct tangible relationship to the other components of a successful architecture and is the realm that students will spend the most time in. Interior architecture should exploit the interior spaces of a work of architecture by means of color texture, lighting, furniture and activity grouping so as to make the space efficient, comfortable, psychologically appealing and sensually and mentally stimulating for the specific users. The natural views both distant and near should be captured carefully with the intent of creating uniqueness for the inhabitants viewing from the room.

College of the Desert's architecture is very pragmatic, systematic and lacks color differentiation. When working within the existing architecture, interiors can be sympathetic with the original design intent with the caveat that any intervention should attempt to create a comfortable environment. Another tact would be to create an interior architecture that uses the simple palette and grid to contrast with. Curvilinear forms, strong colors and materiality can create a dynamism that clearly illustrates what is new and what is original. Color can be used to differentiate each building and reflect the unique course offerings of the college. Remember that the campus is used as much if not more in the evening when the interiors can be seen by passersby which can aid in way finding.

In the new buildings, building entrances should be specially treated with unique colored walls or special natural materials that can be read through the lobby windows. This use of color and materials can create the difference between public and private spaces. Lobbies and corridors could be rendered in lively and interesting colors and forms that would then differentiate them from private spaces such as classrooms, study spaces, labs, etc. The private spaces should be thoughtfully rendered to create a specific or professional look befitting the use. Business environments project a formality or mood within which students act more respectfully and then can transfer that experience and comfort level to their future working environment. This differentiation between private and public spaces helps the users comprehend what their territory, is and to feel comfortable knowing that they are in an appropriate space for what they want to do.

Color
The exterior of the campus buildings express what occurs within the building allowing passersby the opportunity of experiencing the many programs offered by the college. The interiors of the buildings have the same opportunity to express what uses or functions occur within the building. Spaces with unique colored walls or special natural materials can then be read or seen as one walks through the campus in the evening. Because more students attend classes during the evening than during the day, colored spaces can aid in way finding. Color choices should be planned at a macro level to clarify way finding.

The use of color and materials can create the difference between public spaces and private spaces. The public spaces such as lobbies and corridors should be rendered in colors that are lively and interesting versus the private spaces such as classrooms, study spaces, labs, etc. which should be thoughtfully rendered so that the environment created is a of a professional nature befitting the use. Business environments project a formality or mood within which students act more respectively. Business-like interiors elevate the environment from a K-12 level environment to a professional environment which allows students to directly relate their experiences and comfort level to their future working world.

Sustainable Design
As discussed in Section I, Overview, the College of the Desert embraces the goal of Sustainable Design. Careful attention to interior materials is an important part of creating a healthy interior environment. Proper color selection, particularly brightness, is an important aspect of natural lighting schemes. Interior designers are encouraged to work closely with Architects and Engineers to achieve the goals of synergies in Sustainable Design.

Signage (Exterior and Interior)

Building Signage

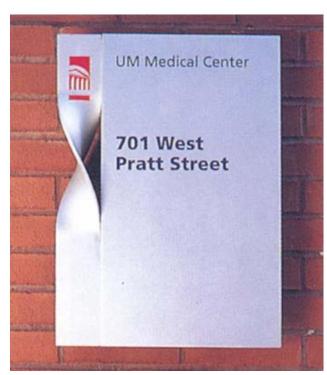
Introduction

Building signage is fundamental to campus wayfinding. Exterior signage must withstand environmental conditions and potential vandalism, as well as effectively communicating to campus users. The uniform design of the majority of campus building, as well as multiple entries and exits, requires more signage. This suite of building identity signs is outlined by sign type in SECTION III, Chapter 16: Signage. In addition to these specifications, all signs should follow a minimal modern design aesthetic drawn from the formal language of the Coachella Valley. This section of the guidelines also includes with a few additional ideas that bridge the territory between architecture and graphics– the concrete block sunshades that could be used to add a distinctive visual element to buildings and additional specialty graphics. By using different patterns, in sunshades, paving and/or banner, graphics could help users to easily identify major corridors and individual buildings. In addition building identity signs, these guidelines include smaller signs for both interior and exterior doorways. These smaller signs must meet a set of ADA guidelines outlined within the descriptions of each sign types in SECTION III, Chapter 16: Signage . For material specifications by sign type see Division 10, Section 10431-2

Goals

The building signage master plan guidelines has the same two goals as the site signage:

- To make wayfinding information clear.
- By creating an easy to follow set of guidelines regarding the number and size and building-mounted signs, see SECTION III, Chapter 16: Signage, Fig 4d.4 .
- By incorporating a flexible system that allows for blade signs, vinyl on glass and room plaques.

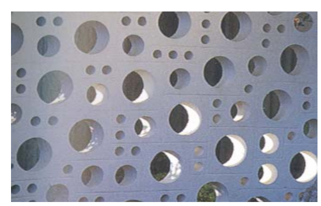


- By incorporating the principles of universal access in the sizing requirements of each sign type. The ADA and ABA Accessibility Guidelines for Buildings and Facilities are available via the internet at:

http://www.access-board.gov/ada-aba/final.htm#pgfId-1010471

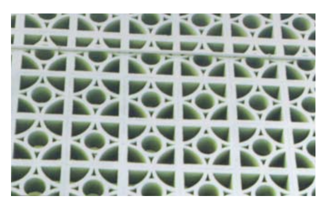
To use signage to reinforce the overall identity of College of the Desert as an educational institution located in the Coachella Valley:

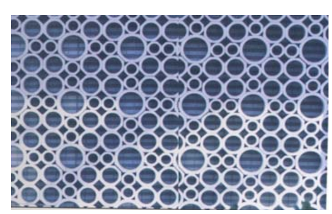
- By requiring materials and sign forms designed to withstand the extreme environmental conditions of the area and that appropriate measures against vandalism and theft be taken. (For specifications by sign type see Division 10, Section 10431-2).
- By making quality design a priority in order to communicate the deeper values of College of the Desert as an institution of higher learning.
- By addressing the unique role of signage to identify the campus as a valuable resource to the campus community, broadly including students, faculty, staff, alumni and the City of Palm Desert.
- By using palettes of materials and type that draw upon indigenous cultural resources such as iconic architecture, desert plants and the fundamentals of modern design that dominate the existing infrastructure of the campus.



Use of Sunshades - Optional

Cast concrete sunshades grew out of a need for creating spaces sheltered from the powerful desert sun. The result is a form that is functional, economical and decorative. Within the basic framework, these sunshades show the great diversity of pattern. These patterns could be used as part of the project wayfinding system with different patterns used in each of the campus buildings. These patterned sunshades can help to define outdoor rooms as wayfinding landmarks, while maintaining a consistent sense of place.





Specialty Graphics
Additional graphic elements may be considered as part of the overall building signage program. They may help guide users to important buildings or events on campus. These specialty graphics may include, but are not limited to:

- A banner program.
- Paving graphics.
- Ornamental ballards that act as cookie-crumbs drawing guests into campus with a sequence of narrative and/graphic information.
- Dedication plaques.

Additional Design Considerations
Like site signage, all the building signage is intended to meet the needs of the College of the Desert, both in terms of wayfinding and as a tool for expressing the college's identity. The following design guidelines draw upon indigenous materials design inspiration.

Materials
Materials should be chosen for their connection to local traditions and the need to function in a public environment. Brushed stainless steel and aluminum are a local tradition that meets the campus's extreme environmental and vandalism concerns.

Form
Geometric, rectalinear forms are a hallmark of the desert modern style. They are also simple to construct. Single panel construction limits theft, while also echoing this local aesthetic.

Color
The color palette is inspired by the local landscape both in specific colors and in terms of the use of proportion. Like wildflowers, color is used in small amounts as a brilliant accent on the returns of sign panels and larger letterforms. Neutral hues will dominate. All colors will be drawn from the local landscape.

Light
Light transforms the mood of an environment. At sunset, the desertscape is transformed into dramatic silhouettes and shadows. This model inspires the idea of how the campus can remain a vibrant environment after dark. In the cool summer evenings people can enjoy the evening walks without the worries of a blazing sun.

Colored lights hold great potential for creating a memorable identity for the campus building, especially for the campus' active night class program. Lights reinforce the use of color through the rest of the campus identity for wayfinding, vitality and distinctive desert college identity.

Type Guidelines: Neutraface is the dedicated font for the entire College of the Desert (Division 10, Section 10431-1C, Fig 4d.4).

College of the Desert

Section III – Specific Design Criteria

October 2005

COLLEGE OF THE DESERT

1. Specific Room Design Criteria and Furnishings

Overview
The Specific Room Design Criteria (RDC) establishes recommended features for the room types listed. As with the *Design Guidelines*, these are not intended to be inflexible requirements. The College emphasizes that the floor plans may vary from those shown in these design criteria. Rather, the RDC establishes goals that need to be addressed during programming by the Project Team. Those goals should be met when possible.

The College recognizes that each project will have its individual character and unique requirements. Renovation projects may limit the Project Team's ability to achieve some of the stated goals due to existing circumstances within the building or surrounding site. For both new and renovated buildings, there will be trade-offs required to fulfill programming imperatives and to respect budget limitations.

For classrooms and labs there may be additional requirements stemming from a particular teaching style or subject matter being taught. For this reason, designers should always incorporate flexibility into room designs that will allow for changing methodologies of teaching and improvements in technology.

The Project Team should also refer to other portions of the Handbook and be familiar with the "State Chancellor's Guidelines" for a complete description of Specific Room Design Criteria. The Site Design Guidelines discuss how covered walkways and forecourts will influence a lobby's design. There are Interior Space Planning Guidelines described in the Building Design Guidelines.

The Room Design Criteria addresses features that are of particular importance to College of the Desert. It is assumed that the design professionals will comply with all code requirements, State Chancellor's Guidelines and address Industry Standards important in the design and specifications for all types of rooms.

Offices & Support Space

Support Spaces

- Waiting area for students
- Mail Room and Lounge centrally located. Adjacencies – faculty offices, meeting rooms, lunch room, and restrooms.

Equipment/Fixtures

- Faculty Office – Tackboard outside office, whiteboard inside office, phones, power and data outlets as required for additional equipment.
- Lunchroom – Microwave, refrigerator, sink and coffee maker.
- Faculty Lounge – Whiteboard.
- Mail Room – Shared network printers.

Casework/Storage

- Bookcases, lockable cabinets, file cabinets in offices.
- General storage in Lounge and Mailroom.

Room Size - Faculty

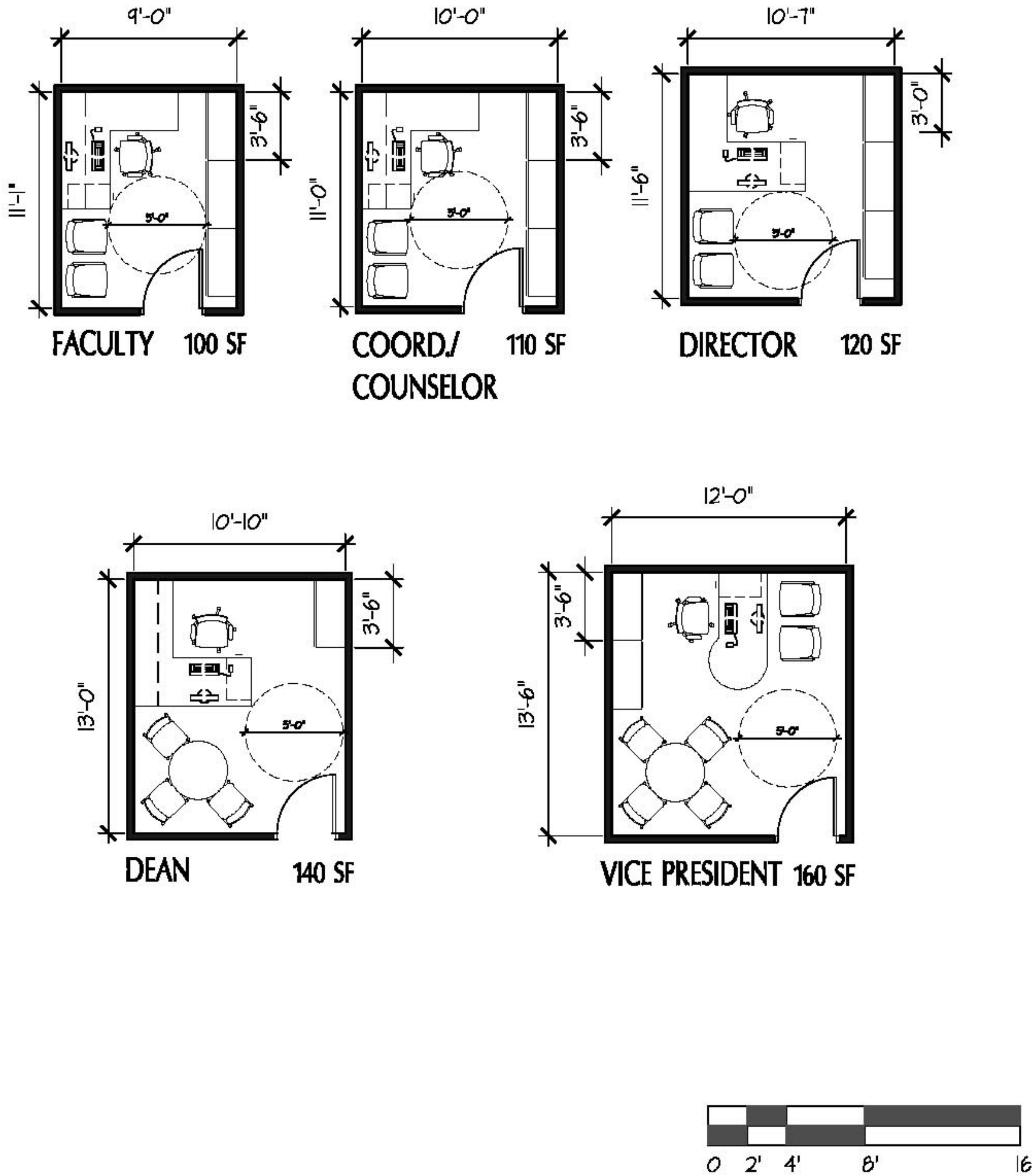
- See Page 5 for typical plans.
- 140 square feet per office serving two faculty

Room Size – Administration

- The following table sets forth College of the Desert office space standards. (Incorporates DSS recommendations)

College of the Desert Office Allowance Standards

Position	**Square Footage**
Vice President	160 s.f.
Dean	140 s.f.
Director	120 s.f.
Coordinator/Counselor	110 s.f.
Faculty	100 s.f.



Note: Floor Plans may vary.

Conference Rooms

Room Size

- 250 square feet: 10-12 seats
- Ceiling Height: 9 feet to 11 feet

Architectural Features

- Full height partitions per criteria set forth in the Specific Design Criteria "15. Sound Isolation and Acoustical Treatments".

Power/Data/Lighting

- Power and one standard data outlet located on the wall where furniture , casework and the audiovisual equipment cabinet has been installed.
- Power and one Quad data outlet located in a floorbox under the conference room table or integrated into the conference room table.
- Lighting - Parabolic non-glare and/or suspended indirect light fixtures with multiple switching for maximized light control to support electronic presentations. Coordinate lighting fixtures with projector location.

Audio Visual

Image Display

- Maximum Viewing Distance: <14'
- Image Height: 24""
- Image Width: 32" (4:3 image aspect ratio), or 43" (16:9 "widescreen" image aspect ratio).
- Flat panel display device (e.g. 50" LCD or plasma screen), the display device will be capable of displaying closed captioning.

Audio Reproduction

- Stereo loudspeakers integrated into flat panel display device. Audio volume will be controlled via the Multi-Media Control Panel (MMCP).
- Assistive Listening System: Provision of a portable ALS system for rooms without installed voice reinforcement systems.

Audio/Video Source Equipment

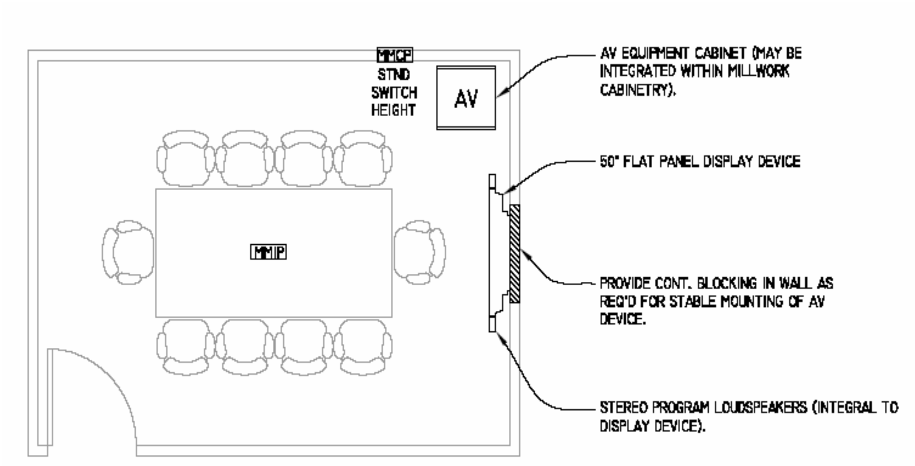
- Permanent Video Sources: Combinational VHS/DVD player located in AV cabinet.
- Permanent Audio Sources: Not required.
- Mobile A/V Sources: Mobile A/V sources such as Laptop PC's and Document Cameras may be connected to the MMIP for presentation using the room A/V presentation system.
- The system will support the ability to install videoconferencing equipment where required.

System Control

- Device Selection: The A/V source device to be displayed will be selectable via push-buttons on the MMCP.
- Device Control: Control of A/V source device functions, such as "Play" and "Fast Forward", will be controlled directly at the device front panel or using the MMCP.

Volume Control: Program audio volume will be controlled via a volume dial on the MMCP.

Conference Room
Room Diagram – Audio/visual Equipment Plan (Floor Plans may vary.)

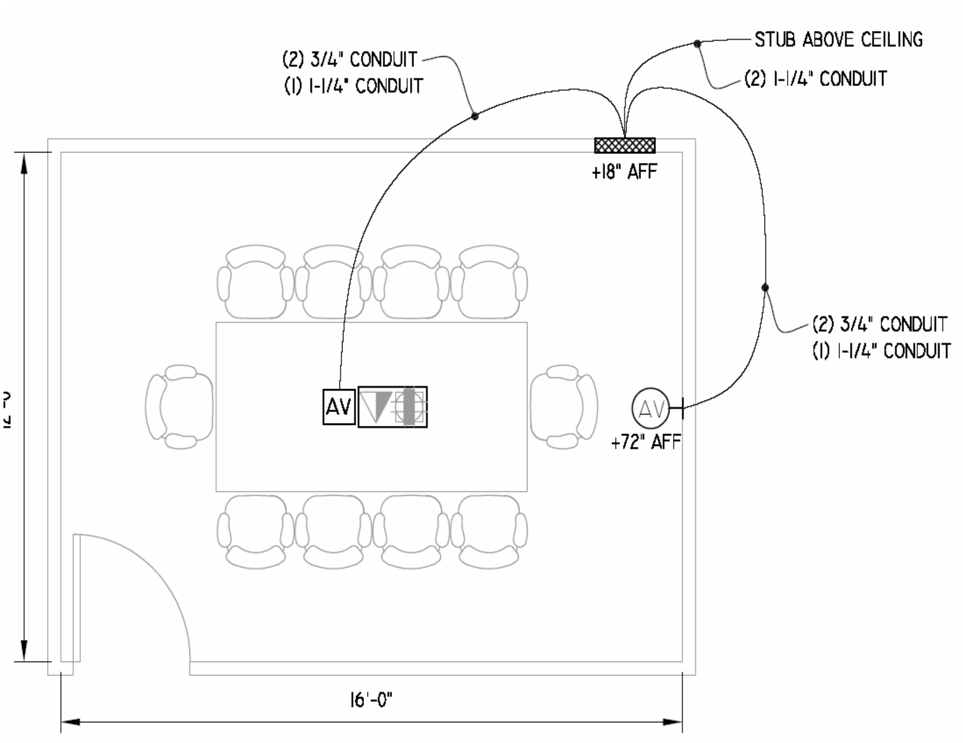


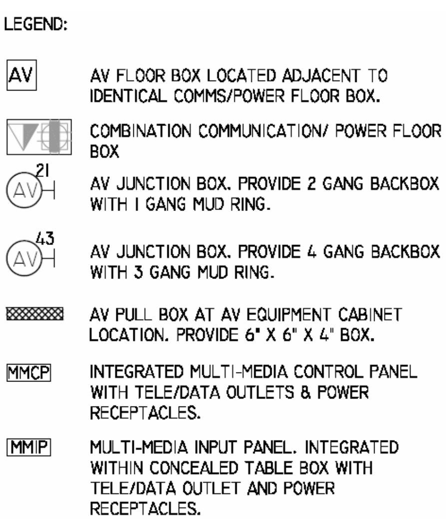
LEGEND:

AV	AV FLOOR BOX LOCATED ADJACENT TO IDENTICAL COMMS/POWER FLOOR BOX.
	COMBINATION COMMUNICATION/ POWER FLOOR BOX
AV 21	AV JUNCTION BOX. PROVIDE 2 GANG BACKBOX WITH 1 GANG MUD RING.
AV 43	AV JUNCTION BOX. PROVIDE 4 GANG BACKBOX WITH 3 GANG MUD RING.
	AV PULL BOX AT AV EQUIPMENT CABINET LOCATION. PROVIDE 6" X 6" X 4" BOX.
MMCP	INTEGRATED MULTI-MEDIA CONTROL PANEL WITH TELE/DATA OUTLETS & POWER RECEPTACLES.
MMIP	MULTI-MEDIA INPUT PANEL. INTEGRATED WITHIN CONCEALED TABLE BOX WITH TELE/DATA OUTLET AND POWER RECEPTACLES.

Conference Room

Room Diagram – Audio/visual Infrastructure Plan (Floor Plans may vary)





Computer Lab

Room Size

- 750 - 900 square feet: Serving 35-45 students.
- Ceiling Height: 10 feet – 12 feet
- Proportions: Similar depth to width ratios shall be maintained to provide good viewing of white board and projection displays.

Architectural Features

- Primary and secondary instructor locations allow for instructor positions at the front or rear of the room. Instructor station will maintain accessibility required for disabled access.
- Full height partitions per criteria set forth in the Specific Design Criteria "Sound Isolation and Acoustical Treatments".
- Lockable cabinets for equipment and materials. See "Audiovisual" for related requirements.
- Natural lighting through "clerestory" windows.
- Computer Labs will have an electronic swipe-card station for attendance and identification.
- Avoid extreme variations of surface brightness around computer lab.

Power/Data/Lighting

- Wall mounted or recessed floorbox for power, data and AV multi-media input panel at instructor station.
- Power receptacles and one standard data outlet dedicated to AV next to the AV multi-media input panel at instructor station.
- Telephone to be located at Instructor station.
- Power and one standard data outlet on each wall in the classroom.
- Power and one standard data outlet mounted at the ceiling projector location for ceiling mounted projector and wireless access point.

Provide distribution of power and one data drop per student seat in

Computer Labs. Outlets shall be located at wall and floor locations to provide distribution to multiple seating layout options.

- Lighting - Parabolic non-glare and/or suspended indirect light fixtures with multiple switching for maximized light control to support electronic presentations. Coordinate lighting fixtures with projector location.

Audio Visual

Image Display

- Maximum Viewing Distance: 30′ – 35′
- Image Height: 60″ – 72″
- Image Width: 80″ – 95″ (4:3 image aspect ratio), or 107″ – 120″ (16:9 “widescreen” image aspect ratio).
- Display Technology: Ceiling mounted video projector (minimum 1024 x 768 pixels; 3,000 ANSI lumens) projecting onto ceiling recessed matte white tensioned front projection screen. The display device will be capable of displaying closed captioning.

Audio Reproduction

- Media Audio Reproduction: Stereo loudspeakers ceiling mounted. Audio volume will be controlled via the AV Control Panel at the instructor station.
- Voice Reinforcement: Provisions for use of wireless and wired microphone system shall be included in each room. Equipment will be located in the lockable AV Equipment Cabinet. Amplified speech reproduced through 6″ ceiling recessed loudspeakers distributed at approximately 12′ centers.
- Assistive Listening System: Provision of an ALS system is required in each room with a permanently installed voice reinforcement system. A portable ALS system shall be accommodated in all classroom locations.
- In rooms with permanent ALS system installations and in rooms using portable ALS equipment there shall be a quantity of receivers that equals at least 4% of the number of seats in the room (rounding up to the nearest integer), or a minimum of 2. (i.e. A classroom of 30 seats would receive 2 receivers. A classroom of 80 would receive 4 receivers.)

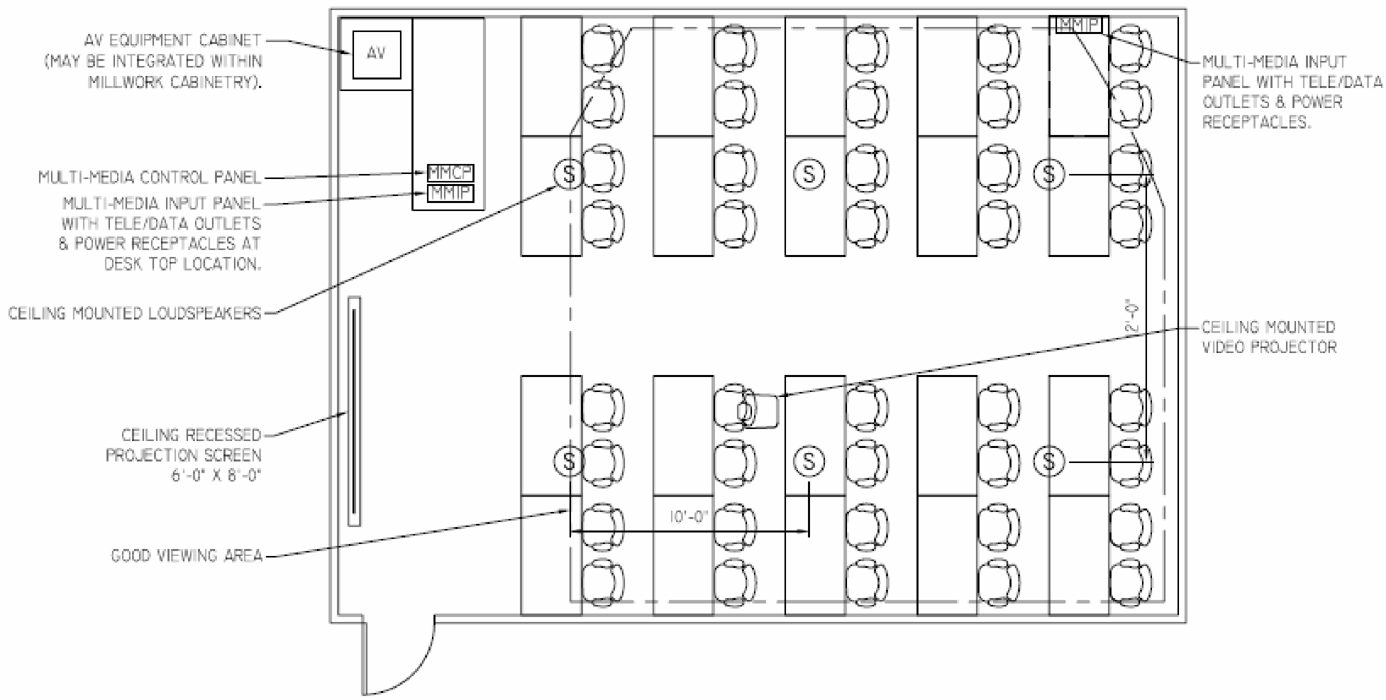
Audio/Video Source Equipment

- Audiovisual Source and Control systems will be installed in secured AV equipment cabinet. This can be a dedicated AV equipment cabinet or integrated into the instructor station.
- Permanent Video Sources: Document Camera, VHS/DVD player and room dedicated computer.
- Permanent Audio Sources: Not required.
- Mobile AV Sources: Mobile AV sources such as Laptop PC's may be connected to the audiovisual input panel for connection to the room AV presentation system.

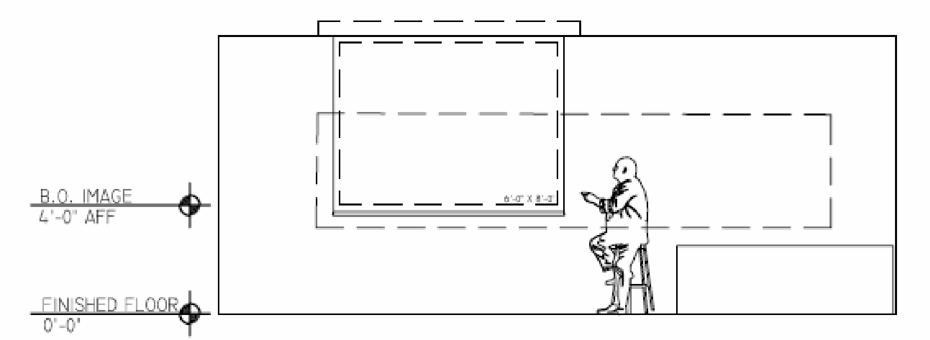
AV System Control

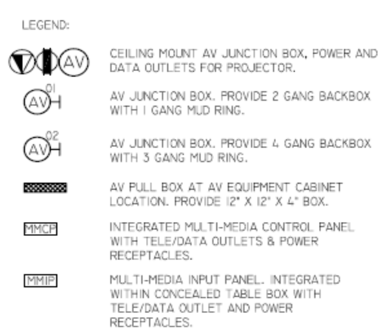
- Device Selection: The AV source device to be displayed will be selectable via push-buttons on the AV Control Panel.
- Device Control: Control of AV source device functions, such as "Play" and "Fast Forward", will be controlled directly at the device front panel or using the AV Control Panel.
- Volume Control: Program audio volume will be controlled via a volume dial on the AV Control Panel. (Note: Voice reinforcement volume level, if a microphone is connected to the room dedicated AV system, will be controlled by the microphone system and not the AV Control Panel.)

Computer Lab
Room Diagram – Audiovisual Equipment Plan (Floor Plans may vary.)

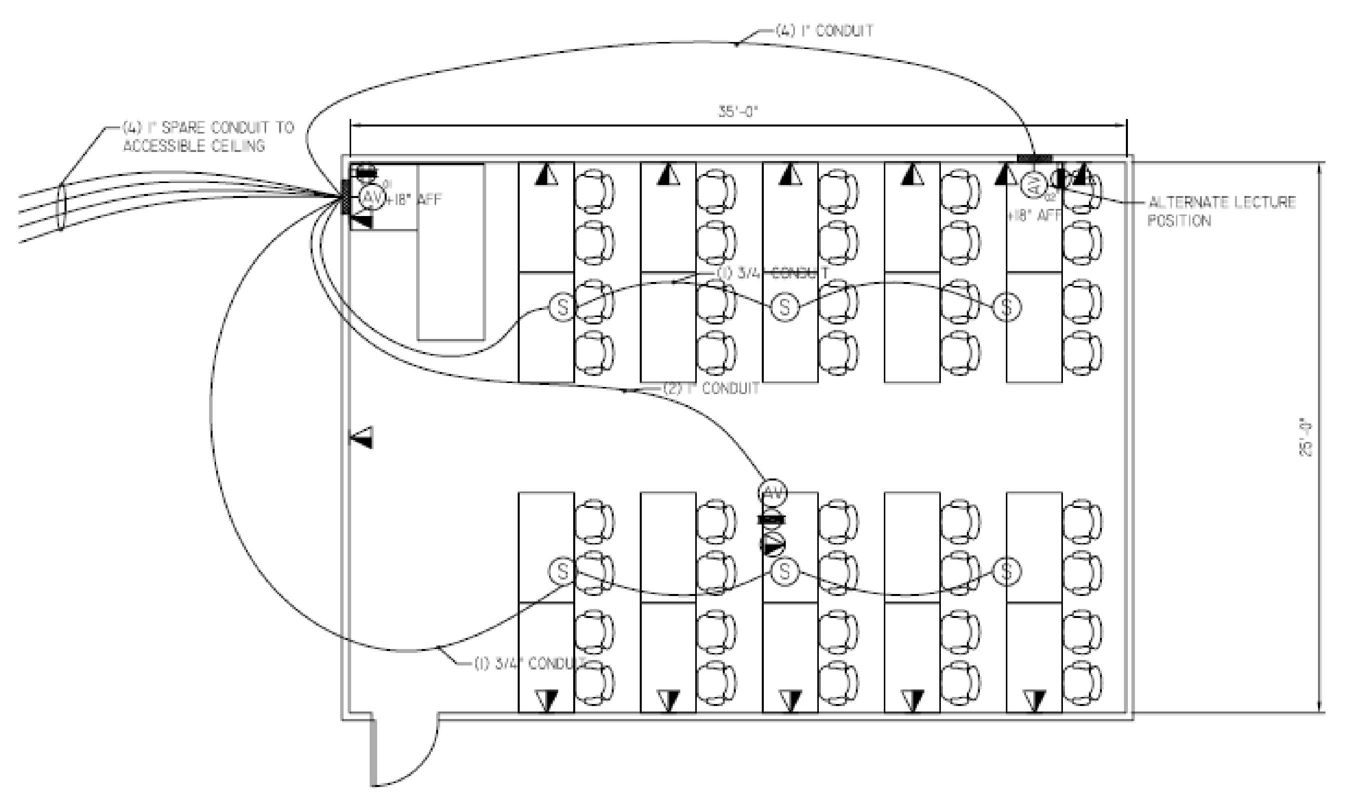


Computer Lab
Room Diagram – Front Wall Elevation





Computer Lab
Room Diagram – Audiovisual Infrastructure Plan (Floor Plans may vary.)



Smart Classrooms

Room Size

- 750 - 900 square feet: Serving 35-45 students.
- Ceiling Height: 10 feet – 12 feet
- Proportions: Similar depth to width ratios shall be maintained to provide good viewing of white board and projection displays.

Architectural Features

- Primary and secondary instructor locations allow for instructor positions at the front or rear of the room.
- Full height partitions per criteria set forth in the Specific Design Criteria "Sound Isolation and Acoustical Treatments".
- Lockable cabinets for equipment and materials. See "Audiovisual" for related requirements.
- Natural lighting.
- Features promoting flexibility shall be incorporated into the classroom's design features. Some shared classrooms will be used for various disciplines; therefore, it is important to enhance the instructor's ability to transform classrooms for their particular area of instruction.
- Cabinetry at corners for storage and media.
- White Board extending at least 2/3rds on the presentation wall (behind instructor).
- White Boards on both side walls.
- Bulletin Boards on both sides of all white boards.
- Instructor's table at front of presentation area. Instructor's station will maintain accessibility required for disabled access.
- Instructor's chair or stool.
- Student tables to seat 2, 3 or 4 – Capacity determined by room size.
- Student chairs that can be nested.
- Drop down screen mounted in the middle of the presentation wall.
- Podium (stand alone) wires so that a laptop computer can be connected with electronic equipment as needed and wired for internet usage by instructor.

- Emergency phone.
- Clock at back or room.
- Lighting such that it can be controlled when utilizing OHP/LCD projector.
- Sturdy window shades.
- Doors that are controlled not to slam.

Power/Data/Lighting

- Wall mounted or recessed floorbox for power, data and AV multi-media input panel at instructor station.
- Power receptacles and one standard data outlet dedicated to AV next to the AV multi-media input panel at instructor station.
- Telephone to be located at Instructor station.
- Power and one standard data outlet on each wall in the classroom.
- Power and one standard data outlet mounted at the ceiling projector location for ceiling mounted projector and wireless access point.
- Computer Labs – Provide distribution of power and one data drop per student seat. Outlets shall be located at wall and floor locations to provide distribution to multiple seating layout options.
- Lighting - Parabolic non-glare and/or suspended indirect light fixtures with multiple switching for maximized light control to support electronic presentations. Coordinate lighting fixtures with projector location.

Audio Visual

Main Image Display

- Maximum Viewing Distance: 30′ – 35′
- Image Height: 60″ –72″
- Image Width: 80″ – 95″ (4:3 image aspect ratio), or 107″ – 120″ (16:9 “widescreen” image aspect ratio).
- Display Technology: Ceiling mounted video projector (minimum 1024 x 768 pixels; 3,500 ANSI lumens) projecting onto ceiling recessed matte white tensioned front projection screen. The display device will be capable of displaying closed captioning.

Distance Learning Dedicated Displays

- Provisions will be made for the installation of a wall mounted flat panel monitor above the instructor station and at the rear wall. These monitors will be used to view the far end classroom participating in the distance learning session. Students will view the far end classroom on the monitor above the instructor position while the instructor views the monitor at the rear wall.

Video Cameras

- Video cameras will be located at front and rear wall positions for video image capture during distance learning sessions.

Audio Reproduction

- Media Audio Reproduction: Stereo loudspeakers ceiling mounted. Audio volume will be controlled via the AV Control Panel at the instructor station.
- Voice Reinforcement: Provisions for use of wireless and wired microphones will be included in distance learning classroom. Equipment will be located in the lockable AV Equipment Cabinet. Amplified speech reproduced through 6″ ceiling recessed loudspeakers distributed at approximately 12′ centers.
- Assistive Listening System: Provision of an ALS system is required in each room with a permanently installed voice reinforcement system.
- In rooms with permanent ALS system installations there shall be a quantity of receivers that equals at least 4% of the number of seats in the room (rounding up to the nearest integer), or a minimum of 2. (i.e. A classroom of 30 seats would receive 2 receivers. A classroom of 80 would receive 4 receivers.)

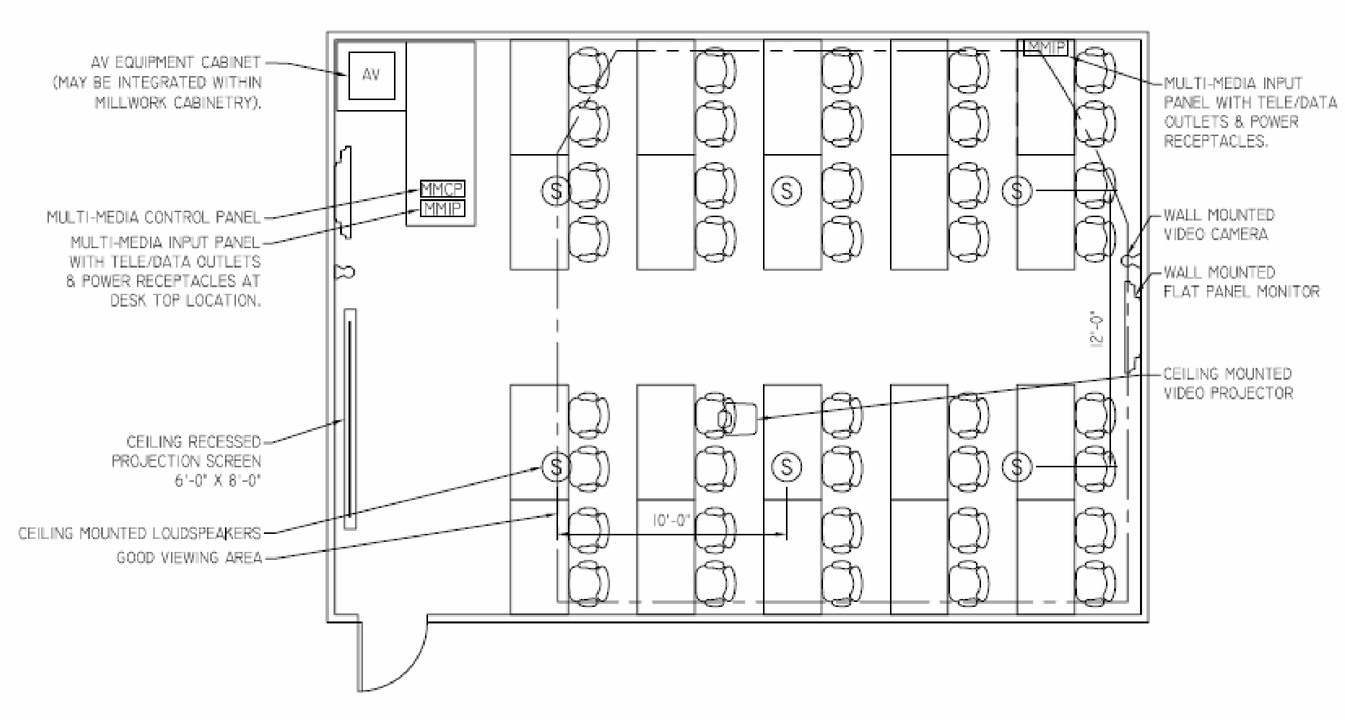
Audio/Video Source Equipment

- Audiovisual Source and Control systems will be installed in secured AV equipment cabinet. This can be a dedicated AV equipment cabinet or integrated into the instructor station.
- Permanent Video Sources: Document Camera, VHS/DVD player and room dedicated computer.
- Permanent Audio Sources: Not required.
- Mobile AV Sources: Mobile AV sources such as Laptop PC's may be connected to the audiovisual input panel for connection to the room AV presentation system.

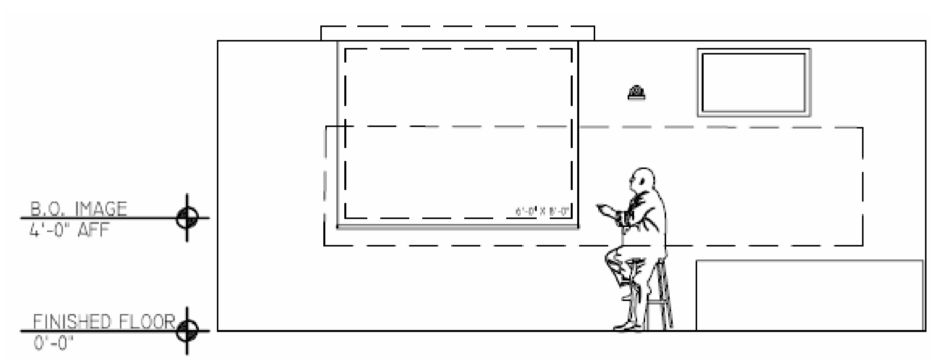
AV System Control

- In Distance Learning Classrooms an advanced level of AV control will be required to provide camera, microphone and videoconferencing codec controls. These advanced controls will operate from the room dedicated computer via a web browser display.
- Device Selection: The AV source device to be displayed will be selectable via push-buttons on the AV Control Panel.
- Device Control: Control of AV source device functions, such as "Play" and "Fast Forward", will be controlled directly at the device front panel or using the AV Control Panel.
- Volume Control: Program audio volume will be controlled via a volume dial on the AV Control Panel. (Note: Voice reinforcement volume level, if a microphone is connected to the room dedicated AV system, will be controlled by the microphone system and not the AV Control Panel.)

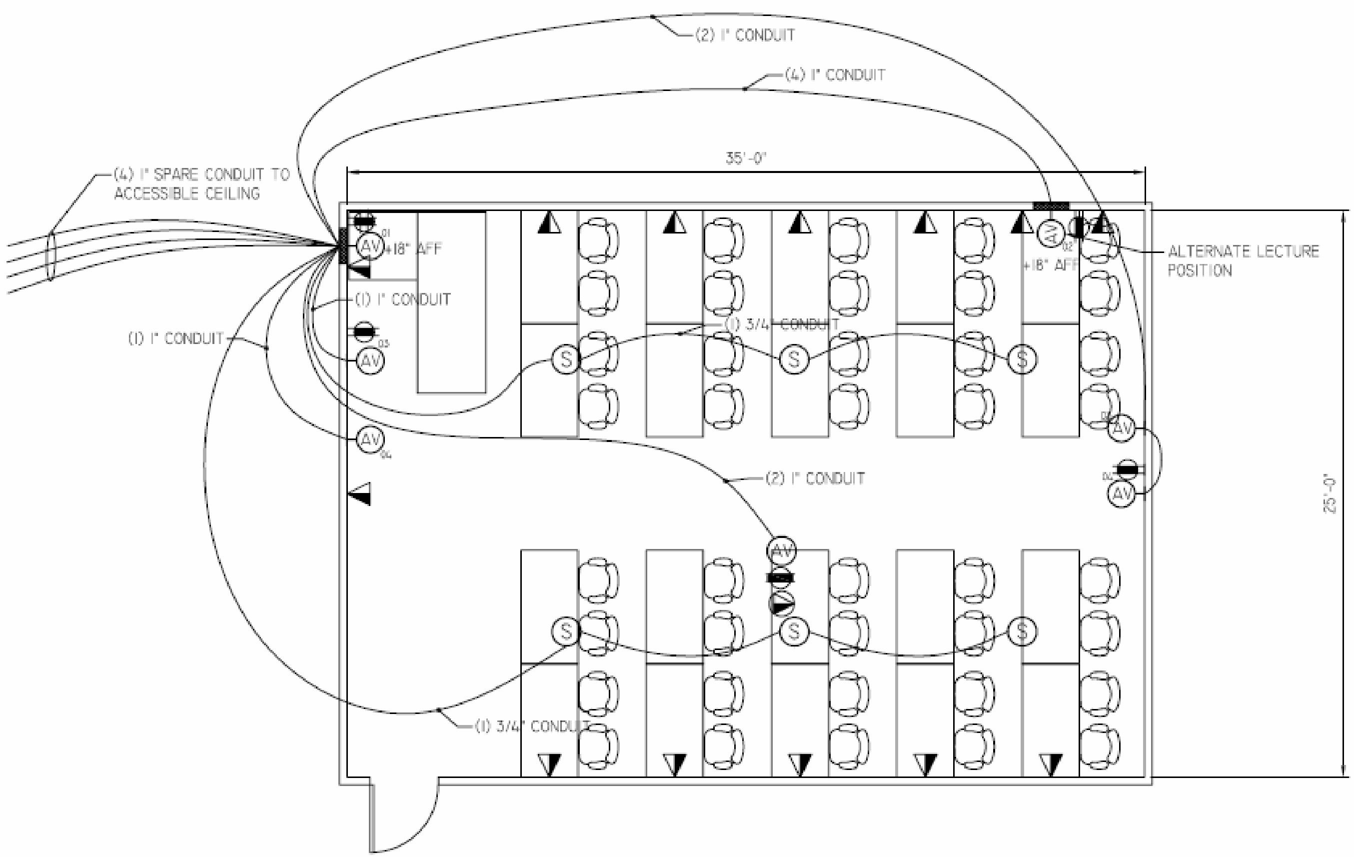
Smart Classrooms
Room Diagram – Audiovisual Equipment Plan (Floor Plans may vary.)

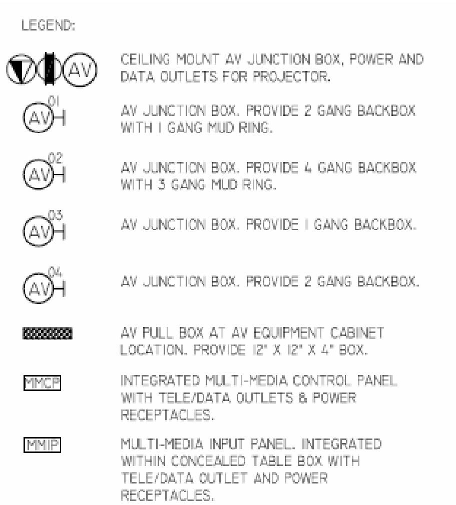


Smart Classroom
Room Diagram – Front Wall Elevation



Smart Classroom
Room Diagram – Audiovisual Infrastructure Plan (Floor Plans may vary.)





IT Equipment Rooms

Design Criteria For The BDF

The BDF is a telecommunications acronym for Building Distribution Frame, in the context of this document the main Technology Room for the building is the BDF. The BDF will act as the entrance facility for connection to the campus optical fiber and data network backbone. The BDF will support the termination of backbone and campus cabling and house centralized communications and server equipment supporting the entire building.

The BDF will also support other building information systems such as media distribution and security, and in most cases function as an IDF supporting the connection point between backbone and horizontal cabling infrastructure.

Architectural and Building System Requirements in the BDF

<u>Room Size</u>

The Minimum space allocated to the BDF shall be 150sq. ft. with a minimum dimension of 15ft in one direction.

<u>Room Location</u>

If the BDF supports the outside cabling connections, it shall be located on the ground floor and located so that it can support two physically separate points of entry. The BDF shall be accessible for the delivery of large equipment throughout its useful life. Ideally, the BDF will be stacked directly under the IDFs to support the distribution of services between the rooms.

Do not locate BDFs in any place that may be subject to water infiltration, steam infiltration, humidity from nearby water or steam, heat (e. g., direct sunlight) or any other corrosive atmospheric or adverse environmental conditions. Avoid locations that are below water level unless preventive measures against water infiltration are employed. If the BDF is below ground, provide a separate Building Service Entrance facility to transition conduit to prevent ingress of water from the conduit infrastructure.

Locate the BDF far enough away from sources of EMI to reduce interference with the telecommunications cabling, including EMI from electrical power supply transformers, motors, generators, radio transmitters, radar transmitters, and induction heating devices. As BDFs are frequently occupied by technicians and sensitive electronic equipment, the room location should not be adjacent to sources of constant, excessive, low or high frequency noise, such as air-handling equipment, pumps, generators, etc.

<u>Room Use</u>
The BDF shall be dedicated solely to Technology and related facilities. Equipment that does not support the BDF (e. g., pipes, duct work, distribution of building power) shall not be located in or pass through the BDF.

Architectural Requirements
<u>Ceiling Height</u>
The minimum ceiling height shall be 8.5 ft. above the finished floor with ceiling protrusions (e. g., sprinkler heads) placed to assure a minimum clear height of 8 ft. clear of obstructions, to provide space over the equipment frames for cables and suspended cable trays. To permit maximum flexibility and accessibility of cabling pathways, false ceilings are not recommended in BDFs.

<u>Doors</u>
BDFs shall have lockable doors that are at least 3.5 ft. wide and 6.5 ft. tall. Since large equipment is often located in the BDF, a double door 6 ft. wide by 7.5 ft. tall is recommended. Door sills are not recommended because they impede the movement of equipment.

NOTE: Doors that open outward provide additional usable space and reduce constraints on BDF layout.

<u>Flood Prevention</u>
Locate BDFs above any threat of flooding. Avoid locations that are below or adjacent to areas of potential water hazard (e. g., restrooms and kitchens).

Wall Requirements
BDF walls should extend from the finished floor to the structural ceiling (e. g., the slab). The BDF should not have windows installed, nor is it desirable to locate BDFs on perimeter/curtain walls where windows comprise the majority surface of the wall.

Backboard
Provide AC-grade plywood, 8 ft. high with a minimum thickness of 0.75 in. around the perimeter of the room. Plywood shall be either fire-rated or treated on all sides with at least two coats of fire-resistant paint. The bottom of the plywood shall be mounted 6 i n. AFF (above finished floor).

Structural Requirements
The floor rating under distributed loading must be greater than 4.8 kPa (100 lbf/ ft. 2) and the rating for concentrated loading must be greater than 8.8 kN (2000 lbf) in areas that will support telecommunications equipment such as batteries and UPS equipment. If access flooring is used in the BDF, it must be rated accordingly.

Mechanical (HVAC) Requirements
Provide BDF with either dedicated HVAC equipment, or access to the main HVAC delivery system. Technology equipment requires the HVAC system to function 24 hours per day, 365 days per year. If a building's HVAC system cannot ensure continuous operation (including weekends and holidays), provide a stand- alone HVAC unit with independent controls for the BDF. If an emergency power source is available in the building, connect the HVAC system that serves the BDF to it.

The HVAC system that serves the BDF should be tuned to maintain a positive air pressure differential with respect to surrounding areas with a minimum of one air change per hour in the BDF. Provide equipment to control humidity and air quality if needed.

Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). Maintain positive pressure with a minimum of three air changes per hour in the BDF. Provide:

- Temperature 70 degrees F +/- 10 degrees
- Relative humidity 50% +/- 20%

Estimated Heat Loads: 5,000 to 7,500 BTU per equipment cabinet. UPS and stand-alone air conditioning systems produce additional heat, if present.

Electrical Requirements

Lighting

Provide adequate and uniform lighting that provides a minimum equivalent of 50 foot-candles when measured 3 ft. above the finished floor level. Locate light fixtures a minimum of 8.5 ft. above the finished floor. Locate light switches near the entrance to the BDF.

Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage.

Coordinate the lighting layout with the equipment cabinet layout, especially overhead cable trays, to ensure the light is not obstructed. Power for the lighting should not come from the same circuits as power for the technology equipment.

Equipment Power

Provide individual branch circuit serving a single load from the feeder panel directly to a branch circuit receptacle (for cord- and-plug connected equipment), or equipment power terminal (for hardwired equipment). Provide branch circuits for equipment power that are protected and wired for 120V, 20A and 120V, 30A.
As a minimum, provide (1) 120V, 20A (NEMA L5-20R) and (1) 120V, 30A (NEMA L5-30R) dedicated circuits.

Convenience Power

Provide separate duplex 120 V, 15A convenience outlets (NEMA 5-15R) for tools, test sets, etc., located at least 18 in. above the finished floor, placed at approximately 6 ft. intervals around perimeter walls and identified and marked as such.

Backup Power

Because of the “mission- critical” nature of the BDF, backup power must be provided with a standalone UPS supporting a minimum of 15 minute battery capacity at full load shall be provided.

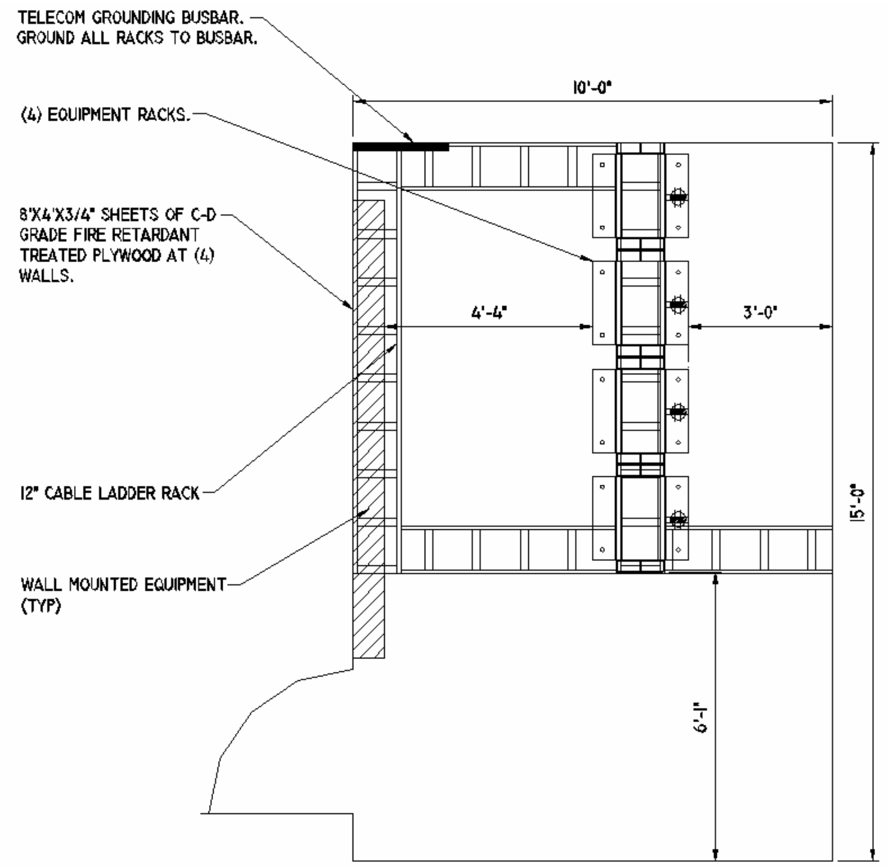
Bonding and Grounding
Provide a copper signal ground busbar in each BDF. The ground conductor shall be a 1/0 copper cable, cad-welded directly to the Ufer Ground or Main Building Entrance Ground, or building steel.

Conduit Sleeve Penetrations
Provide horizontal conduit sleeves into the BDF for the distribution of the horizontal cable from the cable tray. Provide vertical conduit sleeves from the IDF if stacked above to support the distribution of backbone cables.

Conduit sleeves consist of a minimum of (4) 4" conduit sleeves stubbed into the BDF extended 6" on both sides.

Fire Suppression
Provide sprinkler heads in wire cages to prevent accidental operation. Coordinate the layout of fire protection systems with the equipment layout to avoid obstructing sprinklers, access to the alarm, or other protective measures.

Mount portable fire extinguishers (with appropriate ratings) in the BDF as close to the entrance as possible.


TELECOM GROUNDING BUSBAR.
GROUND ALL RACKS TO BUSBAR.
(4) EQUIPMENT RACKS.
8'X4'X3/4" SHEETS OF C-D GRADE FIRE RETARDANT TREATED PLYWOOD AT (4) WALLS.
12" CABLE LADDER RACK
WALL MOUNTED EQUIPMENT (TYP)
10'-0"
4'-4"
3'-0"
15'-0"
6'-1"

TYPICAL BDF

Design Criteria for the IDF

The IDF, Intermediate Distribution Frame is the room type that supports the connection point between backbone and horizontal distribution cable and network edge devices. IDFs are generally considered to be floor-serving (as opposed to building or campus-serving) spaces.

Architectural and Building System Requirements in the IDF

Room Size

IDFs shall be approximately 80 to 120 sq.ft., depending on the size of the area the room is supporting. At a minimum, the IDFs shall be 8 X 10, with a minimum clear dimension of 8 ft. in one direction.

Room Location

There must be at least one IDF per floor. Multiple rooms are required if the cable length between the IDF and the telecommunications outlet, including slack, exceeds 295 ft.

Room Use

The IDF shall be dedicated solely to Technology and related facilities. Equipment that does not support the IDF (e. g., pipes, duct work, distribution of building power) shall not be located in or pass through the IDF.

Architectural Requirements

Ceiling Height

The minimum ceiling height shall be 8.5 ft. above the finished floor with ceiling protrusions (e. g., sprinkler heads) placed to assure a minimum clear height of 8 ft. clear of obstructions, to provide space over the equipment frames for cables and suspended cable trays. To permit maximum flexibility and accessibility of cabling pathways, false ceilings are not recommended in IDFs.

Doors

IDFs shall have lockable doors that are at least 3.0 ft. wide and 80 in. tall. Door sills are not recommended because they impede the movement of equipment. NOTE: Doors that open outward provide additional usable space and reduce constraints on IDF layout.

Flood Prevention

Locate IDFs above any threat of flooding. Avoid locations that are below or adjacent to areas of potential water hazard (e. g., restrooms and kitchens).

Wall Requirements
IDF walls should extend from the finished floor to the structural ceiling (e. g., the slab). The IDF should not have windows installed, nor is it desirable to locate IDFs on perimeter/curtain walls where windows comprise the entire surface of the wall.

Backboard
Provide AC-grade plywood, 8 ft. high with a minimum thickness of 0.75 in. around the perimeter of the room. Plywood shall be either fire-rated or treated on all sides with at least two coats of fire-resistant paint. The bottom of the plywood shall be mounted 6 in. AFF (above finished floor).

Structural Requirements
Provide a minimum floor loading of 2.4 kPa (50 lbf/ ft. 2).

Mechanical (HVAC) Requirements
Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). Maintain positive pressure with a minimum of one air change per hour in the IDF. Provide:

- Temperature 70 degrees F +/- 10 degrees
- Relative humidity 50% +/- 20%

Estimated Heat Loads: 5,000 BTU per equipment cabinet or rack.

Electrical Requirements
Lighting
Provide adequate and uniform lighting that provides a minimum equivalent of 50 foot-candles when measured 3 ft. above the finished floor level. Locate light fixtures a minimum of 8.5 ft. above the finished floor. Locate light switches near the entrance to the IDF. Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage.

Coordinate the lighting layout with the equipment cabinet layout, especially overhead cable trays, to ensure the light is not obstructed. Power for the lighting should not come from the same circuits as power for the technology equipment.

Equipment Power
IDFs shall be equipped to provide adequate electrical power. As a minimum, provide (1) 120V, 20A dedicated circuits, with one duplex receptacle per circuit per rack.

Convenience Power
Provide separate duplex 120V, 15A convenience outlets (NEMA 5-15R) for tools, test sets, etc., located at least 18 in. above the finished floor, placed at approximately 6 ft. intervals around perimeter walls and identified and marked as such.

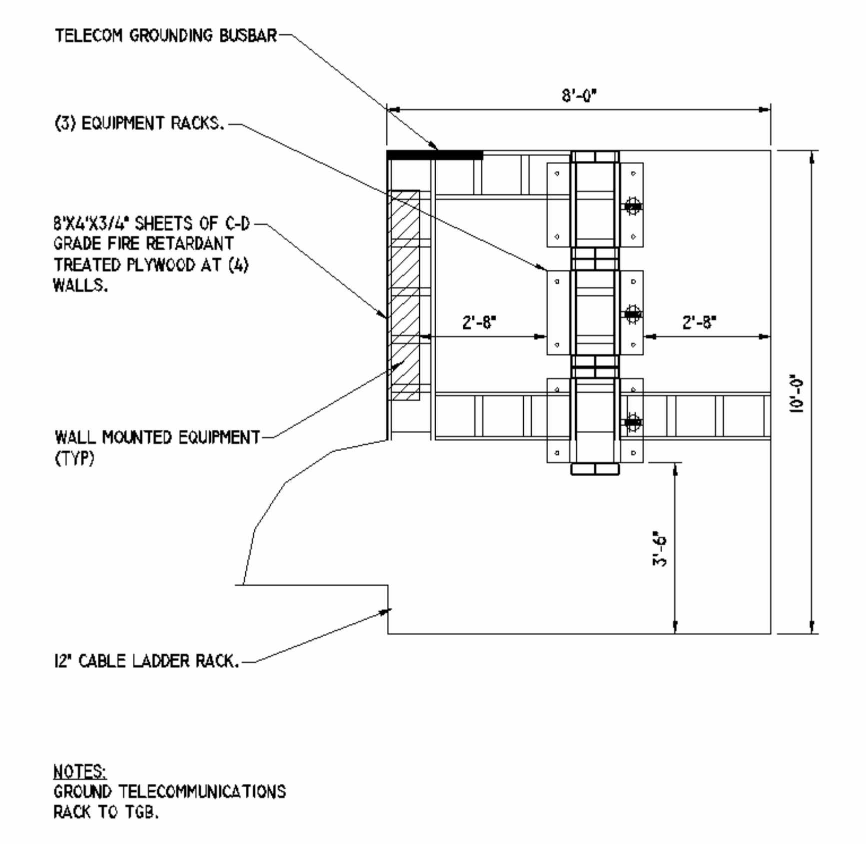
Backup Power
A standalone UPS with a minimum of 15 minute battery capacity at full load shall be provided.

Bonding and Grounding
Provide a copper signal ground busbar in each IDF. The ground conductor shall be a 1/0 copper cable, cad-welded directly to the Ufer Ground or Main Building Entrance Ground, or building steel.

Conduit Sleeve Penetrations
Provide horizontal conduit sleeves into the IDF for the distribution of the horizontal cable from the cable tray. Provide vertical conduit sleeves from the IDF above if stacked to support the distribution of backbone cables.

Conduit sleeves shall consist of a minimum of (4) 4" conduit sleeves stubbed into the IDF and extended 6" on both sides.

Fire Suppression
Provide wet-pipe system with sprinkler heads in wire cages to prevent accidental operation.


TELECOM GROUNDING BUSBAR
(3) EQUIPMENT RACKS.
8'X4'X3/4" SHEETS OF C-D GRADE FIRE RETARDANT TREATED PLYWOOD AT (4) WALLS.
WALL MOUNTED EQUIPMENT (TYP)
12" CABLE LADDER RACK.
8'-0"
2'-8"
2'-8"
10'-0"
3'-6"
NOTES:
GROUND TELECOMMUNICATIONS RACK TO TGB.

TYPICAL IDF

Toilet Rooms

Architectural Features

Exterior

The toilet rooms are susceptible to vandals. The finishes and fixtures should be exceptionally resistant to vandalism (e.g. stainless steel plumbing fixtures, shatter proof mirrors).

Interior

Conversely, interior toilet rooms are more secure. More attractive finishes and fixtures can be used in these rooms. A level of quality that improves the campus image should be specified. Use of colorful tile patters is encouraged by the College. Do not use terrazzo finishes in toilet rooms. Ease of maintenance should be considered while selecting finishes and fixtures.

Plumbing Fixtures

Please refer to the Plumbing System Design portion of the *Specific Design Criteria* for this information.

Unisex Restrooms

The College will designate at least four Unisex Restrooms at each of the "four corners" of the campus. The primary goal is to respond to the needs of the "unique" community to be served. For example, students with disabilities who have personal attendants with them require a unisex, single unit restroom which would accommodate both genders.

Custodial Rooms

Architectural Features
Finishes in this utility room should be durable and water resistant. Provide shelving and hooks as required for storage of custodial equipment.

Plumbing Features
Refer to the Plumbing System Design section of the *Specific Design Criteria* for information on plumbing fixtures.

Mechanical & Electrical Rooms

Mechanical Rooms and Equipment Locations
The Architect/Engineer shall, in the earliest stages of design development, be responsible for establishing and/or verifying programmatic requirements for mechanical rooms in order to:

- Provide adequate safe access and manufacturer's recommended working clearances for all equipment.
- Provide for replacement of the largest piece of equipment without removing permanent walls, large items of equipment or equipment essential to the principal on-going day-to-day building use.
- Provide direct access from the exterior for major mechanical rooms exceeding 100 net square feet.

In phased projects mechanical rooms shall be sized to include equipment for all the phases.

Air handling units, zone control devices, such as VAV boxes, mixing boxes, reheat coils, etc., shall also be located to provide unobstructed access to filters, bearings, manual valves, zone control devices and automatic control equipment.

Mechanical rooms shall be ventilated by a thermostatically controlled fan.

Mechanical rooms shall have a floor drain.

Ventilation
Outside air intakes shall not draw in exhaust air from adjacent systems, loading docks, parking lots, emergency generators, chemical storage, sewer manholes, etc.

Cooling Coil Condensate

- Cooling coil condensate shall be piped to sanitary drains.
- Cooling coil condensate lines shall have cleanouts, which allow access to all branches of the condensate drain system.
- AHU cooling coil condensate lines shall be minimum 1 ¼ inch ID.
- Slope condensate piping down in direction of flow.
- Lines less than 1 ½ inch shall be copper.

Space Inventory

The District is responsible for assigning a building numbers and room numbers for the purposes of maintaining the Space Inventory in conformance with the Space Inventory Handbook published by the State Chancellor's Office.

Building Numbers

New Buildings

- Assign the next consecutive, never before-used building number starting with "1" according to the Summary Building Report for each designated campus.
- Assign a new building number to a new or replacement building located on the site as a demolished or removed building.

Renovated Buildings

- Continue to inventory a renovated building under the existing building number.

Demolished or Removed Buildings

- Permanently retire and never reuse the building numbers of buildings deleted from the District's Space Inventory.

Room Numbers

Assign room numbers according to the patterns described in the text and diagrams contained in the Space Inventory Handbook published by the State Chancellor's Office.

Single Story Buildings

Assign prefixes, room numbers and suffixes according to existing District conventions, which do not conform to the Space Inventory Handbook but which are established consistently across the campus.

- Do not use prefixes for any rooms in single story buildings.
- Begin with a single digit '1' and continue consecutively.
- Use consecutive letters to denote suffixes.

Acceptable Room Designations – Single Story

	Prefix	Room Number	Suffix
First Floor	--	1	
	--	2	
	--	2	A
	…	…	…
		10	
		11	

Room Numbers in Multi-Story Buildings
Assign prefixes, room numbers and suffixes according to the Space Inventory Handbook. District conventions for room numbers in existing multi-story buildings have not been consistent across the campus and do not conform to the Space Inventory Handbook.

- Use the prefix 'B' for rooms on the basement level. Do not use another prefix for any room on any floor.
- Each room number shall have three digits. Basement room numbers shall range from '000' to '099', first story room numbers from '100' to '199', second story room numbers from '200' to '299', and so on. Mezzanine rooms shall be numbered in the same way as other levels (except the basement) to maintain a consistent pattern in all multi-story buildings.
- Use consecutive letters to denote suffixes.

Acceptable Room Designations - Multiple Story Buildings

	Prefix	Room Number	Suffix
Basement	B	000	
	B	001	
	B	001	A
	B	001	B
First Floor	--	100	
	--	101	
	--	101	A
	--	101	B
Second Floor	--	200	
	--	201	
	--	201	A
	--	201	B
Second-level Mezzanine	--	200	
	--	201	
	--	201	A
	--	201	B

Building Names

There are no guidelines for the names of buildings for the purposes of the District's Space Inventory because records for each facility are organized by Building Number.

2. Shade Structures and Fountains

The landscape framework strategy (See Section 3-Landscape Design Principles) creates a strong circulatory and spatial network through the use of specified paving materials and tree species along major promenades and plazas, which creates an opportunity for a more open, creative, and eclectic layer of shade structures and fountains that allow for more character and diversity on campus.

With average summer temperatures reaching 107 degrees, shade structures are an integral part of the campus providing a pedestrian scale and passive refuge space. The existing pedestrian arcades system, which was inspired by Date Palms (see Section II – Site History), forms a network of shaded pedestrian walkways that link buildings and classrooms. The master plan proposes an extension of these walkways out into the landscape that connects buildings to the proposed courtyards, plazas, and quad. This extension should not be done in a literal way by continuing the existing natural gray precast concrete columns. Rather, an eclectic mix of structures should prevail that begin to assign individual character throughout the campus that do not compete with the existing arcade network. These shade structures can have a more dynamic quality to them by incorporating art, sculpture, signage, seating, fountains, and planting that allow for a more unique character and function. Shade structures along the western north/south promenade should be within the same "family" in terms of materiality and use so that the idea of a linear promenade that connects opposite edges of the campus is further reinforced. The eastern north/south promenade can incorporate temporary installations that are constructed by students as part of the architecture, or construction classes that allow students to apply classroom teachings to built form on the campus. This will help give students ownership and pride as well as further the schools educational goal of "Active Learning."

Shade structure material selections should remain open to the individual designer, however special attention must be used in selecting materials that can handle the harsh summer temperatures and direct sunlight (i.e. no wood or timber). Also, sunlight reflectivity and maintenance should be considered as well.

The Fountains will carry this same idea of looseness and creativity throughout the campus. The largest fountain on campus is the Fountain of Knowledge, and this should remain the most prominent fountain because of its symbolism and location being in the Hilb Center forecourt. (See Section II – Site History.) Fountains that occur in the numerous courtyards, promenades, and plazas should be more respectful of the desert climate and have a more passive quality. Being a precious and rare resource, the sensorial aspects of water should be exploited such as its sound, light reflectivity, and microclimate. Passive water fountains can include small bubblers installed in a large regional stone or granite block that showcases its texture and color. Also, small misters arising from planting or shade structures can create a more interactive experience with the user while limiting overall water consumption demands.

3. Site Drainage

Overview

Site drainage will be accomplished through a variety of different means including site grading, on-site retention, use of porous surfaces, water containment in landscape areas, off-site discharge, and connection to existing City storm drain pipes.

Existing Conditions

Stormwater runoff is managed by collection in several dry detention ponds located throughout the campus. Runoff also collects in large landscape areas as well as surface flows along roads out to the city streets. There is minimal existing on-site storm drain piping that carries runoff to detention ponds or connects to the City storm drain system in the streets. Refer to the *Campus Infrastructure Master Plan* for the layout of existing Campus and City storm drain pipes.

Although there is a low frequency of rainfall in the area, the campus is still prone to flooding during storm events due to lack of adequate drainage.

Proposed Design

The following provides general requirements for different components that will contribute to an overall effective drainage concept for the entire campus.

On-Site Drainage

The proposed grading plan will serve to accentuate building and landscape features. Proposed grades will ensure accessibility throughout the project area, while also providing an efficient drainage pattern that directs runoff to the proper drainage method. Finished floor elevations shall be set higher than existing floodplains and designed overflow routes. Figure 1 below shows minimum and maximum design slopes. Final slopes shall adhere to the Geotechnical report, American's with Disabilities Act (ADA) standards, and jurisdictional standards.

Surface Type	Absolute Minimum	Design Minimum	Design Maximum	Absolute Maximum
Pedestrian plaza and seating areas	0.50%	1.00%	2.00%	2.00%
Concrete walkways	0.50%	1.00%	5.00%	15.00%
Unit pavers walkways	1.00%	1.50%	5.00%	15.00%
Asphalt pavement for roadway	1.00%	1.50%	5.00%	15.00%
Concrete pavement for roadway	0.50%	1.00%	5.00%	15.00%
Concrete Gutter	0.20%	0.50%	5.00%	15.00%
Landscape areas (natural surface)	1.00%	2.00%	25% (4:1)	50% (2:1)
ADA routes, non ramp, transverse slope	None	1.00%	2.00%	5.00%
ADA routes, non ramp, cross slope	None	0.50%	2.00%	2.00%
ADA ramps in curb	None	5.00%	8.30%	8.30%
Parking garage ramp	1.00%	1.00%	15.00%	20.00%

Figure 1

Hydrology Calculations

The estimated amount of stormwater runoff will be calculated using methods outlined in the Riverside County Hydrology Manual. Hydrology calculations should take into account existing and proposed hardscape, landscape, and building areas. Any proposed storm water facilities shall be designed for the 25-year storm event for non-sump conditions and the 50-year storm event for sump conditions.

Infiltration Calculations

The estimated infiltration rate for pervious surfaces shall be calculated based on the Riverside County Hydrology Manual. Infiltration calculations should take into account specific soil properties for each project area on campus as outlined by a Geotechnical report. It may be necessary to perform percolation tests to determine a more accurate infiltration rate for larger stormwater retention facilities.

Hydraulic Calculations

Onsite storm drain pipes shall be designed to conform to the Uniform Plumbing Code and criteria outlined in Division 2 of the Master Outline Specifications.

Stormwater Management
The overall goal of the proposed site drainage is to contain as much runoff within the campus as is feasibly and economically possible. The following provides general guidelines for different means of stormwater management.

Landscaping
Landscape areas can be used to reduce the overall amount of runoff from the campus. Proposed landscape areas are outlined in the Landscape Hydrology Strategy exhibit.

Pervious Pavement
Pervious paving surfaces can be used to alleviate a large portion of runoff for paving areas. The percentage of pervious pavement to impervious pavement shall be determined using infiltration calculations. Based on the amount of water that can be absorbed through the pavement, it may be necessary to utilize additional measures to provide adequate drainage. These measures can include installation of catch basins, underground retention basins, or discharge to pond areas.

Retention Basins/Ponds
Underground retention basins may be necessary in areas where pervious paving and landscaping cannot completely mitigate runoff. The retention basins should be designed using specific infiltration calculations for the required area.

Above ground ponds on campus can be used to store a large volume of water and then percolate the water into the earth. Potential planting areas that are suitable for ponds or retention are shown on the Landscape Hydrology Strategy Exhibit.

Onsite Storm Drain System
It may be necessary to utilize onsite storm drain piping to convey water to proper discharge locations. On-site piping should be designed per the Master Plan Specifications and the Utility Infrastructure Master Plan.

Discharge to City Streets
The existing grading at the campus utilizes surface flow to direct water to the main driveways that connect to adjacent city streets. The water flows to the streets and is then collected into the City storm drain system. This is not the desired method of stormwater management, but it may be necessary in some areas of the campus.

Discharge to City Storm Drain System
Connections can be made to existing storm drain pipes located in the City streets to allow for additional means of discharge. The connections will require City approval, but may be a means to provide additional discharge capacity in the event of a larger storm event.

4. Structural Systems & Considerations

General Requirements

Structural Engineering Design of the College of the Desert buildings is governed by the requirements of the Field Act beginning in Section 17280 of the Education Code and the current edition of the California Building Code (CBC—part of the CCR, Title 24, California Building Standards Code), with modifications by the Division of the State of Architects/ Structural Safety Section (DSA/ SS) for school design and construction.

The requirements of CBC provide minimum standards with the objective of maintaining life safety in the event of the strong ground shaking caused by the design earthquake.

The structural engineer shall be responsible for the design, or review of design, of connections to the basic structure of such building elements as veneer materials, window walls and steel-stud assemblies, decorative block screens, mechanical and electrical equipment and components, library shelving, and similar items.

Testing and inspection requirements shall meet Title 24 requirements.

Design Criteria

The requirements of the California Building Code and DSA shall govern except where specifically defined below.

Deflection: Maximum allowable deflection for structural members shall be that defined in the CBC. In order to reduce long-term vertical deflection and cracking of finished surfaces, where floor members of the engineered-wood support floor finishes of ceramic tile, terrazzo, or similar materials, maximum deflection shall be limited to 1/540.

Roof design loads shall provide for the weight of one re-roofing if the roofing designed can be re-roofed without removing the original roofing.

Structural Engineer shall include in his design the effect of extreme weather changes that could occur at the College of the Desert site, including rapid changes of peak temperature. Design shall accommodate structural expansion and expansion without causing noticeable cracking or structural distress. Separation joints shall accommodate such movements caused by temperatures. Control cracks in concrete by joints, construction joint separations, and other means.

Concrete cover shall be designed per CBC and shall accommodate severe weather requirements and prevention of corrosion.

Structural Systems
The following criteria and suggestion reflect the policies and preferences of the College derived from experience with economy and durability. Exception may be made with justification and specific authorization of the College's project manager.

Structural systems should be limited to conventional building systems that are widely used in seismically active areas of the United States. Additional consideration should be made for local market in the Coachella Valley area considering materials, skill sets, and cost. Building systems that provide higher levels of seismic performance should be considered for projects that have special considerations such as contents that far exceed the cost of the building.

The structures of all buildings, including non-bearing partitions, shall be of incombustible materials. Wood structures may be acceptable for one story structures, but with special permissions from the College.

In general, avoid steel moment frame resisting systems, which generally are expensive and produce large lateral story drifts during earthquake that may cause excessive damage to non-structural elements and typical wall finishes.

Structural systems should be redundant, capable of continued resistance and protection of structure and contents after seismic events.

Structural plan and vertical irregularities should be avoided whenever possible. Lateral force resisting systems should be continuous from roof to foundation and should be evenly distributed to develop regular response of the building. Soft stories are not allowed. Short columns should be avoided whenever possible. Discontinuous shear walls over braced frames should not be used. Use of transfer girders or other design elements that limit gravity system redundancy should be avoided.

Concrete and Masonry Structures
Use a minimum concrete ultimate compressive strength of 3000 psi at 28 days. Grout should be high strength non-shrink grout whenever possible.

Concrete mix design must comply with CBC Section 1905A.2.3; Method B. Use admixtures as required to improve concrete performance. Consider mixing, placing, and curing methods to accommodate weather conditions at the time of casting concrete at site. Avoid early strength concrete that may result in cracking.

Specify size of aggregate and slumps. Use 1-inch or 3/4 –inch minimum aggregate size, with smaller sizes only in special cases.

Control cracks in concrete by expansion joints, construction joint separations, and other means.

Avoid thin sections or projections that may crack off when forms are removed. Chamfer column corner.

In concrete masonry walls, grout all cells except in free-standing site walls not retaining soil. Avoid rebar larger than #8.

Clearly show the minimum concrete cover required for the intended fire protection rating and protection against severe weather change.

Exposed concrete surfaces should be free of cracks and complies with treatment specified by the Architect.

Foundations Consideration
All foundation design should adhere closely to the requirements of the site-specific Geotechnical engineering report. All excavation should be checked by the project Geotechnical engineer before the placement of reinforcing steel.

Building foundations should be located below the loose layer and into undisturbed native material.

Slab-on-Grade shall be supported on a properly prepared subgrade as specified in the Geotechnical report.

Seismic Strengthening of the existing Buildings
A detailed seismic evaluation of existing building should be considered as remodels, additions or alterations are planned. Comply with requirements of the CBC.

Refer to the seismic screening study report prepared by Integrated Design Services, Inc (IDS) dated October 2005, as a guideline that outlines the results of preliminary evaluation of the seismic performance of the buildings to remain in the campus. This report uses the ASCE-31 Tier 1 method in the seismic assessment. ASCE Tier 2 and 3 would be required for future seismic upgrade in addition to any other requirements specified by CBC and DSA.

5. Plumbing System Design

The mechanical engineer shall prepare plumbing drawings and specifications in conformance to the design guidelines outlined in this document. A criterion is established for plumbing systems design, and other plumbing requirements to be covered in the Plumbing drawing and specification bid package. Specific design submittal requirements for project are also highlighted, along with specific engineering responsibilities. In the event that design guidelines are in conflict, or a need arises during the project design phase to modify requirements, it is the Mechanical Engineer's responsibility to notify Owner in writing prior to continuing with the design effort.

Codes and Standards

- California Building Code
- California Mechanical Code
- California Plumbing Code
- California Code of Regulations, Title-24
- California Electric Code (NEC)
- American National Standards Institute (ANSI)
- International Association of Plumbing and Mechanical officials (IAPMO)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Agency (NFPA)

Design Conditions

All Plumbing fixtures, materials and equipment shall conform to Sate of California standards and be acceptable to IAPMO.

Building utility systems will include: Domestic hot and Cold water, Tempered Water, Industrial Water, Sanitary Waste and Vent, Storm Drainage, and special waste and vent where applicable.

Domestic cold water will be supplied from the campus water loop, through a water meter and reduced pressure principle backflow preventer.

Tempered water (an energy conservation measure) will be supplied to showers from hot and cold water systems through thermostatic mixing valve(s).

Industrial water will be supplied to HVAC equipment from domestic cold water system through appropriate backflow preventers.

Sanitary sewer will discharge to the campus sewer system.

Storm Drain system rainfall intensity will be determined during schematic design and will be verified by the mechanical engineer. If required, a lift station with duplex pumps, high and low level alarms, an annunciator panel in the building and a force main to campus storm drain system will be provided.

Domestic Water, Sanitary Sewer, Storm Drain, and Firewater piping will be designed with flexible assemblies to accommodate the horizontal seismic movement defined during schematic design. Flexible assemblies will be located under the building (by the base isolators) near exterior building walls.

Seismic bracing for piping shall conform to Title 24 and “Guidelines for Seismic Restraints of Mechanical Systems” by SMACNA. Calculations and details will be signed by a Licensed Structural Engineer with California registration.

6. Fire Suppression Systems

Overview
The mechanical engineer shall prepare fire protection drawings and specifications in conformance to the design guidelines outlined in this document. A criterion is established for fire protection systems design, and other requirements to be covered in the fire protection drawings and specifications bid package. Specific design submittal requirements for projects are also highlighted, along with specific engineering responsibilities. In the event that design guidelines are in conflict, or a need arises during the project design phase to modify requirements, it is the Mechanical Engineer's responsibility to notify Owner in writing prior to continuing with the design effort.

Codes and Standards

- California Building Code
- California Mechanical Code
- California Plumbing Code
- California Code of Regulations, Title-24
- California Electric Code (CEC)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (AMSE)
- American Society for Testing Materials (ASTM)
- American Welding Society (AWS)
- American Water Works Association (AWWA)
- National Electrical Manufacturers Association (NEMA)

National Fire Protection Agency (NFPA)

- NFPA 13 – Installation of Sprinkle Systems
- NFPA 14 – Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
- NFPA 24 – Installation of Private Fire Service Mains and Their Appurtenances.

Design Conditions
The entire system for each building shall be hydraulically designed.

The mechanical engineer shall provide drawings indicating riser diagrams and connections to the campus fire water loop, size and location of fire pumps if required, and design criteria for a licensed fire sprinkler contractor to design/build the sprinkler system.

The contractor shall provide hydraulic calculations for fire department approvals, layout of sprinkler heads and coordinate with reflected ceiling plans, and submit plans to Architect and Engineer for approvals.

7. HVAC System Design

Overview

The mechanical engineer shall prepare mechanical heating ventilation and air conditioning (HVAC) drawings and specifications in conformance to the design guidelines outline in this document. A criterion is established for air systems design, and other mechanical requirements to be covered in the Mechanical HVAC drawing and specification bid package. Specific design submittal requirements for project are also highlighted, along with specific engineering responsibilities. In the event that design guidelines are in conflict, or a need arises during the project design phase to modify requirements, it is the Mechanical Engineer's responsibility to notify Owner in writing prior to continuing with the design effort.

Codes and Standards

- California Building Code
- California Mechanical Code
- California Plumbing Code
- California Code of Regulations, Title-24
- National Electric Code (NEC)
- American Air Balance Council (AABC)
- American National Standards Institute (ANSI)
- Air Conditioning and Refrigeration Institute (ARI)
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Agency (NFPA)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

Design Conditions

Load Calculations

The following information shall be used in the cooling load calculations and design of this project. Where authorities having jurisdiction have applicable design limitation requirements, those design requirements shall prevail. Allowable design safety factors permissible by code shall be applied to equipment selections to ensure adequate cooling capability. Example: T-24 indoor and ambient design criteria may take precedence over table below per State of California Regulatory requirements).

Outdoor Design
Location: Palm Desert, Riverside County, California.
Climate Zone: 15.
Latitude: 33.70 North.
Longitude: 116° 30' West.
Elevation: 200 feet above mean sea level.
Outdoor design dry bulb temperature (cooling): 112 °F .
Outdoor design wet bulb temperature: 73 °F.
Outdoor design dry bulb temperature (heating): 26 °F .
Indoor (Space) Design

Room	Summer	Winter	RH (range)	Pressurization
Office Space	75 F	70 F	(30-60)	Positive
Conference Room	75F	70 F	(30-60)	Positive
Rest Rooms	78 F	68 F		Negative
Locker Rooms	78 F	68 F		Negative
Janitorial	78 F	68 F		Negative
Mechanical Room	80 F	68 F		Positive
Battery Room	75 F	70 F	**	Negative
Electrical Room	75 F	70 F	**	Positive
UPS Room	72 F	68 F (max.)	**	Negative if
Corridor	78 F	70 F	(30-60)	Positive
Telecommunications	72 F	68 F (max.)	(30-60)	Positive

** Specific manufacturer's recommendations.

Building Envelope
Insulation R-value shall not be directly used to determine the assembly R-value. The R-value shall be calculated from each assembly material, and the thermal bridging effect of assembly framing, mullions, cladding, and other through conduction paths shall be used to determine the construction assemblies actual R-values.

Building Operation
The building operation schedule shall be verified with the Owner to allow for appropriate occupancy, lighting, and office equipment loads.

Cooling Load
Perform HVAC cooling load and heating load calculations per the ASHRAE method. And in keeping with current California Coded of Regulations T-24 requirements, including safety factors. Cooling and heating load calculations shall be provided in formal submittal format for review.

Ventilation
Occupant density will be defined within the program documents for the facility, and an additional 15% shall be added to the occupant count to incorporate the high density of people associated with future growth.

If data in unavailable from program documents, refer to ASHRAE Standard 62 and add 15%.

Reasonable assumptions (diversity, etc) should be used in keeping with industry standards to determine the population for purposes of calculating the ventilation air quantity. Assumptions must be documented and understood by the Owner.

Space ventilation rates for the facility shall comply with the CMC, CBC, and the California Code of Regulations, T-24 . Where spaces become unoccupied, the minimum requirements shall be maintained during off-peak cooling and heating cycles at 15 cubic feet per minute per 100 square feet per T-24, or per latest applicable code at time of drawing plan check submittal.

Locker rooms and toilet room exhaust shall be no less than 12 air changes per hour.

Conference rooms and meeting rooms shall be equipped with demand ventilation controls using combination oxygen sensor and thermostat.

Building Pressurization
The outside air requirement shall be based on the greater of the ventilation requirement, or the positive air balance requirement as compared to the total rate of building exhaust. The building shall be kept under positive pressure via building static pressure sensors and the building supply fan VFD's. The equipment rooms shall receive air from the main office air conditioning system to satisfy the ventilation requirement, and to pressurize the equipment room.

Air Filtration
Filtration requirements: 4" deep 30% efficient pleated pre-filters, 18" deep 95% bag filters or 95% micro-pleat cartridge type filters, 12" deep activated carbon filters. Filters shall be 24" x 24" only. Airtight blank-off panels shall be required for irregular modular perimeter panels. Face velocity shall not exceed 550 feet per minute. Filter racks shall be of the face loaded type, and not the slide-in from end type. Filters shall be 24 inch by 24 inch, with blank-off panels as required for an airtight seal at irregular perimeter areas.

Building Management System
The BMS shall monitor and control all building mechanical systems and equipment. Each mechanical system shall be complete with factory controls, and shall be specified with accessory integration modules, hardware, computer cards, and software required for full and complete integration to the BMS. The BMS shall monitor mechanical equipment for failure alarms, and all operating set point variables shall be capable of being reset. Additional integration modules, hardware, software, and programming shall be provided by the BMS vendor as required to complete system integration. The emergency generator, UPS, Battery Plant, main circuit boards, transfer switch, electrical gear, and other building electrical systems and subsystems shall be integrated, and or monitored. The security system and fire control panel shall also be integrated for central monitoring. The BMS system shall be compatible with existing client systems. Coordinate requirements with each discipline, and with the client requirements.

Deliverables to Owner

Schematic Design
HVAC Load calculations performed using a nationally recognized computer based load calculation program (DOE, TRACE, HAP).

Summary and detailed reports shall be provided for Owner's review. The reports shall have cooling and heating load details by zone and system. The reports shall be provided in hard copy and electronic format (MS Excel, Adobe PDF, etc.). Catalog cuts of equipment to be used on the project. For each item, the selection shall be identified for the Owner. The catalog cuts shall be provided in hard copy and electronic format (Adobe PDF, book-marked). Code issues shall be identified. Site coordination issues shall be identified.

Design Development
HVAC Load calculations performed using a nationally recognized computer based load calculation program (DOE, TRACE, HAP). Summary and detailed reports shall be provided for Owner's review. The reports shall have cooling and heating load details by room, zone and system. The reports shall be provided in hard copy and electronic format (MS Excel, Adobe PDF, etc.). Preliminary Title 24 report shall be provided in hard copy and electronic format (Adobe PDF, book-marked). Catalog cuts of equipment to be used on the project. For each item, the selection shall be identified for the Owner. The catalog cuts shall be provided in hard copy and electronic format (Adobe PDF, book-marked). Site coordination issues shall be identified and finalized.

Construction Documents
HVAC Load calculations performed using a nationally recognized computer based load calculation program (DOE, TRACE, HAP). Summary and detailed reports shall be provided for Owner's review. The reports shall have cooling and heating load details by room, zone and system. The reports shall be provided in hard copy and electronic format (MS Excel, Adobe PDF, etc.). Final Title 24 report shall be provided in hard copy and electronic format (Adobe PDF, book-marked). Catalog cuts of equipment to be used on the project. For each item, the selection shall be identified for the Owner. The catalog cuts shall be provided in hard copy and electronic format (Adobe PDF, book-marked). Other calculations shall be provided in hard copy and electronic format (MS Excel, Adobe PDF, etc.). The following is a list of calculations, some or all may be required for a specific project: supply air duct pressure drops; return air duct pressure drops; exhaust air duct pressure drops; air-side equipment selection curves matching the load calculations and pressure drops submitted; chilled water system pressure drops; hot water system pressure drops; pumps, boilers, converters, chillers, cooling towers, etc. selection curves matching the load calculations and pressure

drops submitted; selection calculations and data for all ancillary equipment such as expansion tank, air eliminator, chemical feeder, etc. For all pressure drop calculations, include duct and pipe diagrams indicating nodes and pressure drops for sections.

All data shall be provided in a booklet for Owner's files.

8. Building Management System

The Building Management System (BMS) shall monitor and control all building mechanical systems and equipment. Each mechanical system shall be complete with factory controls, and shall be specified with accessory integration modules, hardware, computer cards, and software required for full and complete integration to the BMS.

The BMS shall monitor mechanical equipment for failure alarms, and all operating set point variables shall be capable of being reset.

Additional integration modules, hardware, software, and programming shall be provided by the BMS vendor as required to complete system integration.

The lighting control panels shall be integrated into the BMS.

The clock system shall be integrated into the BMS.

The emergency generator, UPS, Battery Plant, main circuit boards, transfer switch, electrical gear, and other building electrical systems and subsystems shall be integrated, and or monitored.

The security system and fire control panel shall also be integrated for central monitoring.

The BMS system shall be compatible with existing client systems. Coordinate requirements with each discipline, and with the client requirements.

9. Electrical Systems Design

Overview
Technology Rooms (TRs), also known as IDF Closets, Telecommunications Closets or Tele/Data Rooms, differ from Equipment Rooms (ERs) and entrance facilities in that they are generally considered to be floor-serving (as opposed to building or campus-serving) spaces that provide a connection point between backbone and horizontal distribution pathways. Technology Rooms provide an environmentally suitable and secure area for installing cables, cross-connects, rack- and wall- mounted hardware and technology equipment. The Technology Room is the recognized connection point between the backbone and horizontal pathways.

Technology Room Requirements
The following provides general requirements for all Technology Rooms.

Size and Location of Technology Rooms
Floor Space Served
There must be at least one Technology Room per floor. Multiple rooms are required if the cable length between the Technology Room and the telecommunications outlet, including slack, exceeds 295 ft.

Size Requirements
Technology Rooms shall be approximately 80 to 120 sq.ft. in size, depending on the systems they will contain.

Clearances
The following clearances shall be maintained for equipment and cross- connect fields in the Technology Room:

- A minimum of 36 in. of clear working space in front of and behind equipment and patch panels.
- A minimum of 6 in. depth off wall for wall-mounted equipment.
- Aisles shall be a minimum of 32 in. wide.

Architectural Requirements

Ceiling Height

The minimum ceiling height shall be 8.5 ft. above the finished floor. To permit maximum flexibility and accessibility of cabling pathways, false ceilings are not recommended in Technology Rooms.

Doors

Technology Rooms shall have lockable doors that are at least 3.0 ft. wide and 80 in. tall. Door sills are not recommended because they impede the movement of equipment. NOTE: Doors that open outward provide additional usable space and reduce constraints on Technology Room layout.

Dust and Static Electricity

Provide anti-static floor tiles in each Technology Room. Imbed 2 in. copper tape between the anti-static tile and the conductive adhesive 1.5 feet from the wall. Leave 12 in. of copper tape exposed above the anti-static tile for grounding to copper signal ground busbar in each Technology Room.

Flood Prevention

Locate Technology Rooms above any threat of flooding. Avoid locations that are below or adjacent to areas of potential water hazard (e. g., restrooms and kitchens).

Floor Loading

Provide a minimum floor loading of 2.4 kPa (50 lbf/ ft. 2).

Other Uses

Technology Rooms must be dedicated to the telecommunications function and related support facilities. Equipment not related to the support of the Technology Rooms such as piping, duct work, and distribution of building power must not be located in, or pass through, the Technology Room.

Wall Requirements

Technology Room walls shall extend from the finished floor to the structural ceiling (e.g., the slab), be covered with two coats of fire-retardant white paint and be fire-rated as required by the applicable codes and regulations. Technology Room walls should not have windows installed, nor is it desirable to locate Technology Rooms on perimeter/curtain walls where windows comprise the entire surface of the wall.

Backboard
Provide AC- grade or better plywood, 8 ft. high with a minimum thickness of 0.75 in. around the perimeter of the room. Plywood shall be either fire- rated or treated on all sides with at least two coats of fire- resistant paint. The bottom of the plywood shall be mounted 6 in. (AFF above finished floor).

Mechanical System (HVAC) Requirements
Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). Maintain positive pressure with a minimum of one air change per hour in the Technology Room. Provide:

- Temperature 70 degrees F +/- 10 degrees
- Relative humidity 50% +/- 20%

Estimated Heat Loads: 5,000 to 7,500 BTU per equipment cabinet or rack.

Electrical System Requirements
Lighting
Provide a minimum equivalent of 500 lux (50 footcandles) measured 1 m (3 ft) above the finished floor. Locate light fixtures a minimum of 2.6 m (8.5 ft) above the finished floor. Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage.

Power
Technology Rooms shall be equipped to provide adequate electrical power. Provide two (2) dedicated non-switched 3-wire, 20A, 120-volt (V) alternating current (ac) duplex outlets for equipment power at each equipment rack location. Provide (1) 120/30 receptacle, NEMA L5-30R, for a dedicated rack-mountable UPS.

Provide separate duplex 120 V AC convenience outlets (NEMA 5-15R or 5-20R) for tools, test sets, etc., located at least 18 in. above the finished floor, placed at approximately 6 ft. intervals around perimeter walls and identified and marked as such. All outlets must be on non- switched circuits.

Bonding and Grounding
Provide a copper signal ground busbar in each Technology Room. The ground lead shall be a minimum 6AWG stranded copper cable with green insulation, cad-welded to the Ufer Ground or building steel.

Fire Suppression System Requirements
Provide wet-pipe system with sprinkler heads in wire cages to prevent accidental operation.

10. Building and Site Lighting

Overview
A primary goal of the College is to maximize energy efficiency and to utilize sustainable design practices wherever possible on campus. The College may not pursue LEED certification for all their buildings, however, their goal is to utilize LEED sustainable design practices wherever practicable.

Lighting design is an important component of the energy efficient design required by the Campus. Lighting design must consider energy efficient design as well as the use of renewable energy sources. In addition, the lighting must provide the visual comfort to optimize the learning environment on campus.

The following design objectives address both interior and exterior lighting requirements on campus. The goal is to exceed Title 24 requirements by as much as 20% and to maximize the use of renewable energy sources. All projects on this campus should adhere to these design criteria and objectives. If a need arises to modify these requirements during the design phase it is the designer's responsibility to notify the Owner in writing. Although it is not mentioned for the remainder of these guidelines, all of the requirements below are goals but they are all subject to compliance with state mandated Title 24 requirements.

Interior Lighting
Lighting Levels
Footcandle levels should be consistent with IES guidelines. Lighting levels should be calculated at desk height (30 inches) and should use appropriate reflectances for the finishes and furniture located in the individual room.

Lighting Fixture Types
The type of light fixtures should enhance the overall aesthetics of the space as well as provide quality, comfortable light. Indirect/direct fixtures should be used where possible in classrooms. All fixtures

should be chosen and located to reduce glare and increase the visual comfort of the building occupants.

Lamps/Ballasts

The primary lamp source for all interior spaces is fluorescent. Compact fluorescent lamps should be used for smaller fixtures. For linear type fixtures, T8 lamps should be used. In larger areas with higher ceilings T5 lamps can be used but care must be taken due to the extreme brightness of these lamps. Linear fluorescent lamps should have a CRI of at least 70 and compact fluorescent a CRI of at least 80. Where possible, use linear fluorescents due the higher efficiency than compact fluorescents. Ballasts should be electronic type with a THD<10%. Dimming ballasts should be solid-state type and compatible with any dimming or daylighting systems used. Ballasts should be employed to allow multiple lighting levels in each space.

Controls

Controls should consist of a networked lighting control system, switches, dimmers, and occupancy sensors. A networked lighting control system should be utilized on every building where possible and should be integrated into the campus Building Management System. The system allows central time control over multiple zones which helps to maximize energy efficiency. Manual switches should meet the requirements of Title 24. Dimmers should be used in selected areas as dictated by the College. Occupancy sensors should be used wherever possible to maximize energy efficiency. Occupancy sensors should utilize dual technology. Sensors for small single-occupancy rooms can be wall-mounted. Larger rooms will require ceiling mounted sensors. Regardless of the controls used, all spaces greater than 100 square feet should utilize multiple lighting levels. Where possible, lighting controls should be integrated into the campus-wide Building Management System.

Daylighting

Daylighting is an opportunity to utilize a renewable energy resource to maximize energy efficiency. Wherever possible daylighting should be utilized. This may reduce HVAC loads and equipment sizes. Because of the impact of automatic control on the lighting levels to the occupants, care should be taken in choosing to utilize daylighting systems. Because of the many issues surrounding the use of these systems it is the designer's responsibility to address the use of daylighting during the early stages of project design. Any opportunities to use this system should be addressed in writing to the Owner during the initial design stage. Provide enough information to allow the Owner to make an informed decision regarding the use of this system.

Exterior Lighting

Glare Control

The following design strategies should be taken into account to help increase nighttime visibility and to reduce glare:

- Distribute light more uniformly and over a broader area by using shorter poles with lower wattage lamps.
- Reduce light levels.
- Shield light sources.

Light Pollution

The College has a "dark-sky" policy that generally conforms to the County of Riverside Ordinance No. 655. The intent is to prevent light pollution at the campus. The college does not wish to use low pressure sodium lamp sources, so all exterior lighting should be in conformance with the applicable portions of the Ordinance to allow the use of metal halide or other lamp sources. In addition, full cut-off and shielded luminaires must be used for exterior lighting. Luminaires mounted on buildings and on poles should be aimed and shielded to avoid any light trespass onto adjoining properties. Unshielded security floodlights or wallpacks should be avoided. Use "full cut-off" luminaries wherever possible. All fixtures should have controlled distribution. Uplighting should be avoided wherever possible.

Security – Safety

Lighting that provides a sense of security increases legitimate nighttime activity which in turn increases actual security. This can be accomplished by providing increased uniformity, reduced shadows, reduced source glare, using natural color, and avoiding over-lighting. Sidewalks, pathways and bikeways should be designed to provide illumination onto the vertical plane so people's faces are comfortably lighted. Low height bollards generally light the ground and should be utilized in conjunction with taller luminaries or where another criterion takes precedence. Additional transitional lighting should be provided to the sides of walkways as they pass building alcoves, building entrances, or dense shrubbery.

Color
Metal halide lamps with a CRI above 65 should be used. For smaller fixtures compact fluorescent lamps should be used. For heavily populated pedestrian locations where superior color is required and where there is sufficient project budget, ceramic metal halide lamps should be used. These lamps should have a CRI above 80 with an apparent color of 3200K to 5000K depending on the application.

Controls
All exterior lighting should use a combination of photocells and astronomical time switches. Exterior lighting control should be incorporated into the campus-wide building management system. Exterior lighting should be zoned to allow multiple levels of light during the entire nighttime period. The lower level for basic security and a higher level for normal usage. Hours of operation should conform to the County of Riverside Ordinance No. 655.

Luminaires
Luminaires selection should consider vandalism. Sturdy construction is required. Provide tamperproof fasteners. Provide rigid and fixed aiming to prevent rotation of fixtures. Lenses and diffusers should resist breakage, weakening, or discoloration by aging or exposure to UV light.

Thermal Considerations
Some exterior fixtures have excessive surface heat due to the weatherproof construction. These include uplight burial fixtures. These should be avoided due to the excessive heat which can burn people and due to the light pollution discussed earlier.

Exterior Luminance Levels

Exterior Luminance Recommendations				
Space Type Categories	Horizontal FC (Min. Avg.)	Vertical FC (Avg.)	Luminance Ratios	
Exterior Building Entries	5	3		
Exterior Doors, Inactive	3	3		
Sidewalks and bikeways	2	1	4:1	Avg/ Min
Parking Lots	1	0.25	20:1	Max/ Min
Areaway Lighting	1	0.25	4:1	Avg/ Min

11. Fire Alarm System

Overview
The existing campus-wide fire alarm system is an addressable system manufactured by Simplex. All new buildings shall utilize the Simplex fire alarm system and components conforming to DSA standards.

Panels/Power Supplies
Panels

Power Supplies

Devices
Smoke/Heat Detectors

Pull Stations/Monitor Modules

Horns/Strobes

Control Modules

Smoke Damper Control

12. Access Control/Security Design

Introduction
This section provides particular standards associated to the security industry and offers guidelines that address campus security concerns. The information contained in this section also describes functional requirements for each of the sub-systems (systems) that will form the "integrated security system" (SYSTEM), which establishes the design criteria in a form readily understood to be the model for architects and engineers as campus structures are design and built. It is therefore expressed here that the reader appreciates the functional relationship between the systems and the campus personnel.

Surveillance
External movable cameras known as pan-tilt-zoom (PTZ) will be located at certain building exteriors for the purpose of viewing activity on campus grounds, and the call-for-assistance units that will be located at parking lots. This will be discussed later in this document. The PTZ's will be mounted at either the parapet, or no greater than 20' feet above grade on a structure façade to allow for maintenance purposes. Each camera will be esthetically pleasing utilizing a dome configuration.

Fixed cameras will be located within structures at most entrances. Care will be taken to avoid wash-out due to external light conditions. These cameras will be of a flush dome configuration when practical.

Analog cameras with digital signal processing (DSP) will transmit video signals in one direction. Bi-directional transmission is required for PTZ's to allow video in one direction with movement control in the opposing direction.

Both fixed and PTZ cameras will derive their power from low-voltage power supplies at centralized locations within structures consisting of electrical building power fed to the power supplies. The power need not be of an emergency source. However, care will be taken to avoid phasing issues.

Functional Requirements
The system will allow for a concentration consisting of a single location within structures for video signals convergence to fiber-optic capacity. These will be fed to digital video recorders (DVR) where recording and remote playback capabilities will occur. The system will consist of the following components:

Cameras
Cables within structures will use coax cables from camera to fiber-optic converters, or have fiber-optic outputs. Separate power cables will be used from camera to power supplies. Control cables for PTZ cameras will be of a separate source type, or utilized the same fiber-optic output used for video. All cables will be sized and selected to allow for voltage drop and video attenuation. Domes shall be of a vandal resistant type for protection against wanton damage. Cameras will consist of the following:

- PTZ cameras incorporating a color camera with day/night-low light capacity to include an integral zoom lens and PTZ motors for movement will be provided. The unit will be equipped to allow a 360% rotation with auto-flip for smooth operation, and come with both mechanical and digital zoom. The lower portion will be fitted with a dome liner to allow for a clear dome outer shell. Each unit will have either a coax or fiber-optic output.

- Fixed cameras incorporating a color camera with sufficient auto-iris control will be provided to allow changes in external light conditions to exist. The unit will be housed in either a standard or small dome configuration with the lower dome portion to be a smoked finish. Each unit will have either a coax or fiber-optic output.

- DVR units will allow for 16 video ports, and be located at the central location with 240GB of storage capacity per unit. The unit will have video motion as a feature allowing a change in status in pixels to generate an alarm condition. The unit will run its application software over the operating software in order to record video scenes according to programming. DVR's will allow for fiber-optic transmission from cameras with the use of fiber-optic transmitters/transceivers. Thereafter, DVR's will be equipped with 10/100 network interface cards and connected to a data network switch.

- CCTV Switch
  DVR's will be connected to the switch allowing a remote client software access to any one of the DVR's for play back and to control the PTZ's on campus. In essence, through the remote client software, any camera may be programmed or controlled for recording, live, and playback of any video scenes. Other equipment required to be place on the switch will be the access point/bridges described below.

- Client Software, Notebook, and WiFi
  A remote notebook using the current version of windows XP operating system will be provided. Residing on the notebook will be application software compatible with the DVR selected to manipulate and control camera scenes as necessary using client software. The unit will have the capacity to allow remote viewing with the use of a WiFi (wireless fidelity) for remote video capture and control.

- Remote Equipment
  The remote equipment to transport video scenes will consist of a radio network access point using the network 802.11b standard. Every WiFi deployment is different. Engineering will require research to determine varying building sizes, construction materials, and interior divisions that will raise transmission and multi-path considerations. The design of a building-to-building solution to include, distance, physical obstructions between facilities, and number of transmission points will be taken into account. This should be accomplished prior to any camera installation to support the monitoring function.

  The components for such an enterprise will consist of access points, client adapters, and bridges along with 2.4 GHz and 5 GHz antennas, cables, and accessories available to support the remote equipment.

  For reasons stated above, a comprehensive study will be required to evaluate actual condition related to existing and proposed building materials, distances between structures, structure footprint size, and number of floors involved above and below grade. The survey should be accomplished using manufacturer's tools and method to determine the precise location of products upon or with structures.

Access Control/Proximity

Information on this system is presented here for reference due to connectivity requirements for integration to other systems. The reader is requested to refer to the Specific Design Criteria related to finished hardware.

COD currently has adopted the Ingersoll-Rand, Schlage, Locknetics proximity system as the product of choice for new construction projects involving structures on campus. The system involves the use of off-line locking hardware that is battery operated, and therefore, standalone with application software for up-loading user information and down-loading 1000 incidents of activity per lock through the use of a PDA. COD will continue to use this system for existing structures, which amount to approximately 45+ locks campus-wide.

New construction projects will be required to provide an on-line lock system capable of being fed power from the building, and being on line for editing to control, manage, produce badges with photographs on cards, and accept surveillance interface for display for security purposes. The new system will be compatible with the current locks and therefore is backward compatible. The technology of choice is proximity.

Functional Requirements

The application software will be the Ingersoll-Rand SMS Schlage Management System, which is backward compatible for current locks, which will replace the current application software. The new management software will reside on a platform currently established or one identified by COD.

This system will include off-line and on-line locks in combination on doors assigned by COD where emphasis is necessary for security purposes. The locks will be configured for differing door applications such as mortise, cylinder, and exit (panic) devices. Where on-line locks are in use, door position switches and request-to-exit functions will be used to support door alarm/door-prop-open, and request-to-exit functions.

The finish for the locks will be dark bronze.

Intrusion Detection
Digital Alarm Communicating Transmitters (DACT) will be provided within structures for transmissions of alarm, panel trouble, and non-communicating functions to a third party monitoring company selected by COD. In the event of an alarm condition, the monitoring company will call the police department for immediate response, and thereafter, notify COD personnel according to a call list provided by COD. In the event of a trouble condition, the monitoring company will notify COD using the same call list, or one developed for only trouble conditions according to individual zone or groups of alarm zones. Either full panel or partition zone arming for subsequent alarm conditions will be accomplished with the use of keypads.

Each intrusion system will be designed to integrate with the surveillance system.

Functional Requirements
The unit will allow security alarm devices, not to include fire alarm system or components, to be connected to its terminals for monitoring circuit alarm conditions with panel output to drive internal building audible devices. Programming will be accomplished by the installing company with input from COD staff.

The panel will have the capacity to have hundreds of inputs in both hardwired fashion, or through remote data loops with 8 partitions per panel thereby allowing separate accounts (partitions).

The system will be self sustaining with internal batteries to support the panel for up to 24 hours minimum, with low-battery condition reported to the monitoring company. The system will consist of the following interconnected components to form the overall system:

- Keypad: These units will be equipped with a fluorescent character display for zone and alarm identification. The systems will be non-supervised; a condition whereby the monitoring company will not monitor scheduled openings, but will receive only alarm or supervisor conditions.

- Door Position Switch: Building exit doors at new constructions will be fitted with door position switches. These devices will be included in the structure design typically specified by the project door hardware consultant, with conduits in support designed by the project electrical engineer or security consultant. The switches will be located on each door at the upper most location within the door header with hidden flush mounted units. Where conditions will not allow for this approach, surface mounted device will suffice.

Loading doors will be fitted with either floor, or rail mounted position switches.

- Motion Detectors/Glass Break Sensors: A selection of either motion detectors and/or glass break sensors will be fitted to protect either physical motion or glass breakage due to intrusion break-ins respectively. The coverage and location must be carefully selected to avoid false alarms due to miss-application. The installation must adhere to the manufacturer's installation recommended practices.

  Motion detectors will be dual units consisting of both infrared and microwave technology to mitigate false alarm conditions.

  Both units will be fitted with tamper switches and interconnected to the DACT as the device alarm zone.

- Panic Buttons: These devices will be located under desk tops, counters, or walls adjacent to individuals that either handle monies or control masses of students on a regular basis. The device is intended to summons police when a person feels they are in eminent danger of assault.

  Care should be taken by COD when authorizing its location, with special instructions for those assigned the installation of the device.

- Audible Sounder: An internal alarm device as either a horn or siren will be located within or adjacent to the alarm system or partition to deter further intrusion into the structure. The sounder will be listed at greater than 80 dB at 10' feet.

Call-For-Assistance
Located on the campus grounds, these units will consist of either squared or cylindrical steel bollards, free standing on concrete footing at grade. Wind resistance calculations with considerations to unit weight and height will be provided to assure a fixed and permanent

position. The finish color will be established prior to construction and will be uniform throughout the campus.

Functional Requirements
The Call-For-Assistance (CFA) units will be an easily identified by color and with the use of a beacon light to draw attention to its location. The unit will be aesthetically pleasing and virtually impervious to damage, and will include a high quality, vandal resistant, hands-free communications device, and a powerful strobe that serve to identify the unit from a great distance upon an alarm condition.

The vandal resistant communications device will be compliant with the Americans with Disabilities Act (ADA), and will auto-dial a set of preprogrammed telephone numbers to either a cell telephone carried by the security force, and (when required) to a stationary telephone instrument on or off campus (programmable).

Each unit may gain its power from either an adjacent building, or from internal batteries continually charged by photovoltaic method. The selection of which will be determined during design based upon cost consideration per unit.

Where CFA units are hardwired they may be integrated with the surveillance system.

System Integration
Integration is best described as multiple systems interconnect as a SYSTEM in a fashion that will allow an action in one system to cause a reaction in another. The reaction will consist of auto-recording to take place by the camera(s) that are within viewing of the associated building with camera call-up to automatically cause the video scene to appear on the remote notebook carried by the security force. Therefore, intrusion systems and the CFA units will be integrated with the surveillance system for integration purposes as follows:

- Intrusion panels will be fitted with multiple outputs for connections to the DVR's.

- CFA units (when hardwired) will be fitted with a single output interconnected to the DVR's.

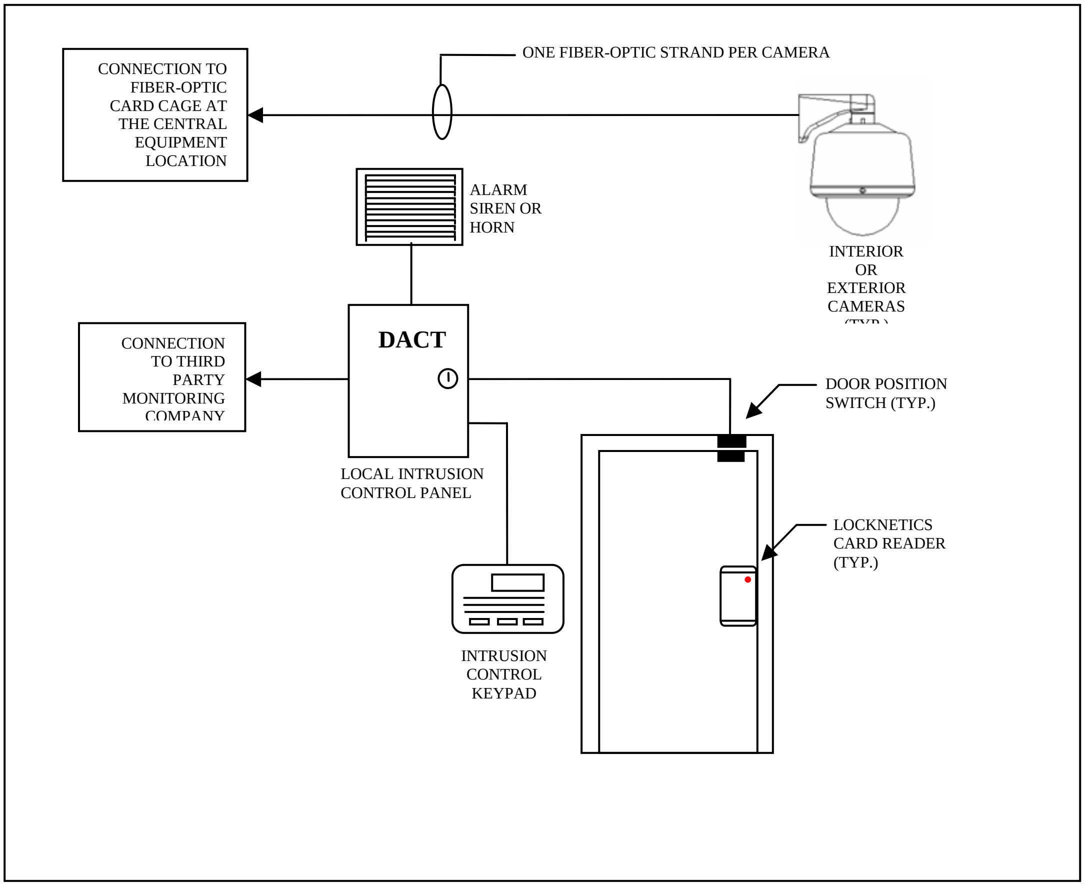
Standards
Adherence to codes and standards will be observed. Those listed below are not to be considered all inclusive. Local and state codes and standards not listed will also be observed. Designer/builders will investigate all required codes and standards for each construction project prior to design.

- CEC, 2001 edition, Articles 725, and 800; Commercial Building Telecommunications Wiring Standard, ANSI/EIA/TIA 568-1991 & Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/EIA/TIA 569-1990.

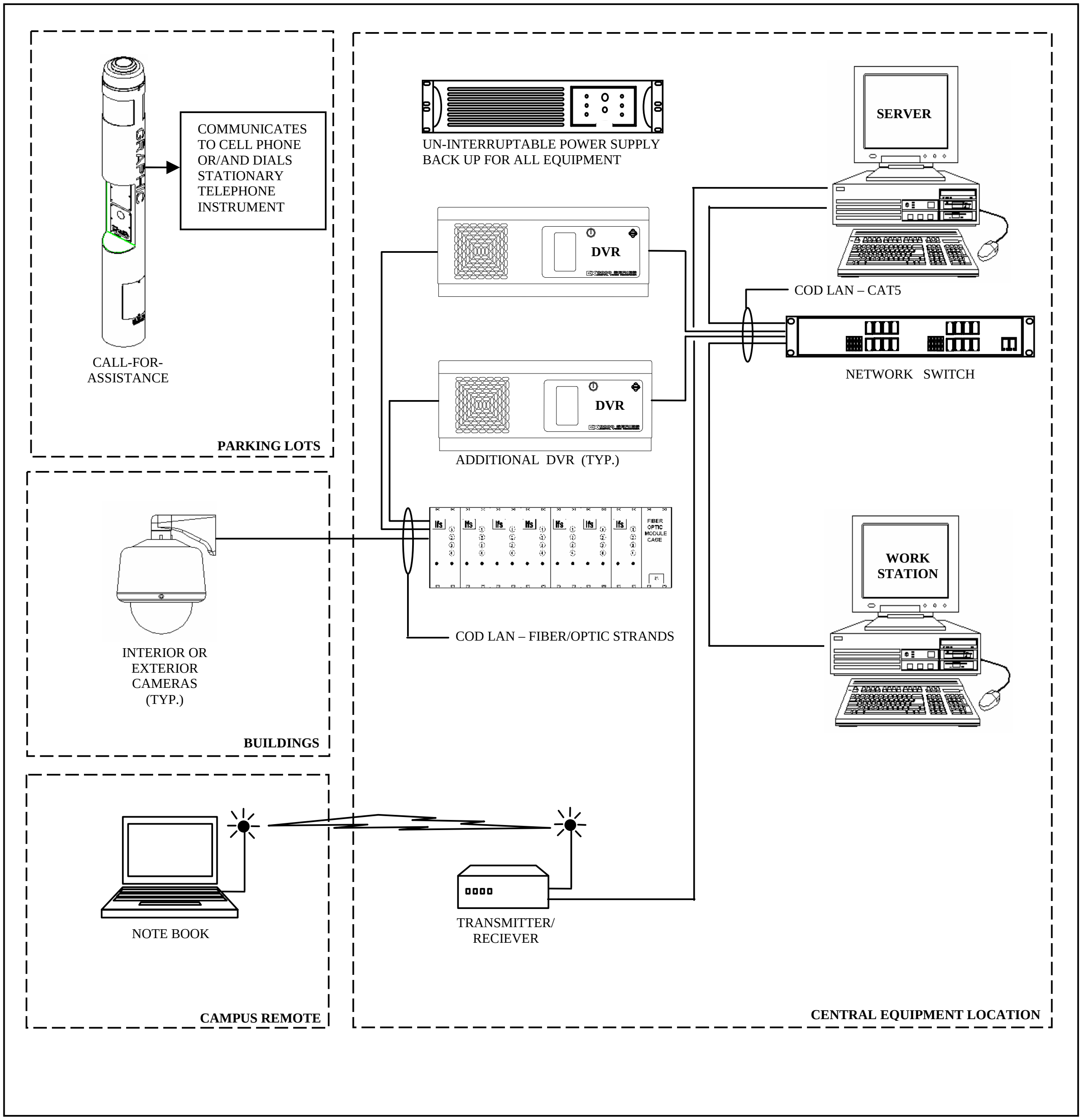
- CBC, 2001 edition, Chapter 11B, Section 1118B.5 & 1118B.6, forward and side reach maximum height restrictions for controls

- National Electrical Manufacturer's Association (NEMA).

- Federal Communications Commission (FCC), Code of Federal Regulations Title 47 - Part 15 – Radio Frequency Devices and Part 68 – Connection of Terminal Equipment to the Telephone Network.



Building Security System Block Diagram



Campus-Wide Security System Block Diagram

13. Telecommunications Systems Design

Introduction
The information included in this section is provided as reference for project's architects, engineers and other consultants in order to establish an initial understanding of how integrated technologies will impact architectural designs and construction for the new and renovated building projects on campus.
This document addresses minimum guidelines for the design of Technology Rooms, pathways (inter-building and intra-building), and structured cabling system.

Technology Rooms
There are a number of names used to describe Technology Rooms, including Telecommunications Rooms (TR), IDF Closet, Tele/Data Closet, Equipment Rooms (ER), BDF, MDF etc. For the purpose of this document relevant to the individual building projects, the College has identified two classifications of Technology Rooms, the Building Distribution Frame (BDF) and Intermediate Distribution Frame (IDF). The College reserves the use of the MDF, Main Distribution Frame and Data Center to spaces that support the entire Campus.
Technology Rooms provide an environmentally suitable and secure space for installing cable, associated hardware, rack and wall mounted technology equipment.

Communications Requirements in the Technology Rooms
Ladder Rack
Provide Ladder Rack within the BDF and IDF rooms to route cable to or from sleeves, risers, ducts, cable trays to termination fields within equipment racks or mounted on walls. This cable ladder system shall be contained within the confined rooms.

<u>Ladder Rack Materials and Applications</u>
Cable ladder may be mounted horizontally or vertically on walls and over equipment cabinets and racks. Vertical ladder will be used to support riser cable from floor to ceiling as it passes between floors. The Cable Runway system shall be mounted to walls, the top of equipment rack, or hung with threaded rods for bracing and support. Refer to Local Building Codes for additional seismic bracing for code compliance.

<u>Ladder Rack Bonding and Grounding</u>
The ladder rack system shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.

Equipment Racks
Provide a minimum of (4) equipment racks in a standard BDF rooms and (3) equipment racks in a standard IDF rooms.

<u>Size and Construction</u>
Each rack shall consist of a modular EIA 19" mounting frame, with a minimum of 77" (44U) space for equipment in the vertical plane. The rack shall be manufactured from extruded aluminum / steel with a minimum load-carrying capacity of 1000 lbs. (450 kg.).

Each rack will have both horizontal and vertical cable management. Provide side-mounted vertical cable management on both sides of each rack.

Provide strain relief and cable management at the rear of each rack to ensure tidy routing of all feeder and horizontal cables.

<u>Power Requirements</u>
Each cabinet to have a minimum of (1) mounted power strip at the rear of the cabinet with eight power sockets. The strip will connect to a UPS with a dedicated 20amp circuit. The power receptacles on the connector strip shall be NEMA 5-20R compatible. The plug shall be NEMA 5-20P compatible.

Installation Requirements
Provide all mounting components and accessories to securely fix racks to floor and supporting walls. Provide appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines), and fix each rack to the overhead ladder.

Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the rack. Do not allow cables to be unsupported as they run from conduit or cable tray to equipment cabinets.

Bonding and Grounding
The equipment racks shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.

Communication Cable Distribution Infrastructure
The horizontal communication cable distribution infrastructure includes the pathway and support hardware which concentrates, supports and protects horizontal cable between its origination point in the IDF or BDF and the workstation outlet location. It also provides a permanent pathway that facilitates the addition or replacement of cable over time. Horizontal support hardware is further defined as continuous, (e.g. Conduit, Cable Tray) and non-continuous (e.g. J-Hooks, Bridle Rings).

Communication Distribution Cable Tray
Distribution cable tray shall be installed above the accessible ceiling and used as a main pathway for the management of high volumes of cable through corridors, and for access and egress to BDF and IDFs.

Construction
Cable tray shall be the wire basket type manufactured of ASTM A510 high strength steel wires or equal, and comply with NEMA VE1 or the proposed IEC 61537 standards. The cable tray shall be UL (Underwriters Laboratory) listed.

Dimensions
The cable tray shall be a minimum of 12 in. wide, with a depth of 6 in. Narrower cable tray may be used for locations with lower volumes of cable.

Support Requirements

A trapeze-style support shall be used along the span of the cable tray. The trapeze shall be constructed of channel stock (i.e.Unistrut) and 5/8 in. threaded rod. The trapeze support elevation should allow a minimum of 12 in. between the top edge of the cable tray and the slab above. Appropriate threaded rod anchors shall be selected and approved by the Project Structural Engineer. Trapeze supports shall be placed a minimum of every 10 ft. and at cable tray intersections and terminations.

Seismic bracing for the cable tray as required by code, shall be installed along cable tray routes. Coordination of lateral and oblique bracing locations shall be coordinated with the other disciplines whose equipment and systems share the area above the suspended ceiling.

Bonding and Grounding Requirements

The cable tray shall be bonded to the Telecommunications Grounding Bus Bar in the IDF(s) on the same floor. All non-contiguous segments of the Cable tray shall be bonded together using 6AWG stranded copper wire, with crimp-on lugs bolted to each segment of the cable tray to ensure electrical continuity throughout the length of the cable tray system.

Firestopping Requirements

Cable trays that penetrate fire-rated walls shall be equipped with wall penetration sleeves at each location, and have appropriate firestopping materials installed after the placement of cable has been completed.

Communication Cable System Conduit

Provide Communications cable conduit in locations where access to cable tray is unavailable or where portions of the pathway span are inaccessible (i.e. embedded in walls or inaccessible ceilings). Provide conduit for small quantities of cable where cable tray is impractical. Conduit materials may be used to house non-rated cables between end points to ensure NEC Code compliance.

Conduits serving individual workstation outlets shall be a minimum of 1 in. The 1 in. conduits shall be connected to double-gang, deep device boxes (2-1/2 in. deep), equipped with a single-gang mud ring at the outlet location. Individual workstation conduits are to be dedicated to only one outlet box each, and shall not be "daisy-chained" together.

The following conduit type shall be utilized as described below:

<u>Rigid Galvanized Steel (RGS)</u>
Rigid conduit shall be used in areas exposed to the outside elements above ground and used for the containment of non-rated cable as specified in the NEC.

RGS shall be installed using threaded couplers and fittings.

<u>Thinwall Electrical Metallic Tubing (EMT)</u>
EMT shall be used for installations within the confines of an environmentally-controlled building. EMT conduit is not acceptable for non-rated cable installations. EMT conduit may be used, however, to carry riser-rated cable and innerduct in vertical and horizontal cable applications. EMT conduit may be used as sleeves for wall penetrations, and for floor core riser penetrations.

EMT conduit connectors and fittings shall be installed using "Set-Screw" type or air-tight "Compression" type fittings.

<u>Flexible Conduit ("Flex")</u>
Flexible conduit shall not be used for communication cable installation when EMT conduit is available. Flex conduit may used for connections into modular furniture or similar applications. When using Flex conduit, increase the diameter of the Flex by one trade size over what the requirement would be using smooth-wall conduit. Flexible conduit runs may not exceed 5 feet.

<u>Plastic Conduit/Polyvinyl Chloride (PVC)</u>
Plastic and PVC conduit shall be used for underground duct construction between buildings and vaults. PVC conduit shall not be used within buildings per NEC Code and UBC (Uniform Building Code).

The PVC conduit shall be a minimum of Schedule 40 PVC. Plastic.

Conduit Installation Guidelines

Support Requirements

Conduits shall be installed with support systems such as channel stock/threaded rod trapeze supports. Individual conduits may be supported using threaded rods with clamps. Conduits may be attached to the underside of cable trays and affixed to walls where practical. Seismic bracing shall be installed as required by local building codes, DSA, and NUSIG (National Uniform Seismic Installation Guidelines). Accommodations for lateral and oblique bracing struts must be coordinated with the other disciplines that vie for critical ceiling space.

Bonding and Grounding

Bonding of conduits to the Telecommunications Grounding System is required. At the termination of conduit runs within technology rooms, attachment of a ground wire between the Telecommunications Ground Bus to grounding rings installed on conduit box connectors should be accomplished to ensure electrical continuity of the conduit system.

Firestopping

Partially filled and empty conduits that pass through fire-rated walls or through floors shall be firestopped in accordance with Local Fire Codes. Material shall be flexible firestopping putty or pillows.

Innerduct

Innerduct shall be installed to establish multiple pathways in a larger conduit or provide a pathway across a cable tray. Innerduct shall be used for the protection of fiber optic cabling, but copper cabling may be installed in the innerduct to prevent tangling with other cables already present. Innerduct shall be used to protect fiber optic cabling in cable trays, exposed areas in ceilings, IDFs, and BDFs.

Communication Cable System Pull Boxes

A pull box shall be installed in conjunction with conduit installations to provide access to cables at appropriate locations for distribution to tributary locations, and to facilitate cable installation.

Materials
For indoor use, use NEMA Type 1 pull boxes. For areas exposed to heavy moisture, chemicals or weather elements, NEMA Type 3 or 4 pull boxes shall be installed.

The pull box shall be equipped with hinged covers, or removable covers which are screwed or bolted on. The pull boxes shall have hardware for supporting and securing cabling and pulling eyes to facilitate cabling installation.

Placement
A pull box shall be installed after 100 feet of conduit has been placed, and/or after 180 degrees of directional change in the conduit pathway has been affected. The installation of a pull box shall not be used for directional change.

Support Requirements
Pull boxes shall be attached directly to the ceiling slab, or suspended by 4-point threaded rod supports anchored to the ceiling. Pull boxes require seismic bracing to comply with Local Building Codes. Seismic bracing shall be installed as required by local building codes, DSA, and NUSIG (National Uniform Seismic Installation Guidelines). Accommodations for lateral and oblique bracing struts must be coordinated with the other disciplines that vie for critical ceiling space.

Horizontal Cable Support Hardware (Non-Continuous)
Horizontal Cable Support Hardware such as J-Hooks shall be used in locations where the communication cable is not supported by continuous systems such as cable trays or conduit.
Provide J-Hooks every 48” at a minimum, attached to threaded rod or ceiling hangers to provide support for cable bundles or innerduct. The J-Hooks shall be metal stampings configured in a “J” form providing a broad cradle or saddle for supporting for of cable.

Design Criteria for Inter-building Communication Ductbanks and Transition Structures
Inter-building Communication Infrastructure Ductbanks shall be installed to carry communication cables between campus building locations. The Duct shall be constructed of contiguous segments of PVC conduit. The Ductbanks shall be encased in slurry.

Transition Structures, manholes, shall be installed as required to allow technicians access to cable and splices to perform maintenance or to modify distribution configurations. The size of the Transition Structures shall be selected for installation by the number of ducts and potential cable count the structure must contain.

The following provides general requirements for all Inter-building Communication Duct Banks and Transition Spaces as components of the overall communication cable system infrastructure.

Inter-building Communication Ductbanks

Inter-building Communication Ductbanks shall be designed to provide a permanent and durable pathway system which is available for the delivery of entrance cable from the campus connection point.

<u>Configuration</u>

There shall be minimum of (4) 4" conduits between the Campus Buildings and the Campus connection point. The Ductbanks shall be configured in arrays, with several rows stacked together such as 1 x 4, 2 x 2, 3 x 4 and shall correspond to the arrangement of duct openings in pre-cast concrete vaults and manholes where transitions occur. Provide (3) 1 1/4" innerduct in two of the 4" conduits.

<u>Construction Materials and Methods</u>

Ductbanks shall be encased in slurry. Where Ductbanks share underground pathways with other underground infrastructure components such as water lines, gas lines, sanitary systems, it is critical that the communications infrastructure be installed with the highest level of durability.

The duct material itself shall be Trade Size 4 (4-inch diameter), PVC Schedule 40 or equal, and suitable for contact with concrete. Conduits shall be cut square, with the cut ends reamed and deburred. Plastic bushings are to be installed over the each end of every conduit.

Place a ¼"nylon or polyethylene pull rope in each conduit from end to end. Install conduit plugs in each empty outside plant conduit to prevent the introduction of noxious gases or water into the building.

Ductbank Placement

Duct routing shall be coordinated with the Campus Master Plan Infrastructure project, with consideration for distance between Transition Structures and difficulty of cable pulls, particularly when high-count multipair copper cables are necessary.

Slurry-Encased Ductbank Dimension Guidelines

Ground Cover	Minimum of 24 inches
Top Level of Slurry	Minimum 3 Inches above top duct
Slurry on Outer Sides of Ductbank	Minimum 3 inches
Slurry Between Ducts	1.5 inch (above, below and to each side)
Bottom Level of Slurry	Minimum 3 inches

Ductbank Marking

A metallic warning tape, detectable with magnetic location equipment, should be buried directly over the path of the Ductbank approximately 18" below the surface.

Ductbank Termination At The Building

Communication Ducts should be terminated with bell-end connectors, flush with the inner surface of the wall.

Communication Transition Structures

Ductbank Transition Structures shall be provided to allow access to cable installed within underground ductbanks. The transitions structures shall provide a location for the storage of splice cases and slack loops of cable. The transition structures shall facilitate the distribution of cable to multiple locations by providing a junction point for ducts radiating in several directions.

Selection of Transition Structure Type

The type of structure chosen for installation shall be dependent on the number of ducts in the span. The ductbank transition structure shall be preformed concrete structures have weight-bearing cover/lid capacities that range from light pedestrian traffic to deliberate heavy vehicular traffic. The appropriate rating should be selected based on the anticipated exposure of the structure to these differing traffic types.

<u>Placement of Transition Structures</u>
Structures shall be placed after 180 degrees of directional change has been affected in the ductbank route. In straight or relatively straight runs, there shall be no more than 400 feet between structures. Structures shall not be used as the apex of 90-degree change in duct direction. Sweeps and structures shall be planned such that the sweep occurs outside of the structure, allowing straight cable pulls through the structure itself.

<u>Transition Structure Accessories and Equipment</u>
Transition structures require the following equipment:

- A sump, or gravel drainage in the case of small hand holes
- Corrosion-resistant pulling eyes
- Cable racking
- Grounding cables installed per applicable codes or practices
- Ladders and steps
- Watertight duct plugs

Design Criteria for Communication Cabling
Cabling System Requirements
The communications-cabling system will be based on the following design guidelines:

- The cabling system will be standards compliant (EIA/TIA 568A)
- The cabling system will provide a high level of flexibility, capability and resilience.
- The cabling system shall include high performance copper and optical fiber cabling, as well as wireless systems where appropriate.
- Communications Outlets will be provided throughout the facility. Each outlet will support voice, data and digital media connectivity.

Cabling System Overview

The communications cabling system at College of the Desert is based on a flexible design that will allow communications connectors to be used for voice or data. All communications station cable is terminated on RJ45 connectors at the faceplate and RJ45 patch panels in the IDF rooms.

Communications Outlet Configurations

All communications outlets will support a combination of voice, data and media applications. The table below describes the typical outlet configurations.

Standard Wall Mounted Outlet	Standard wall mounted outlets will be the typical outlet configuration throughout the buildings. Standard wall mounted outlets will consist of three Category 6 unshielded communications cables terminated on RJ45 connectors at the faceplate.
Wall Mounted Phone Outlet	Wall mounted phone outlets will consist of one Category 6 unshielded communications cables terminated on RJ45 connectors at the faceplate. The faceplate will be mounted 48" above the finished floor, unless directed otherwise by the Architect.
Floorbox / Poke-through	In areas that need communications outlets in the floor, the typical floorbox and poke though will consist of four Category 6 unshielded communications cables terminated on RJ45 connectors in the floor devices.
Audiovisual Communications Outlets	At instruction or presentation locations, provide communications outlets dedicated to the audiovisual presentation system. If no audiovisual system exists, the AV communications outlet will still be provided at the instructor's location consisting of two Category 6 unshielded communications cables terminated on RJ45 connectors in a wall or floor device.
Ceiling Mounted Outlet	At the video projection locations ceiling mounted outlets will consist of two Category 6 unshielded communications cables terminated on RJ45 connectors at the faceplate mounted in the accessible ceiling tile or mounted on the surface as applicable.
Wireless Access Point	Communication outlets support wireless access points will be located at ceiling locations. In other areas, wall mounted 1' above the accessible ceiling or 1' below an inaccessible ceiling. The outlets supporting the wireless access points will consist of two Category 6 unshielded communications cables terminated on RJ45 connectors at the faceplate.

Backbone Cable (Inside Building)
The Backbone cable will connect each IDF back to the BDF. Backbone connectivity will be supported by optical fiber cables for data and voice communications.

Optical fiber will be run from the BDF to each IDF consisting of (6) Singlemode and (6) high performance, 50 micron Multimode elements terminated on SC connectors rack mounted in optical fiber patch panels.

Category 6 cable will be run from the BDF to the IDFs located less then 290 feet away and shall consist of (6) Category 6 cables terminated on RJ45 connectors terminated in patch panels.

Backbone Cable (Campus Connection)
Optical Fiber consisting of (6) Single-mode and (12) 50 micron Multi-mode elements shall be installed at each building. The fiber will originate from the campus optical fiber MDF location.

Labeling
Labeling shall be consistent across all projects. Please ensure that the labeling corresponds to the final room number which may be different then the Architect's number scheme on the construction documents.

IDF Closets
Use the room number to identify the BDF and IDF.

Patch Panels
All patch panels will be uniquely numbered in each closet as follows:

- Patch Panel A –Z
- Patch Panel Jack Numbers 1-48

Workstation Outlets
All workstation outlets will be clearly labeled as follows:

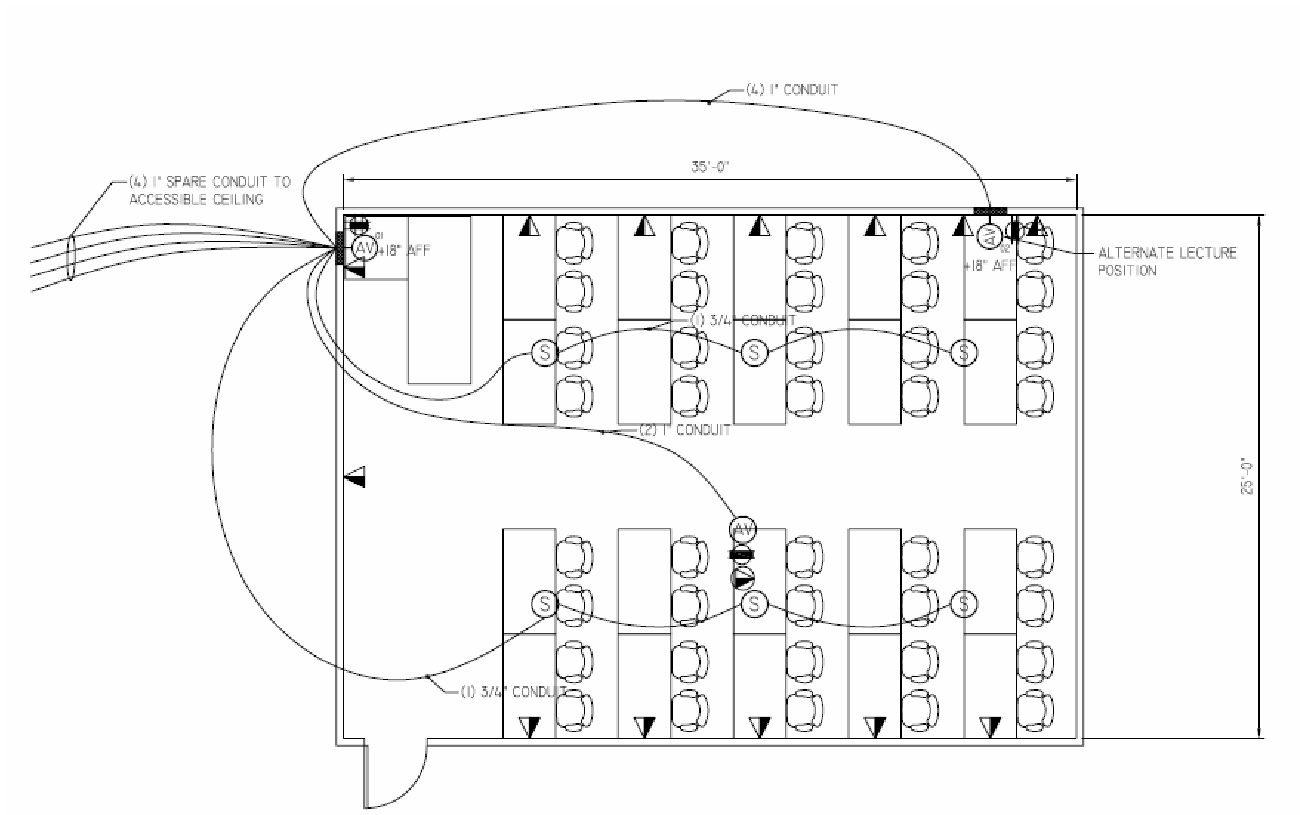
WWW X YY, YY, YY	IDF Closet Room Number Patch Panel Number Patch Panel Jack Number Example: 202A46,47,48 IDF Room 202, Patch Panel A, Jack # 46, 47, 48	

14. Multimedia Design Criteria

Introduction
The purpose of this document is to define campus-wide standards for related building infrastructure in spaces that will have multimedia equipment installations. The primary objective is to establish standards for classroom spaces to ensure consistency in the audiovisual (AV) systems across all rooms. The intent of the standards is to ensure that classrooms/computer labs and distance learning rooms are designed with similar infrastructure and equipment supporting audiovisual functions. These like spaces will allow users to be immediately familiar and comfortable with using a standard audiovisual system, and allow the AV systems to serve as an instructional aid rather than an instructional obstacle or distraction.

The room infrastructure design standards outlined in this document also ensure adequate flexibility to accommodate both future expansion and re-configuration of deployed audiovisual systems, without the need to undertake costly infrastructure modifications as the room AV systems are installed.

Technology Deployment
Infrastructure Requirements
The provision of the audiovisual dedicated infrastructure to support both "day-one" and future audiovisual systems represents a minimal level of audiovisual deployment. Audiovisual system infrastructure includes low-voltage cable containment, power and data requirements, equipment heat-load management, lighting and structural support systems. Conduit infrastructure requirements for Classroom/Computer Labs and Distance Learning rooms are detailed below.



LEGEND:

AV	CEILING MOUNT AV JUNCTION BOX, POWER AND DATA OUTLETS FOR PROJECTOR.
AV 01	AV JUNCTION BOX. PROVIDE 2 GANG BACKBOX WITH 1 GANG MUD RING.
AV 02	AV JUNCTION BOX. PROVIDE 4 GANG BACKBOX WITH 3 GANG MUD RING.
	AV PULL BOX AT AV EQUIPMENT CABINET LOCATION. PROVIDE 12" X 12" X 4" BOX.
MMCP	INTEGRATED MULTI-MEDIA CONTROL PANEL WITH TELE/DATA OUTLETS & POWER RECEPTACLES.
MMIP	MULTI-MEDIA INPUT PANEL. INTEGRATED WITHIN CONCEALED TABLE BOX WITH TELE/DATA OUTLET AND POWER RECEPTACLES.

In addition to this infrastructure, projection screens are also provided to facilitate image display from mobile or installed projection devices.

Architectural Integration Guidelines for Multimedia Rooms

The information in this section is provided as reference for the project's architect, engineers and other consultants to help establish an initial understanding of how integrated technologies will impact architectural designs and construction. Specific equipment and architectural integration requirements will be identified separately in the Program documentation for the particular project.

Architectural

Support Structures for Equipment

Coordinate location of ceiling mounted projectors, projection screens, loudspeakers, etc. with other building systems (e.g., fire sprinklers, light fixtures, HVAC), structure and architectural features of ceilings. Blocking should be provided at all locations where equipment is mounted at wall brackets (e.g., cameras, monitors, loudspeakers).

Refer to equipment plans for specific locations.

Floor standing equipment racks shall be equipped with casters to allow the racks to be pulled away from the wall for rear equipment service access. Any seismic bracing required shall be removable to facilitate movement of the racks for service.

Recessed projection screens installed in the ceiling will require structural support. Depending on the specific screen used and applicable building codes, it may be necessary to build a fire-rated enclosure around the screen assembly.

Accessibility

Physical access to audiovisual facilities, including equipment and projection rooms, shall be provided per requirements of the Americans with Disabilities Act (ADA) and other applicable codes and standards.

Facilities without electronically reinforced sound systems call for portable assistive listening system as part of campus and ADA requirements.

Coordinate placement of assistive listening transmitters where they occur to ensure uninterrupted coverage of audience areas.

<u>Architectural Finishes</u>
Refer to the following section, *Acoustics*, for acoustic finish recommendations in audiovisual spaces.

In facilities using video cameras (e.g., distance learning rooms), color, pattern and other characteristics of architectural finishes within camera view will critically impact camera performance and image quality.

On walls within the field of view of installed video cameras, avoid use of finishes with intensely saturated colors, detailed patterns and heavy textures, which can cause unwanted anomalies in video camera images.

Dark table surfaces should be avoided in distance learning facilities. Light colored table surfaces will help reflect light up onto faces and improve lighting quality for camera imaging.

<u>Acoustics</u>
Acoustic conditions in audiovisual spaces will critically impact the performance and effectiveness of the audiovisual systems. Therefore, careful consideration must be given to such issues as wall construction, finish treatments, background noise levels (e.g., HVAC) and other factors that will affect the acoustic character and noise levels of the audiovisual facilities.

Detailed acoustic requirements for audiovisual areas of the project shall be as specified by the project's Acoustic Consultant. Audiovisual Consultant will review acoustic designs and recommendations related to areas to confirm compatibility with the audiovisual systems designs.

Electrical
<u>Power Service & Grounding</u>
Line voltage (i.e., 110/208/277 VAC) power service specified by the Audiovisual Consultant to support audiovisual equipment and related activities shall be identified as Technical Power.

Unless otherwise noted, Technical Power service shall provide a dedicated ground with a separate insulated copper ground wire from each receptacle to a dedicated Technical Power ground bus bar at the electrical panel board. Technical Power receptacles must not be grounded to the building structure.

All construction documentation, including plans and specifications, describing electrical power service associated with the project's audiovisual program shall be engineered and documented by the project's Electrical Engineer. Documentation provided by the Audiovisual Consultant shall be for reference only.

Low Voltage Signal Distribution

All low voltage cabling for audiovisual systems will be routed through conduit, wire ways or other dedicated containment. No plenum cabling will be used.

The project electrical contractor will be expected to install the conduit required for all audiovisual cabling.

Pull wires are to be installed in the audiovisual conduit by the electrical contractor to facilitate later installation of the low voltage cable by the Audiovisual Contractor.

All conduits specified to support the systems shall be EMT type. Flexible metal conduit may be used in runs of less than ten feet (10'), or where approved by the Audiovisual Consultant.

The depth of audiovisual connection boxes and conduit diameters may require non-standard wall depths in some locations. Such conditions will be identified at a future date.

Flush floor power distribution outlets and signal connection boxes will be required at locations where connections cannot reasonably be made at wall outlets.

Flush floor electrical boxes will be required at designated locations for audiovisual signal and power connections. The size and density of cabling and connections will preclude the use of standard "poke-thru" type fittings. Recommended specifications for flush floor electrical boxes will be provided in the audiovisual drawings.

Where oversized flush floor electrical connections are specified for audiovisual applications, consideration must also be given to the structural and other building design implications.

<u>Low Voltage Remote Control Interfacing</u>
Line voltage powered devices, such as projection screens, motorized window coverings and lighting control systems, that are to be operated by low voltage audiovisual control systems will require interface electronics between line voltage power and low voltage switching. Such interface electronics are referred to in this document as Low Voltage Interfaces (LVI).

Where low voltage remote control interfaces are required per the Architect and Audiovisual Consultant's recommendations, such electronics shall be specified and documented for construction by the project's Electrical Engineer.

Wherever available, Low Voltage Interfaces should be provided by the manufacturer of the line voltage device being controlled (e.g., projection screen interface by projection screen manufacturer). Where the manufacturer of a line voltage powered device does not offer a low voltage control interface, a third party interface or standard relay product may be used.

Wherever available, serial digital control interfaces operating on industry standard communications protocols (e.g., RS232, RS422) should be utilized.

Lighting
<u>Lighting for Video Cameras</u>
Supplemental lighting is required where video camera systems are installed for use in applications such as video teleconferencing, distance learning and videotape recording.

Special precautions must be taken to control lighting where video camera systems are used in association with projected image displays such as may occur in video teleconferencing and distance learning. Lamp color temperature for video camera lighting shall be in the range of 3000 - 3400 degrees Kelvin. All lamps used for video camera lighting within a given room shall be of the same color temperature specification.

Illumination levels for video camera lighting should provide a minimum of 70 foot-candles of illumination at the vertical facial plan of the subject.

Provide illumination of background surfaces located behind camera subjects to enhance the separation of the subjects from the background in the camera's view.

Special caution must be taken in distance learning and video teleconference facilities to avoid conflicts between image displays and camera subject illumination. This issue is particularly difficult in distance learning where instructors like to move around the classroom while they lecture, often taking them in proximity to a projected image display.

<u>Lighting for Projection</u>
Where visual image display systems (e.g., monitors, projection screens) are utilized it is imperative that careful consideration be given to the design of room lighting and its impact on the image displays.

Lights in audiovisual spaces shall be circuited to allow fixtures adjacent to projection screens to be turned off during projection. Indirect architectural lighting should be avoided in rooms with large screen image projection since increased ambient light levels on projection screens will decrease the intensity of projected images.

Light fixtures should provide maximum directivity of illumination and minimal surface brightness to reduce the opportunity for glare and distribution of stray light onto image display screens.

<u>Lighting of Presenters</u>
Where it is appropriate to provide spotlighting of presenters in audiovisual areas, provide narrow beam lamps in adjustable fixtures. Lighting fixtures providing spotlighting of presenters in audiovisual facilities shall be dimmable.

Spotlighting of presenters should provide illumination from three lighting positions (minimum of two positions) to minimize shadows on the presenter. This is particularly critical where video cameras are being used.

Task Lighting
Where direct task lighting is provided in instructional areas and meeting rooms, such task lighting should be designed to provide appropriate levels of illumination at the work surface with minimal diffusion onto adjacent surfaces in order to prevent deterioration of image display quality. This is particularly critical in facilities utilizing front projection display systems.

It is recommended that source fixtures that provide task lighting at lecterns and presenter stations should be positioned on the furniture to minimize reflection onto presentation images.

Daylight Control
Where window glazing allows exterior daylight or lighting from adjacent interior spaces into an audiovisual space, blackout window coverings should be provided.

Standard window blinds and sun shading devices are typically insufficient for controlling daylight intrusion in visual display environments. In facilities with direct sun exposure or where the highest degree of presentation quality is required, edge and bottom channels are recommended on blackout window coverings to prevent light leakage at shade perimeters.

Where a large number of individual blackout window coverings are provided or in more formal meeting rooms (e.g., boardrooms) or presentation environments (e.g., lecture halls, auditoria), it is recommended that the window coverings be motorized with remote control capability tied to the audiovisual system controls.

Lighting Controls
Where lighting is controllable through the audiovisual control system, redundant wall-mounted controls shall also be provided per Architect’s specification.

Where designated, provide a Low Voltage Interface for remote switching of lights from the audiovisual system in designated audiovisual facilities. (See Low Voltage Remote Control Interfacing). Lighting control equipment and all associated installation, setup and programming shall be provided by the electrical contractor (not the Audiovisual Contractor) per electrical engineer’s specifications.

Coordinate system requirements and electrical interfaces with the Audiovisual Consultant.

Furniture & Millwork

Tables

The shape of conference tables should take into consideration the necessity of viewing image displays as well as the instructor/presenter and other meeting/class participants at the table(s). To the greatest extent possible, orient the viewers directly toward the primary presentation area.

Tables used in video teleconferencing rooms should be shaped to position the meeting participants directly facing the primary camera position. This generally limits the number of primary conference participants to less than eight (8) people. In applications requiring more than eight (8) participants, it is advisable to distinguish between primary participants, secondary participants and observers. This allows a hierarchy for positioning of videoconference participants relative to the camera with minimal compromise in capacity.

Tables must anticipate the need to distribute power and low voltage electrical between equipment used on the tabletop and remote equipment and systems (e.g., computer network, sound systems, controls, etc.). Connections may be provided in the floor below the table or may be extended up into the table.

Provide accessible cable pathways through tables when integrating and power connections into tables.

Lecterns & Presenter Stations

Formal presentation facilities frequently provide lecterns or presenter stations at the front of the room. Electrical connections may be required at either an adjacent side wall box or floor box to support integrated or portable devices and other presentation support equipment.

Lecterns and presenter stations may be fixed or movable. However, where more than one or two electrical (power or low voltage) connections are required, lecterns and presenter stations should be considered fixed due to the risk of damage or improper connections when setting up and removing equipment. Where trained technical support is available to install and remove equipment, greater flexibility may be provided.

Mobile Audiovisual Furniture

Mobile audiovisual furniture may be utilized to support equipment such as overhead transparency projectors or 35mm slide projectors. Electrical power and audiovisual signal distribution to mobile audiovisual equipment should be provided in a manner that avoids service cables running across the floor to wall receptacles. Provide flush floor electrical and signal distribution wherever possible.

Unless otherwise noted, mobile audiovisual furniture will be specified by the Audiovisual Consultant and provided by the Audiovisual Contractor. Furniture styles and finishes must be coordinated with the Architect to ensure that material provided is compatible with other furniture and finishes.

15. Sound Isolation & Acoustical Treatments

Overview

The acoustical criteria included herein pertain to both new buildings and the renovations of existing buildings. The criteria address the following:

1. Speech privacy in rooms with confidential conversations,
2. Freedom from distraction due to intruding sounds in rooms where such intrusions would disrupt the room's main functions,
3. Control of reverberation and echoes to permit adequate speech intelligibility in assembly rooms of various sizes, as well as good sound quality in performance, rehearsal and multimedia rooms.
4. Control of footfall impact sounds from people walking on the floor above.

It is recommended that the design team retain the services of a qualified acoustical consultant to assist in complying with the guidelines included herein. Such an individual should be experienced with the acoustical requirements for a wide range of higher educational facilities.

Exterior Sound Isolation

The façades of buildings near the campus perimeter should be designed and glazed to control the intrusion of traffic noise and other environmental noise. The design of the exterior envelope (e.g., walls, roof, windows, doors, etc.) should control the intruding environmental sound levels to maximum values of Leq = 35 dBA and L10 = 40 dBA during any contiguous 60-minute time period. Leq is the energy-averaged, A-weighted sound level over a contiguous 60-minute time period. L10 is the A-weighted sound level that is exceeded only 10% of time during any contiguous 60-minute time period. Rooms with extreme sensitivity to noise should not have a perimeter exposure and should be surrounded with quiet "buffer" zones, such as corridors, etc.

All doors should have frame seals and door bottoms that form airtight closures when the door is closed. Typical seals are similar to Pemko S88 frame seals and Pemko 4301 automatic door bottoms.

Interior Sound Isolation (Horizontal and Vertical)
Interior partitions, doors and windows, as well as floor-ceiling assemblies, should be selected to provide appropriate levels of speech privacy and freedom from distraction. Tables 1 & 2 below gives the minimum recommended Sound Transmission Class (STC) ratings for various horizontal and vertical room-pair adjacencies.

Proper detailing of the partitions is critical for maintaining their expected acoustical performance. The following guidelines will help with the detailing of interior partitions.

1. Pay specific attention to stud gauge and o. c. spacing when selecting partition STC ratings. Light gauge studs with 24" o. c. spacing provide higher STC ratings than heavier studs and closer spacing. Where heavy gauge studs are needed, use ½" thick, 25 gauge, single-leg resilient channels on one side of the partition to improve its STC rating, installed per the channel manufacturer's written instructions.
2. Separate all adjacencies rated at STC-45 and higher with full height, slab-to-slab partitions.
3. All interior partitions with insulation batts in their stud cavities should be considered "acoustical" partitions. All "acoustical" partitions shall be designed and installed in complete conformance with the latest revision of ASTM E497 "Standard Practice for Installation Sound-Isolating Lightweight Partitions".
4. Seal all perimeters, including the ends, head and the bottom, of all "acoustical" partitions with a continuous bead of acoustical sealant. Install the sealant at both sides of the partition.
5. Seal all intersections of "acoustical" partitions airtight to the building perimeter. Dog-leg partitions to intersect the perimeter at drywall or masonry, not at glass or window mullions.
6. Seal all penetrations through "acoustical" partitions with a continuous bead of acoustical sealant. Install the sealant at both sides of the partition.

7. Avoid back-to-back electrical, telephone, data or other wired service outlets in all "acoustical" partitions. Separate the boxes by at least 16 inches. Backwrap all recessed electrical, telephone, data, etc. boxes with box pads; in fire-rated partitions use a product similar to Manville Firetemp Putty Pads; in non-rated partitions use a product similar to Lowry's Outlet Box Pads.
8. For an enclosed space that is completely surrounded by slab-to-slab partitions provide a sound-isolating, internally-lined return air "Zee-boot" located above the entry door to the space.
9. Where an occupied space occurs adjacent to, above or below an equipment room or duct shaft, select and detail the partitions and slabs so that the background sound level criteria specified elsewhere in these guidelines are not exceeded.
10. Select all operable panel partitions for a laboratory STC rating not less than STC-49. Install all operable partition systems in accordance with ASTM E557, "Standard Practice for Architectural Application and Installation of Operable Partitions" such that the Noise Isolation Class (NIC) rating is not less than NIC-42. This will usually require an airtight drywall plenum barrier directly above the operable partition's ceiling track, as well as a solid threshold strip where the partition panels' bottom seals contact the floor.
11. The door in an "acoustical" partitions should have an STC rating that is no more than 5 points less than the partition's STC rating; i.e., the door in an STC-45 partition should be rated at STC-40 or higher.

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Footfall Impact Sound Control

The impacts of footfalls on above-grade floors can often be heard on the floor below. In lightweight structures it is impossible to make all footfalls inaudible, but their ability to annoy downstairs occupants can be controlled by specifying a proper Impact Insulation Class (IIC) rating for the entire floor-ceiling assembly. Therefore, the IIC rating of all above-grade floor-ceiling assemblies should be at least IIC-55 when measured in complete accordance with ASTM E492-04 Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine and rated in complete accordance with ASTM E989-89(1999) Standard Classification for Determination of Impact Insulation Class

(IIC). Most floor-ceiling assemblies with carpet can meet or exceed the IIC-55 rating, but hard-surfaced floors usually need a resilient underlayment to meet the rating.

Reverberation Time and Echo Control
Apply sound-absorbing treatments to a room's ceiling and walls, as needed, such that the Reverberation Times (RT) in the octave bands from 125 to 4000 hertz do not exceed the values given in the table below.

Room Classification	Octave Band Center Frequency					
	125	250	500	1000	2000	4000
A	0.8	0.7	0.6	0.6	0.6	0.5
B	0.9	0.8	0.7	0.7	0.7	0.6
C	1.3	1.2	1.0	1.0	1.0	0.8
D	0.6	0.5	0.4	0.4	0.4	0.3
E	2.0	1.8	1.5	1.5	1.5	1.3

<u>Room Classifications</u>
A = Classrooms, Private Offices, Conference Rooms, Small Group Instruction Rooms, Study Rooms

B = Laboratories, Large Group Instruction Rooms, Lecture Halls, Multimedia Rooms, Library

C = Large Music Rehearsal Rooms, Theater, Auditorium

D = Small Music Practice Rooms

E = Gym

Locate the sound-absorbing acoustical treatments in the Auditorium, Theater, Lecture Rooms, Large Music Rehearsal Rooms and Small Music Practice Rooms to preclude the presence of perceptible flutter, echo and discrete, late, sound reflections.

Sound-absorbing treatments are usually specified on the basis of their Noise Reduction Coefficient (NRC) ratings. Be careful to specify the

NRC ratings for complete treatment assemblies, and not for just the core acoustical material. For example, a fabric-wrapped acoustical wall panel might use a core acoustical material with a rating of NRC-.85, but the addition of a particular fabric might reduce the rating to NRC-.65.

Also note that a product's NRC rating depends on how it is mounted. For example, the NRC rating of an acoustical wall panel is lowest for a Type A mounting (directly on a hard surface), and increases as the airspace between the back of the panel and its mounting surface increases. Be sure to specify each product's NRC rating along with the mounting method that is most representative of the method required for the room. The various mounting methods are described in ASTM Standard E795-93 Standard Practices for Mounting Test Specimens During Sound Absorption Tests. So, for example, an acoustical wall panels mounted directly to a wall would be specified with a minimum rating of NRC-.XX in a Type A Mounting. Another example would be suspended acoustical ceiling tiles, which would be specified for a minimum NRC-.XX in a Type E405 mounting, which means that it is suspended 405 mm (16") from a hard surface.

TABLE 1 Minimum Partition STC Rating between Room-Pairs without a Door in the Common Partition	Classroom, Small Group Instruction	Lecture Room	Science Lab	Lab Prep Room	Computer Lab	Private office, Conference Room	Open Office Area	Office Support Room	Lobby, corridor	Toilets	Storage Room	Mech/Elec/Elev Equipment Room
Classroom Small Group Instruction	50	55	50	50	50	55	50	50	45	50	50	AR
Lecture Room		55	55	55	55	55	50	50	45	50	50	AR
Science Lab			50	45	45	55	45	45	45	50	40	AR
Lab Prep Room				---	40	50	40	40	40	50	40	AR
Computer Lab					---	50	40	40	40	50	40	AR
Private office, Conference Room						50	50	50	50	50	45	NR
Open Office Area							---	40	---	50	40	AR
Office Support Room								---	---	50	40	AR
Lobby, Corridor									40	50	---	AR
Toilets										50	45	AR
Storage Room											---	AR
Mech/Elec/Elev Equipment Room												---

Legend

--- = Architect's choice

NR = Not recommended

AR = As required to meet other acoustical criteria

Note: Ratings higher than STC-40 require slab-to-slab construction

<u>TABLE 2</u> Minimum Partition STC Rating between Room-Pairs with a Door in the Common Partition	Classroom, Small Group Instruction	Lecture Room	Science Lab	Lab Prep Room	Computer Lab	Private office, Conference Room	Open Office Area	Office Support Room	Lobby, corridor	Toilets	Storage Room	Mech/Elec/Elev Equipment Room
Classroom Small Group Instruction	NR	NR	NR	NR	NR	NR	NR	NR	40	NR	---	NR
Lecture Room		NR	NR	NR	NR	NR	NR	NR	40	NR	NR	NR
Science Lab			45	40	40	NR	NR	NR	40	NR	---	AR
Lab Prep Room				---	40	NR	NR	NR	35	NR	---	AR
Computer Lab					---	NR	---	---	40	35	---	AR
Private office, Conference Room						NR	35	NR	40	NR	---	NR
Open Office Area							---	---	---	35	---	NR
Office Support Room								---	---	NR	---	NR
Lobby, Corridor									---	40	---	AR
Toilets										NR	35	AR
Storage Room											---	---
Mech/Elec/Elev Equipment Room												---

<u>Legend</u>

--- = Architect's choice

NR = Not recommended

AR = As required to meet other acoustical criteria

Note 1: Ratings higher than STC-40 require slab-to-slab construction

Note 2: STC rating of door to be at least "partition STC rating minus 5 points" (e.g., STC-30 or higher door in an STC-35 partition)

16. Signage Design Criteria

Site Signage
Part one of this section deals specifically with site signage. These signs are intended for outdoor applications. Each sigh is summarized in terms of its function, location, type style, preliminary messaging, illumination information and fabrication notes. In addition to these specific sign type, specifications are included for additional miscellaneous sign types.

1. A. Primary Entry Monument,
2. B. Secondary Entry Monument,
3. C. Primary Vehicular Directional,
4. D. Secondary Vehicular Directional,
5. E. Street Signs,
6. F. Parking Lot Signs,
7. G. Directory
8. H. Pedestrian Directional
9. I. Additional Sign Types
10. M. Electronic Readerboard (Optional)

For more detailed information on the design of these signs, please refer to the Campus Wide Signage Program. Material specifications are listed in 10431-B.

1. A. Primary Entry Monument
This monument, located at the main campus entrance, is the first impression for first -time visitors to the campus. It should be legible for vehicular traffic. These two functions are met by a sculptural sign that reflects the modern architecture of the campus with large internally illuminated, brushed stainless steel letters.

<u>Type</u>: 36" to 48" The name of the campus will be Neutraface Demi All-Caps or the new campus logomark. Additional information such as street address or location should be a maximum of 33% the size of the campus name. By following these specs, signs will be visible from 450 feet, with maximum legibility at a distance of 100 feet.

Messaging: College of the Desert (Optional: Street Address)

Illumination: Yes, Internal

Fabrication Notes: Painted dimensional letters with internally illuminated brightly colored returns, pin mounted to dry-stack stone wall.

2. B. Secondary Entry Monument
Smaller in scale than primary monument, this monument defines the boundaries of the campus. Design elements are consistent with the main sign family.

Type: 12 to 16”” All Caps

Messaging: College of the Desert (Optional: Palm Desert, California and/or Street Address) Special Considerations at Fred Waring entry to be coordinated with the Library.

Illumination: Yes, Internal or External Illumination

Fabrication Notes: Painted dimensional letters (halo-lit, reverse channel or externally illuminated)

3. C. Primary Vehicular Directional
These vehicular directionals are used by every visitor as they enter the campus. They are located at major decision-making points. For maximum visibility type is light on a dark background, minimum 3” high, Readability is maximized by a limited number of messages.

Quantity: 3

Type: 3” to 5”, Neutraface Bold or Medium All-Caps (fig. 4d.6). Destination located to the left, will be flush left; while right destinations will be flush right. When included on a single sign, type should be all the same size. If necessary, smaller secondary type must be at least 75% smaller than the main type. Type will be located between 1’ and 4’ from ground level. Legible from 100 feet, with maximum legibility at 25 feet.

Messaging: 4 to 6 primary destinations and arrow(s).

Illumination: Yes, External

<u>Fabrication Notes</u>: Painted metal sign with acid-etched, paint-filled type and graphics.

4. D. Secondary Vehicular Directional

These vehicular directionals include information designed for visitors unfamiliar with the campus. They supplement primary directionals, and have a related design. Overall, the sign and the type are smaller. For maximum visibility type is light on a dark background, Two-sided.

<u>Type</u>: 2” to 3”. Neutraface Bold or Medium All-Caps (fig. 4d.6).Destination located to the left, will be flush left; while right destinations will be flush right. When included on a single sign, type should be all the same size. Type will be located between 1’ and 4’ from ground level. Legible from 100 feet, with maximum legibility at 25 feet.

<u>Messaging</u>: Visitor destinations (guest parking, admissions, child-care, community sports) and arrow(s). Illumination: Yes, External.

<u>Fabrication Notes</u>: Painted metal sign with acid-etched, paint-filled type and graphics.

5. E. Street Signs

Like public street signs, these campus signs orient visitors as they move around the campus. They are located at vehicular intersections. Street names should include cardinal directions for improved navigation on this radially symmetrical campus. Secondary directional blade, optional.

<u>Type:</u> 3” to 4” Neutraface Bold Titlecase (fig. 4d.7) at a minimum of 2”. Signs will be located at least 8ft from the ground plan. Maximum number of messages per sign: 4. Legible from 100 feet, with maximum legibility at 25 feet.

<u>Messaging</u>: North, South, East or West Alumni (+ 1 optional key destination)

<u>Illumination</u>: Yes, External.

<u>Fabrication Notes</u>: Pole-mounted painted metal sign with acid-etched, paint-filled type.

6. F. Parking Lot Signs
These two-sided signs are located at the entry into individual parking lots. Locations alternate to accommodate traffic moving in both directions on the ring road. The lot number and adjacent building are indicated with light type on a dark background. Returns may be color-coded if desired.

<u>Type</u>: 8” for number and 2” to 3” Lot number will be the largest type on the sign in Neutraface Light. Building names, in line with the style of vehicular directionals will Neutraface Bold or Medium All-Caps. Building names will be a minimum of 2” high. Legible from 100 feet, with maximum legibility at 25 feet.

<u>Messaging</u>: Parking Lot # and Adjacent Campus Buildings. For additional clarification signs may replace the words “Parking Lot” for user designations, such as “Visitor and Student Parking.”

<u>Illumination</u>: Optional, external or ambient light.

<u>Fabrication Notes</u>: Post and panel sign, two-legged scheme, painted metal sign with acid-etched, paint-filled type.

7. G. Directory
Located as guest enter the campus interior, these directories contain the most comprehensive wayfinding information. Internal illumination and an integrated shade improve function throughout the day. An enclosed information case allows for changeable displays.

<u>Type</u>: 5”

<u>Messaging</u>: Large campus map, campus info case, student and temporary flyer board.

<u>Illumination</u>: Yes, Internal.

<u>Fabrication Notes</u>: Horizontal map surface will be 27” from ground level to accommodate wheelchair users.

8. H. Pedestrian Directional

These freestanding signs offer secondary direction to pedestrians, including restrooms, important buildings that are nearby. Optional: A small campus map offers further information. A pocket allows for handouts, as appropriate for maps or special event promotions. Type: 1″ Neutraface Bold, Medium or Light. Type will be located located between 5′ to 8.5′ from the ground plain. Legible from 30 feet, with maximum legibility at 10 feet.

Messaging: 3 destinations and small campus map and arrow(s).

Illumination: No, ambient light.

Fabrication Notes: Painted aluminum sign panel with acid-etched, paint-filled letters and graphic, with 11″x17″ display case with clear cover with changeable campus map and optional built-in handout pocket.

9. I. Additional Sign Types

These freestanding signs include a wide range of sign types including parking lot and parking space designations for students, visitors, faculty & staff, service entries, loading zones, handicapped and possibly high level administration.

Type: 1″-3″ Neutraface Bold, Medium or Light All Caps or Titlecase. Type will be located between 5′ to 8.5′ from the ground plain. Legible from 30 feet, with maximum legibility at 10 feet.

Messaging: TBD

Illumination: No, ambient light.

Fabrication Notes: Post and panel sign, one-legged or two-legged scheme, painted metal sign with acid-etched, paint-filled type.

10. M. Electronic Readerboard
This sign should be located near a major intersection for maximum legibility of the electronic messages. Only stopped traffic will be able to read these messages. Messages are mainly temporary events and are programmed electronically into the sign.

Quantity: 1

Type: TBD

Messaging: TBD. Permanent elements may include the campus and the theatre names.

Illumination: Yes, internal and animated.

Fabrication Notes: TBD. Recommended construction would include a stacked stone base to match sign types A and B with a small horizontally oriented readerboard.

Neutraface is the dedicated font for the entire College of the Desert sign family (Fig 4d.4). This choice is a good match to the campus' location in the Coachella Valley where the modern architectural pioneer Richard Neutra lived and built some of his most famous building, using a similar type style.

Neutraface was designed by Christian Schwartz in 2003 and is available from House Industries. This face is has a large family of weights for creating visual hierarchies.

Type height is the distance between the baseline and the height of uppercase letter (Fig 4d.5). All Caps indicates that all uppercase letters will be used (Fig. 4d.6) Title case indicates that each word will start with one uppercase letter followed by lowercase. (Fig 4d.7)

Figure 4d.5

Figure 4d.6

Figure 4d.7

Figure 4d.4 Neutraface's family of type styles.
Available at House Industries,

http://www.houseindustries.com/index.php?page=showfont&id=18

Building Signage
Building signs, exterior and interior signage reinforce the same design family of the site signage family. A simple brushed aluminum sign with a non-directional finish and acid-etched paint filled type is a highly durable and functional sign that will connect the entire campus to a single design aesthetic. Quality materials and a simple set of rules connect the entire sign family, down to the smallest detail.

1. J. Primary Building Identity
Building identity signs should reinforce the same design family of the site signage family, but as building -mounted signs, they introduce new elements. The raceway simplifies sign installation and maintenance, as well as reducing the risk of vandalism and theft.

<u>Quantity</u>: TBD, Maximum two sides of any single building.

<u>Type</u>: Building Name: 12″ Neutraface Bold. Type will be located located on a 3″ raceway. For all single story buildings type will be mounted 80″ from the ground plain. For multiple story buildings, type may be located at 80″ from ground plain or higher as necessary. 12″ type is legible from 450 feet, with maximum impact at 100 feet.

<u>Donor Recognition</u>: 3″ Neutraface Medium Titlecase. Legible from 100, with maximum impact at 30 feet.

<u>Messaging</u>: Building Name, with space for later donor recognition.

<u>Illumination</u>: No, ambient light.

<u>Fabrication Notes</u>: Raceway mounted to existing concrete walls with concealed fixtures. Type and raceway cut from a single piece of 1/2″ painted aluminum with contrasting returns. Building donor recognition may be added at a later date as dimensional letters mounted to the raceway, center vertically and horizontally.

<u>Additional Notes</u>: The sign area is for building identity signage only and excludes the placement of vending machines, trash receptacles, other outdoor furnishing and any other additional elements. Sign area extends beyond edge of actual letters, 3 feet on either side concrete sign panels or 6 feet on either side of building mounted letters. Sign area includes all the area above and below the actual sign. The back of concrete sign panels may be used for additional

signage and vending machines, as long as these elements are not visible from the front elevation of the building identity sign. Signs will be located near the most prominent entrance and/or on locations with the longest view corridor from th parking lot or interior campus courtyards.

2. K. Secondary Building Identity
Building identity signs may be required on multiple sides of the building. To avoid over signing, a smaller secondary building identity sign may be used. The raceway element of the primary building identity sign is employed as a background for dimensional letters. This design controls the contrast between the letters and the background, which can be especially problematic on smaller letters, as well as reducing the risk of vandalism and theft.

<u>Quantity</u>: TBD, Maximum three sides of any single building

<u>Type</u>: 3″ Neutraface Bold. All Caps. Brushed aluminum or stainless steel type will be located on a 4.5″ painted sign panel, mounted 80″ from the ground plain. Legible from 100, with maximum impact at 30 feet.

<u>Messaging</u>: Building Name.

<u>Illumination</u>: No, ambient light.

<u>Fabrication Notes</u>: 1/2″ painted aluminum sign panel with contrasting returns, mounted to existing concrete walls with concealed fixtures. Dimensional brushed metal letters.

4. L. Building Entry Blade Sign
College of the Deserts shaded arcades contain much of the pedestrian traffic. From this vantage point, exterior building mounted signage is difficult, if not impossible, to see. To accommodate this circulation pattern, a blade sign shade may be located in the arcade, perpendicular to pedestrian traffic.

<u>Quantity</u>: TBD, Maximum one per side of any single building, located perpendicular to main building entrances.

<u>Type</u>: 3″ Neutraface Bold. All Caps. Legible from 100, with maximum impact at 30 feet. In compliance with ADA guidelines for overhead signs.

Messaging: Building Name.

Illumination: Optional, spot lighting.

Fabrication Notes: 2" Aluminum box sign, with brightly painted returns and 1/8" brushed aluminum face with acid etched, paint filled type. Mounted a minimum height of 80" from ground level. Additional Notes: Maximum area of sign panel 4 square feet.

5. N. Building Entry Wall Mounted Plaque
As required by ADA specifications, doorways along the pathways to functional spaces require plaques with dimensional type (minimum 5/16"high and maximum 2" high) as well as Braille translations.

Quantity: TBD, Located at entries into the building.

Type: 1" and 2" Neutraface Bold. All Caps and Titlecase. Flush left.

Messaging: Building Name (Optional: Hours of Operation.)

Illumination: No, Ambient.

Fabrication Notes: 1/8" brushed aluminum sign panel with acid etched, paint filled type and Braille. Center of sign panel to be 60" from ground level. No visible fixtures. Additional mounting details to be determined according to location and in consultation with fabricator.

6. O. Building Entry Window Decal Signage, Optional
Certain campus building, such as the administration building require signage information regarding hours of operations and other information. This information may be included on sign type N or as vinyl on glass. The goal of this sign type is to minimize temporary paper signs that clutter the entry of important campus buildings.

Quantity: TBD, Located at entries into the building.

Type: 2" Neutraface Bold or Book. Titlecase. Flush Left.

Messaging: TBD by each individual building's needs.

Illumination: No, Ambient.

Fabrication Notes: Vinyl mounted to the second surface of glass on glass doors or on window adjacent to entry doors. Type should be flush left 6" from the left edge of any glass surface with the top of the type block at 60" from ground level.

7.P. Interior Building Identity Signs
Some new, as well as some existing building, may have lobby areas that would benefit from interior building identity signage. In these case, dimensional letters should be mounted either directlt to the wall surface or follow the description of sign type K Secondary Building Sign.

Quantity: TBD

Type: 3"Neutraface Bold and book. Titlecase. Centerred.

Messaging: TBD

Illumination: Optional spot lighting.

Fabrication Notes: 1/3" brushed aluminum dimensional letters. No visible fixtures. Additional mounting details to be determined according to location and in consultation with fabricator.

8.Q. Interior Building Signs: Wall Mounted Plaques
As required by ADA specifications, doors along the pathways to functional spaces require plaques with 1/32" dimensional type (minimum 5/16"high and maximum 2" high) as well as Braille translations. Included in this sign type are signs to individual offices, classroom, offices, meeting rooms and countless other spaces. Other signs that may be in this category include back of house signs, such as janitors closets and electrical rooms.

Quantity: TBD

Type: 3/4" to 2"Neutraface Book. Titlecase. Flush Left.

Messaging: TBD

Illumination: No, Ambient.

Fabrication Notes: 1/8" brushed aluminum sign panel with acid etched, paint filled type and Braille. Mounted on the latch side. Center of sign panel to be 60″ from ground level. No visible fixtures. Additional mounting details to be determined according to location and in consultation with fabricator.

9.R. Interior and Exterior Additional Directional Signs, Directional Blade Signs, Suspended Directionals and Wall Mounted Directional Plaques

Additional directional signs may be helpful for users trying to access either campus amenities, such as restrooms, vending machines, telephone, etc…. They may also be helpful in for large auditoriums, other major destinations or functional spaces that are outside of the normal flow of interior traffic.

<u>Quantity</u>: TBD, Maximum one per distance of 20 feet along a single hallway or pedestrian corridor.

<u>Type</u>: 3″ for all overhead signs. 1″ to 3″ for wall mounted signs. Neutraface Bold or Book. Titlecase. Destination located to the left, will be flush left; while right destinations will be flush right. Legible from 100, with maximum impact at 30 feet. In compliance with ADA guidelines for overhead signs.

<u>Messaging</u>: TBD. Multiple destinations as required and arrow(s).

<u>Illumination</u>: No, ambient.

<u>Fabrication Notes</u>: Brushed aluminum sign panel, with brightly painted returns and 1/8″ brushed aluminum face with acid etched, paint filled type. All overhead signs mounted a minimum height of 80″ from ground level.

<u>Additional Notes</u>: Maximum area of sign panel 3 square feet.

17. Sustainable Design Criteria

College Goals and Objectives
As stated in Section I, Overview, one objective of College of the Desert is to encourage designers to pursue sustainability and achieve energy efficiency. This portion of the SDC will discuss in more detail the sustainable strategies that may lead to facilities that minimize environmental impact, save operation and maintenance costs, and promote health and well being. Through synergistic design coordination between architects and engineers, the building envelope, ventilation, lighting and water systems can work together to reduce use of natural resources and minimize operational costs without substantially increasing construction costs.

Sustainable Design and LEED
The primary objective of the college is to encourage sustainable design on campus. When practical, LEED Certification is a secondary goal of the college. The college recognizes the additional effort required to obtain LEED Certification. When budget, schedule and program facilitate certification, the college will direct design consultants to pursue LEED Certification. In projects that would not lend themselves to LEED Certification, the project designers should still incorporate sustainable design features where practicable.

Benefits of Sustainable Design
There are three basic benefits of "Green Design"; environmental, economic, health and safety. By definition, a sustainably designed building will minimize environmental impacts. College of the Desert embraces the local micro-climate. Designers must be sensitive to the unique characteristics of the desert's climate extremes. Outdoor spaces should provide comfortable niches for all seasons. The plant palette will reflect desert flora and attract native fauna. Please refer to Section II, 3. Site Design Guidelines, for more information on Landscape Design. The resulting efficient use of resources will be a natural result of thoughtful design. By taking a leadership role, the college is making a commitment to progressive design strategies that benefit the community in the large sense.

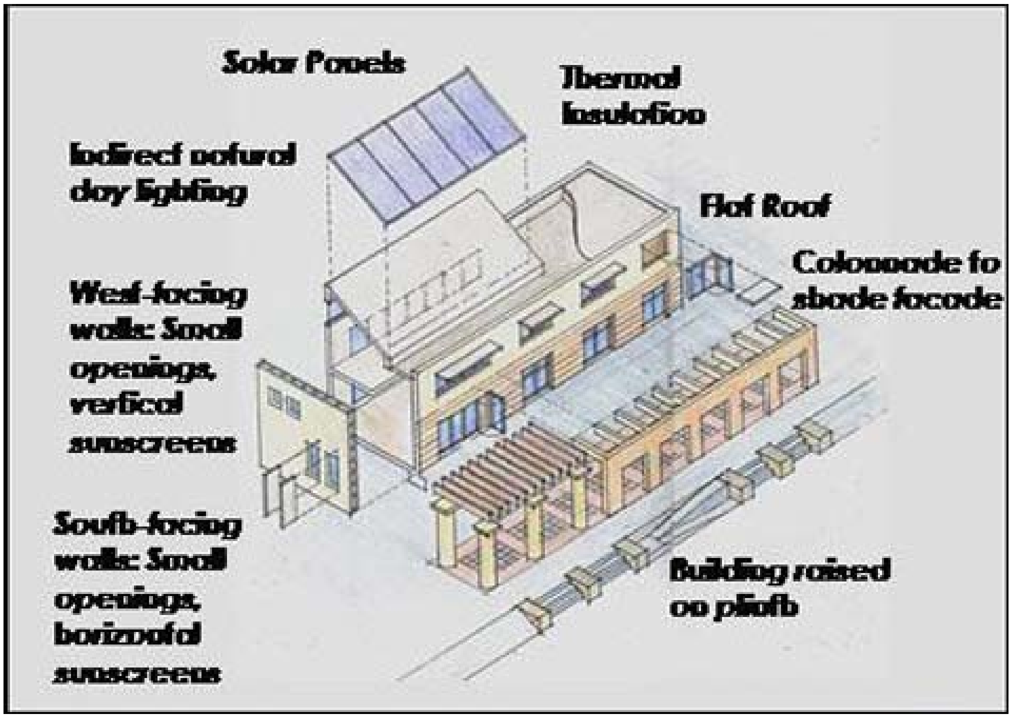
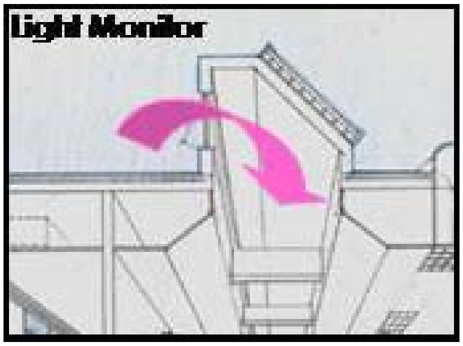
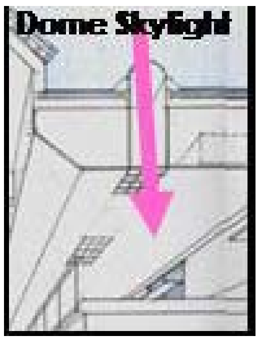
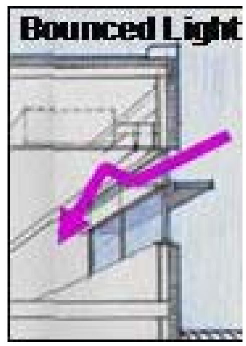

Solar Panels
Thermal Insulation
Indirect natural day lighting
Flat Roof
Colonnade to shade facade
West-facing walls: Small openings, vertical sunscreens
South-facing walls: Small openings, horizontal sunscreens
Building raised on plinth

Figure 17.a







Light Shelf

North South

Figure 17.b

The economic benefits of sustainable design stem from reduced use of natural resources. Energy efficiency, minimizing water use, and thoughtfully responding to the college's micro-climate all reduce operating costs on the campus. The life cycle cost reduction is particularly important since the college "owns" the campus and will be encumbered with operating and maintaining the buildings and infrastructure for years to come.

The Health and Safety benefits of sustainable design are often overlooked. By protecting the interior and exterior environmental quality on campus, an extraordinary benefit may be realized. The adverse effects of the sick building syndrome are well known. Conversely, the improved productivity of faculty, staff and students in buildings with good indoor air quality, pleasant lighting, and low noise levels can be remarkable. Classrooms and student learning in particular benefit from these and other features of sustainable design. This benefit, by example, will extend to the community served by the Desert Community College District.

Natural Lighting and Ventilation

Historically, the architects and engineers of the original buildings on campus incorporated features that provided natural lighting. Future projects on campus should further develop these techniques by employing state of the art technologies to enhance these traditional features of sustainable design. The campus' micro-climate provides opportunities for effective applications of sustainable design strategies. The goal is to improve energy efficiency while enhancing the air and light quality of building interiors.

Natural Lighting

Building facades and fenestrations should be designed to bring good quality sunlight into the buildings' interiors. Proper building siting along with windows and skylights employing correct glazing are key features. The master outline specifications provide the specific standards for these features.

The window openings should be protected by overhangs and light shelves as required to avoid uncomfortable glare. To augment the light shelves, high reflectance ceiling finishes will improve the diffuse quality, brightness and interior penetration of sunlight.

Specially designed skylights that provide good quality interior lighting in the desert climate are described in the Master Outline specification "08600 High Performance Daylighting Systems". Designers are encouraged to include these sustainable design features in new and existing buildings.

When practical and effective, automatic dimmers should be provided to reduce the artificial lighting load when sunlight illuminates building interiors. This is an example of a synergistic strategy wherein one sustainable design feature improves the effectiveness of another. In this case, when sunlight is available the dimmers reduce the heat load from artificial lights in the interior. This reduction in peak load could allow for a reduction in air handler's size and cooling load on the chillers. This then makes variable air volume controls more effective in reducing energy consumption. The possible net result is a well lit interior environment with visual connection to the outside as well as enhanced occupant comfort.

Other similar design approaches are encouraged as well as innovative design strategies and technologies that may currently be under development to provide natural lighting.

Please see figure 17.b for drawings describing recommended natural lighting methodologies.

Natural Ventilation
The existing microclimate in the Coachella Valley presents problems for applications of natural ventilation technologies. The blow sand that is part of high wind episodes common in the area is a concern. If buildings are not properly sealed, this fine sand will penetrate interiors resulting in significant maintenance problems. As a result, natural ventilation is not recommended for College of the Desert.

LEED Certification and the Design Process
The United States Green Building Council is a national, non-profit organization which has established "Leadership in Energy and Environmental Design" (LEED) as a means for a building to be certified as being sustainably designed. The LEED rating system has four levels of certification reflecting increasing effectiveness of a project's sustainable design features; certified, silver, gold and platinum. There are four types of LEED certifications; New Construction, Existing Buildings, Commercial Interiors, Core and Shell, and Homes.

While buildings are certified, the United States Green Building Council also provides for accreditation of design professionals. There is a requirement that at least one LEED accredited professional be part of the design team for LEED Certification. It is advisable to have an accredited team to insure that the synergies of coordinated design can be achieved. In addition, consideration of sustainable design should start early in the design process. LEED pre-requisites and credits are more easily obtained when planning, programming and budgeting are done with consultation from LEED accredited professionals. There will be benefits realized during site selection, design, construction, commissioning, occupancy, and through years of operation and maintenance of the building.

College of the Desert

Section IV – Master Outline Specifications

October 2005

COLLEGE OF THE DESERT

SECTION 01310

PROJECT MANAGEMENT AND COORDINATION

1.0 GENERAL

A. This Section includes administrative provisions for coordinating construction operations on a Project including, but not limited to, the following:

1. Coordination Drawings.

2. Project meetings.

B. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

5. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work.

D. Coordination Drawings: Prepare Coordination Drawings only if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

E. Meetings, General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

F. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than [15] [ ] days after execution of the Agreement. Hold the conference at Project site or Owner's conference room. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers;

and other concerned parties shall attend. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.

    b. Phasing.

    c. Critical work sequencing and long-lead items.

    d. Designation of key personnel and their duties; list of Subcontractors.

    e. Procedures for processing field decisions and Change Orders.

    f. Procedures for requests for interpretations (RFIs).

    g. Procedures for testing and inspecting.

    h. Procedures for processing Applications for Payment.

    i. Distribution of the Contract Documents.

    j. Submittal procedures.

    k. LEED requirements. (If Required).

    l. Preparation of Record Documents.

    m. Use of the premises [and existing building].

    n. Work restrictions.

    o. Owner's occupancy requirements.

    p. Responsibility for temporary facilities and controls.

    q. Construction waste management and recycling.

    r. Parking availability.

s. Office, work, and storage areas.

t. Equipment deliveries and priorities.

u. First aid.

v. Security.

w. Progress cleaning.

x. Working hours.

3. Minutes: [Architect will record] [Record] and distribute meeting minutes.

G. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each major construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

H. Progress Meetings: Conduct progress meetings at [weekly] [biweekly] intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the

conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Review schedule for next period.

   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Status of submittals.
      3) Hazards and risks.
      4) Quality and work standards.
      5) Status of correction of deficient items.
      6) Field observations.
      7) Requests for interpretations (RFIs).
      8) Status of proposal requests.
      9) Pending changes.
      10) Status of Change Orders.
      11) Pending claims and disputes.
      12) Documentation of information for payment requests.

3. Minutes: [Architect will record][Contractor will record] and distribute the meeting minutes.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

I. Proprietary Campus Standards: During preparation of bid documents, care shall be taken to address any proprietary products which may be part of the Work. The bid documents shall include a unit price or allowance for all bidding contractors to use in their bid preparation. The amount of the unit price or allowance shall be negotiated before bid documents are finalized.

J. Refer to Owner's current Contracting Requirements, including General and Supplementary (or Special) Conditions of the Contract, for additional requirements.

END OF SECTION

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

1.0 GENERAL

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.

2. Submittals Schedule.

3. Daily construction reports.

4. Field condition reports.

B. Definitions:

1. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

a. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

b. Predecessor Activity: An activity that precedes another activity in the network.

c. Successor Activity: An activity that follows another activity in the network.

2. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

3. Critical Path: The longest connected chain of interdependent activities through a network schedule that establishes the minimum overall Project duration and contains no float.

4. Float: The measure of leeway in starting and completing an activity.

    a. Float time [belongs to Owner] [is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date].

5. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

6. Major Area: A story of construction, a separate building, or a similar significant construction element.

C. Submittals Schedule: Submit [three] <Insert number> copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Architect's final release or approval.

D. Preliminary Network Diagram: Submit [two] <Insert number> opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Contractor's Construction Schedule: Submit [two] <Insert number> opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

F. CPM Reports: Concurrent with CPM schedule, submit [three] <Insert number> copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

G. Daily Construction Reports: Submit [two] <Insert number> copies at [weekly] intervals.

H. Field Condition Reports: Submit [two] <Insert number> copies at time of discovery of differing conditions.

I. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

2.0 PRODUCTS

A. Submittals Schedule: On major projects, submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

B. Contractor’s Construction Schedule, General:

1. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

2. Activity Duration: Define activities so no activity is longer than [20] <Insert number> days, unless specifically allowed by Architect.

3. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule.

4. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule.

5. Startup and Testing Time.

6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

7. Constraints: Include constraints and work restrictions as follows in schedule, and show how the sequence of the Work is affected.

    a. Phasing.

    b. Work under More Than One Contract.

    c. Work by Owner.

    d. Work Restrictions.

    e. Work Stages.

    f. Other Constraints.

8. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion, [and the following interim milestones:]

9. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

C. [Provide Gantt-Chart if Owner does not require a CPM Schedule]. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within [30] <Insert number> days of date established for [commencement of the Work] [the Notice to Proceed]. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

1. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in [10] <Insert number> percent increments within time bar.

D. General: Prepare network diagrams using AON (activity-on-node) format.

E. Preliminary Network Diagram: Submit diagram within [14] <Insert number> days of date established for [commencement of the Work] [the Notice to Proceed]. Outline significant construction activities for the first [60] <Insert number> days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

F. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, [cost- and resource-loaded,] time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than [30] <Insert number> days after date established for [commencement of the Work] [the Notice to Proceed].

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

G. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

H. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities.

I. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports as requested by Owner.

J. Reports:

1. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

    a. List of subcontractors at Project site.

    b. Equipment at Project site.

    c. Material deliveries.

    d. High and low temperatures and general weather conditions.

    e. Work completed.

    f. Stoppages, delays, shortages, and losses; accidents.

    g. Orders and requests of authorities having jurisdiction.

    h. Services connected and disconnected.

    i. Equipment or system tests and startups.

2. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation [on CSI Form 13.2A]. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

3.0 EXECUTION

A. Contractor's Construction Schedule Updating: At [monthly] <Insert time> intervals, update schedule to reflect actual construction progress and activities. Issue schedule [one week] <Insert time> before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

1.0 GENERAL

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Definitions:

1. Action Submittals: Written and graphic information that requires Architect's responsive action.

2. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Submittals Schedule: Comply with requirements in Section 01320 Construction Progress Documentation; for list of submittals and time requirements for scheduled performance of related construction activities.

E. Processing Time: Allow enough time for submittal review, including time for resubmittals. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow [15] <Insert number> days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow [15] <Insert number> days for review of each resubmittal.

F. Identification: Place a permanent label or title block on each submittal for identification. Indicate name of firm or entity that prepared each submittal on label or title block.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are approved.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, Owner’s inspector, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Architect.

L. At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions: [ ].

2.0 PRODUCTS

A. Action Submittals: Prepare and submit Action Submittals required by individual Specification Sections. Architect to verify with Owner the number of copies required for each type of submittal. Contractor to verify submittal routing if a Construction Manager, as well as the Architect, will be reviewing the submittals.

1. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

    a. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

    b. Mark each copy of each submittal to show which products and options are applicable.

2. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.

3. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

    a. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

    b. Identification: Attach label on unexposed side of Samples that includes the following:

        1. Generic description of Sample.

        2. Product name and name of manufacturer.

        3. Sample source.

        4. Number and title of appropriate Specification Section.

5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity.

4. Product Schedule or List.

5. Submittals Schedule: Comply with requirements specified in Section 01320-Construction Progress Documentation.

6. Application for Payment.

7. Schedule of Values.

8. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

B. Informational Submittals: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit [two] <Insert number> copies of each submittal, unless otherwise indicated. Architect will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Coordination Drawings: Comply with requirements specified in Section 01310 - Project Management and Coordination.

4. Contractor's Construction Schedule: Comply with requirements specified in Section 01320 - Construction Progress Documentation.

5. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents.

Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

7. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

8. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

9. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

10. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

11. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

12. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

13. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

14. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

15. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

16. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

17. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

18. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

19. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

20. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

    a. Statement on condition of substrates and their acceptability for installation of product.

    b. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

c. Results of operational and other tests and a statement of whether observed performance complies with requirements.

21. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

22. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

C. Submittals to Division of State Architect

1. Submit Verified Reports to the Division of the State Architect (DSA).

2. Deferred Approvals:

a. Submit detailed plans, specifications and engineering calculations for all deferred approval items. Calculations and drawings of structural nature shall be prepared and signed by a Structural Engineer registered in the State of California.

b. Submit one reproducible transparency and three opaque prints. If revisions are necessary, the Architect will return only the transparency to the contractor. Resubmit one transparency and three opaque prints with all corrections. The reproducible and one print will be sent to DSA by the Architect for the approval. If corrections are required by DSA, make the corrections and submit one transparency and three opaque prints, along with DSA checkset, to the Architect. After DSA approval, the transparency with DSA approval will be returned to the Contractor.

c. Fabrication and installation of deferred approval items shall not be started until detailed plans, specifications and engineering calculations have been accepted by the Architect and the Division of the State Architect.

3.0 EXECUTION

A. Contractor’s Review

1. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect

2. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

B. Architect's Action:

1. Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

2. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

3. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

4. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

5. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01352

SUSTAINABLE DESIGN (LEED REQUIREMENTS)

1.0 GENERAL

A. Summary

1. The Desert Community College District has set the goal of incorporating sustainable design features into Bond Program Projects. Though the primary goal is sustainable design in general, a secondary goal is to achieve LEED Leadership in Energy and Environmental Design) Certification when feasible. More information concerning these goals is in the Campus Design Guidelines and Sustainable Design Criteria.

2. This Section includes general requirements and procedures for compliance with certain U.S. Green Building Council's (USGBC) LEED prerequisites and credits needed for the Project to obtain LEED.

a. Other LEED prerequisites and credits needed to obtain LEED certification are dependent on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.

b. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification are dependent on the Architect's design and other aspects of the Project that are not part of the Work of the Contract.

B. Submittals

1. General: Submit documentation requested for sustainable design features in other sections as required for specific jobs. Submit additional LEED submittal requirements for the projects pursuing LEED Certification.

2. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

3. LEED Documentation Submittals: When a project is to be LEED Certified, list each individual pre-requisite and credit being pursued. Each individual LEED document required shall be listed.

2.0 PRODUCTS

A. The following is a list of product features that have sustainable design aspects of concern. In general, the specifier should be cognizant of these features and incorporate them when feasible. In a project pursuing LEED certification, there are rigorous criteria to incorporate into the specification section being authored.

1. Salvaged and Refurbished Materials.

2. Recycled Content of Materials.

3. Regional Materials.

4. Certified Wood.

5. Low-Emitting Materials.

3.0 EXECUTION

A. The following list describes some attributes of "Execution" of the Work that have sustainable ramifications. In general, when practical the specifier shall incorporate these into the specifications. In projects pursuing LEED Certification, the rigorous requirements to satisfy prerequisites and credits shall be described.

1. Site Disturbance.

2. Refrigerant [and clean-agent fire-extinguishing-agent] removal.

3. Construction Waste Management.

4. Construction indoor air quality management.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

1.0 GENERAL

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

2. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

3. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

4. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

C. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

D. Qualification Data: Submit for Contractor-retained testing agencies to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect and Owner.

2. Notify Architect [seven] <Insert number> days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work. Demolish and remove mockups when directed by Owner.

I. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor[, and the Contract Sum will be adjusted by Change Order].

J. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least [24] <Insert number> hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

K. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01330- Submittal Procedures.

L. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

M. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

N. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

O. Special Tests and Inspections: Owner will engage a qualified [testing agency] [special inspector] to conduct special tests and inspections required by code authorities having jurisdiction (i.e. DSA) as the responsibility of Owner, and as follows:

1. Testing Agency must have approved of Division of State Architect.

2. Comply with California Code of Regulations, Title 24, Part 1, Chapter 4.

3. All tests and inspections required by DSA shall conform to CCR Title 24.

4. One copy of all test reports shall be forwarded to DSA by testing agency.

5. [List Schedule of Tests and Inspections required by DSA, including Code paragraph number].

3.0 EXECUTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

1.0 GENERAL

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

C. General: Cost or use charges for temporary facilities shall be included in the Contract Sum.

D. [Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.]

E. [Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations].

F. Submittal of Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

G. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

H. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

I. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

2.0 PRODUCTS

A. [Temporary Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails. Provide opaque fabric or plastic windscreen full height and run of fence.]

B. [Wood Enclosure Fence: Plywood, [6 feet] [8 feet] high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart].

C. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

E. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3.0 EXECUTION

A. Temporary Utility Installation

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

2. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

3. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

4. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

5. Provide temporary ventilation, heating, or cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.

6. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Connect temporary service to Owner's existing power source, as directed by Owner.

7. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

B. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

D. Project Identification and Temporary Signs: Provide Project identification and other signs as directed by Owner. Unauthorized signs are not permitted.

1. Provide temporary plastic or wood directional signs to guide pedestrians around construction site, and for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with Section 01524-Construction Waste Management.

F. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

G. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

1. Obtain all necessary permits, including preparation of engineering documentation, as required to comply with jurisdictional authority regulations regarding storm run-off and erosion control. Compliance with requirements of Federal Clean Water Act, associated State Water Resources Board, and local regulations is specifically required.

2. The California State Water Resources Control Board has adopted a statewide General Permit for Storm Water Discharges associated with construction activities. The Contractor shall comply with the conditions of this General Permit.

3. Contractor shall perform following:

a. Develop and implement a Storm Water Pollution Prevention Plan (SWPPP).

b . Prepare and submit a Notice of Intent to comply with the terms of this General Permit prior to commencement of construction activity.

c. Monitor and submit reports and retain records.

H. Site Enclosure Fence: Before construction operations begin, provide temporary fencing and gates as directed by Owner.

1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

I. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

J. Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

L. Temporary Fire Protection: Prohibit smoking in construction areas. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and Owner, and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

M. Noise Abatement:

1. To minimize annoyances in classrooms, labs and offices, Contractor shall institute material delivery and handling logistics, and shall erect noise control barriers, as needed to ensure that the sound level due to any part of the construction process does not exceed 65 dBA at any glazed building façade and 75 dBA at any unglazed facade.

2. Control the noise emissions from engine-powered equipment by keeping it maintained in prime operating condition, using all available noise control accessories in the way intended by the accessory manufacturer, keeping all equipment enclosure doors closed, and locating the equipment as far as possible from classroom and office building facades.

N. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until directed by Owner.

END OF SECTION

SECTION 01524

CONSTRUCTION WASTE MANAGEMENT

1.0 GENERAL

A. Purpose and Intent: The main thrust is to promote waste reduction (source reduction) and recycling practices to the maximum extent reasonably possible for construction and demolition projects. Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

1. Requirements: Develop and implement a waste management plan, qualifying material diversion goals. Recycle and/or salvage 50% of construction, demolition and land clearing waste. Calculations can be done by weight or volume, but must be consistent throughout.

2. Completion of required documentation and submittal of disposal and diversion reporting form to enable District tracking and calculation of diversion rate. District to provide necessary forms.

B. References

1. The California Integrated Waste Management Act of 1989 (AB 939).

2. California Code of Regulations Title 14, Section 18700 et seq.

3. Definitions:

a. "Recycle" or "recycling" means the process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace. "Recycling" does not include transformation, as defined in California Public Resources Code Section 40201.

b. "Source reduction" means any action which causes a net reduction in the generation of solid waste. "Source reduction" includes, but is not limited to, reducing the use of nonrecyclable materials, replacing disposable materials and products with reusable materials and products, reducing packaging, reducing the amount of yard wastes generated, establishing garbage rate structures with incentives to reduce the amount of wastes that generators produce, and increasing the efficiency of the use of paper, cardboard, glass, metal, plastic, and other materials. "Source reduction" does not include steps taken after the material becomes solid waste or actions which would impact air or water resources in lieu of land, including, but not limited to, transformation.

c. “Transformation Facility” means a facility whose principal function is to convert, combust, or otherwise process solid waste by incineration, pyrolysis, destructive distillation, or gasification, or to chemically or biologically process solid wastes, for the purpose of volume reduction, synthetic fuel production, or energy recovery. Transformation facility does not include a composting facility.

C. Submittals

1. Waste Management Plan: Prior to any waste removal, submit the following for review and approval.

a. Materials to be recycled, reused, or salvaged, either onsite or offsite

b. Estimate of waste quantity (in tons) by type of material, (If waste is measured by volume, give factors for conversation to weight in tons.)

c. Procedures for recycling/reuse program.

d. Permit or license and location of Project waste-disposal areas

e. Site Plan for placement of waste containers.

2. Submit Owner-provided Waste Disposal and Diversion Reporting Forms at the completion of the construction and/or demolition project.

a. Contractor shall provide weigh tickets and/or other documentation to support the reported tonnages and destinations. Attach documentation confirming amounts and disposal locations.

b. Contractor must maintain records for a minimum of 3 years.

3. If required, provide the LEED Letter Template signed by the Architect. Owner or other responsible party, tabulating the total waste material, quantities diverted and the means by which diverted, and declaring that the credit requirements have been met.

2.0 PRODUCTS – (NOT USED)

3.0 EXECUTION

A. When reasonably feasible, implement "source reduction" (waste reduction/prevention) and recycling practices that divert waste from landfill disposal. Practices such as deconstruction, on-site crushing and reuse of concrete /asphalt as base material, salvage of fixtures, and recovering recyclable materials should be implemented.

B. Contractors shall make arrangements with the waste hauler for providing source separated bins so that the Contractor can keep recyclable materials separated to a level that a recycling facility can accept them.

C. Contractors shall take materials to a Transformation Facility whenever feasible and cost effective. Each transformation facility will only accept limited wastestreams. The Contractor is responsible for determining if their specific wastestream is acceptable by each facility.

D. Complete and submit the Owner's Waste Disposal and Diversion Reporting Form along with the supporting documentation.

E. Designate an on-sight person to be responsible for instructing workers and overseeing the sorting and recording of waste/recyclable materials.

F. Include waste management and recycling and waste bins neat and clearly marked to avoid contamination of materials.

END OF SECTION

SECTION 01571

STORM WATER POLLUTION CONTROL MEASURES FOR CONSTRUCTION ACTIVITIES

1.0 PERFORMANCE

A. Minimum Water Quality Protection Requirements

1. The Contractor is required to meet the following minimum standards of good housekeeping:

    a. Eroded sediments and other pollutants must be retained on site and may not be transported from the site via sheet flow, swales, area drains, natural drainage, or wind.

    b. Stockpiles of earth and other construction-related materials must be protected from being transported from the site by wind or water.

    c. Fuels, oils, solvents, and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil nor the surface waters. All approved toxic storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.

    d. Excess or waste concrete may not be washed into the public way or any drainage system. Provisions shall be made to retain concrete wastes on-site until they can be appropriately disposed of or recycled.

    e. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.

    f. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public ways. Accidental depositions must be swept up immediately and may not be washed down by rain or by any other means.

B. Wet Weather Erosion Control Plan (WWECP)

1. The Contractor shall prepare a Wet Weather Erosion Control Plan (WWECP) and implement Best Management Practices (BMPs) as necessary.

C. Storm water Pollution Prevention Plan

1. The Contractor shall prepare applicable sections and comply with The Stormwater Pollution Prevention Plan (SWPPP). The Contractor shall complete and submit the Notice of Intent to construct under the California Construction General Permit (NPDES). The Contractor shall implement Best Management Practices (BMPs) necessary to control stormwater pollution from sediments, erosion, and construction materials leaving the construction site. At the end of the construction project, the Contractor shall complete and submit the Notice of Termination.

2. The BMPs contained in the Development Best Management Practices Handbook – Part A, Construction Activities cover the following categories of construction activities:

   a. Site preparation/earth removal

   b. Underground structures

   c. Aboveground structures

   d. Roadways, walkways and parking lots

   e. Planting and landscaping

3. The SWPPP document shall include the following information:

   a. Name, location, period of construction, and a brief description of the Project.

   b. Contact information for the Contractor, including name, address, and telephone number.

c. Name, location, and description of any environmentally sensitive areas located on or adjoining the Project.

d. List of major construction materials, waste, and activities.

e. List of BMPs to be used to control pollutant discharges from major construction materials, wastes, and activities.

f. Site plan (a construction plan may be used) indicating the location of BMPs where appropriate.

g. Developer's certification statement that all required and selected BMPs will be effectively implemented.

4. Whenever the Contractor is required to get any type of permit from the Department of Building and Safety (DBAS), the Contractor shall submit the SWPPP document to the DBAS for review and approval before obtaining the permit. If the Contractor does not need any type of permit from the DBAS, the Contractor shall submit the SWPPP document to the Project Manager for review and approval. At least one copy of the approved SWPPP shall be kept at the construction site and accessible to inspectors.

END OF SECTION

SECTION 01731

CUTTING AND PATCHING

1.0 GENERAL

A. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended, or decreased operational life or safety.

C. Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching, by methods and with materials so as not to void existing warranties. Verify with the Owner the existence of a current roof bond or guarantee. Cutting and patching of existing roof shall be performed with compatible materials using methods so as not to invalidate any current bond or guarantee. Cutting of all openings through roof shall be done by manufacturer's licensed or approved roofing contractor. Arrange with the manufacturer who furnished the roof bond or with the roofer who provided the roof guarantee for an examination of the complete work and provide two copies of an acknowledgement and approval to the Owner indicating that such bond or guarantee (if any) will remain in effect.

1. Where the work of removals, demolition, cutting and similar work involves possible hazardous substances or harmful agents, such as asbestos fibers, lead paint, or polychlorinated biphenyl (PCB), extreme care shall be exercised to avoid damage and preserve the safety of all personnel. Contractor shall stop the Work and notify Owner prior to working with or handling hazardous materials.

2.0 PRODUCTS

A. Comply with material requirements specified in other Sections. Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces.

3.0 EXECUTION

A. Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions exposed during cutting and patching.

C. Cutting: Use methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces.

2. Cut masonry and concrete using a cutting machine, such as an abrasive saw or a diamond-core drill.

3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other matter after cutting.

D. Patching: Patch with durable seams that are as invisible as possible.

1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

2. Patching, painting or restoration shall be carried to natural breaks (i.e., corners) wherever possible.

E. Brick: Where brick or brick tile from existing building is required for patching, exercise care in removing brick from existing building to preserve for reuse. Do not reuse broken brick. After removal clean all mortar from all sides of brick, carefully stockpile and protect to ensure brick is available for reuse. Stockpile on suitable platform (not on earth).

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES

1.0 GENERAL

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Substantial Completion: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list).
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site.

11. Advise Owner of changeover in utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes.

C. Final Completion: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

D. Punch List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

E. Warranties: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of

Substantial Completion is indicated. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

2.0 PRODUCTS

A. Materials: Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3.0 EXECUTION

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

2. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

3. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

4. Leave Project clean and ready for occupancy.

B. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01810

GENERAL COMMISSIONING REQUIREMENTS

1.0 GENERAL

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. Intent: Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

C. Requirements: Implement or have a contract in place to implement the following fundamental best practice commissioning procedures.

1. Engage a commissioning team that does not include individuals directly responsible for project design or construction management.
2. Review the design intent and the basis of design documentation.
3. Incorporate commissioning requirements into the construction documents.
4. Develop and utilize a commissioning plan.
5. Verify installation, functional performance, training, operation and maintenance documentation.
6. Complete a commissioning report.

D. Definitions:

1. BoD: Basis of Design.
2. CxA: Commissioning Authority. The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
3. OPR: Owner's Project Requirements.

4. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

5. TAB: Testing, Adjusting, and Balancing.

E. Commissioning Team

1. Members representing [each] contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists.

2. Members representing Owner, including CxA, facility user and operation and maintenance personnel, and Architect.

F. Owner's Responsibilities:

1. Provide OPR and BoD documentation.

2. Assign operation and maintenance personnel and schedule them for commissioning meetings.

3. Provide utility services for commissioning process.

G. Contractor's Responsibilities:

1. Provide utility services for commissioning process.

2. Assign personnel and schedule them for commissioning activities.

3. Require subcontractors to assign personnel and schedule them for activities.

H. CxA's Responsibilities:

1. Organize and lead commissioning team.

2. Prepare construction-phase commissioning plan.

3. Review and comment on submittals from [each] Contractor.

4. Convene commissioning team meetings.

5. Observe and inspect construction and report progress and deficiencies.

6. Prepare Project-specific test and inspection procedures and checklists.

7. Schedule, direct, witness, and document tests, inspections, and systems startup.

8. Compile test data, inspection reports, and certificates for systems manual.

9. Certify date of acceptance and startup of each item of equipment for start of warranties.

10. Review Project Record Documents for accuracy.

11. Review and comment on operation and maintenance documentation and systems manual.

12. Prepare and conduct operations and maintenance personnel training.

13. Videotape training.

14. Videotape construction progress.

15. Prepare commissioning reports.

16. Assemble final commissioning documentation.

I. Commissioning Documentation:

1. Index of Commissioning Documents.

2. Owner's Project Requirements (OPR).

3. Basis of Design (BoD).

4. Commissioning plan.

5. Test checklists.

6. Certificate of Readiness.

7. Test and inspection reports.

8. Corrective action documents.

9. Issues log.

10. Commissioning report.

11. Systems manual.

J. Submittals:

1. Prefinal and final commissioning plan.

2. Test checklists and report forms.

3. Certificates of Readiness.

4. Corrective action documents.

5. Prefinal and final commissioning reports.

6. On LEED Projects: Provide the LEED Letter Template, signed by the Owner or Commissioning Agent(s), confirming that fundamental commissioning requirements have been successfully executed or will be provided under existing contract(s).

K. Operation and Maintenance Training Requirements:

1. Training preparation conference to finalize training requirements and documents.

2. Training modules for each item of system, subsystem, and equipment.

3. Coordinate these training requirement with those specified in Section 01820 Demonstration and Training.

END OF SECTION

SECTION 01815

HVAC COMMISSIONING REQUIREMENTS

1.0 GENERAL

A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment. This Section supplements the general requirements specified in Division 1 Section "General Commissioning Requirements."

B. See Division 1 Section "General Commissioning Requirements" for general requirements for commissioning processes that apply to this Section.

C. Definitions

1. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.

2. BoD: Basis of Design.

3. BoD-HVAC: HVAC systems basis of design.

4. CxA: Commissioning Authority.

5. OPR: Owner's Project Requirements.

6. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

7. TAB: Testing, Adjusting, and Balancing.

D. Contractor’s Responsibilities:

1. The following responsibilities are in addition to those specified in Division 1 Section "General Commissioning Requirements."

2. Each Contractor:

   a. Attend procedures meeting for TAB Work.

b. Certify that TAB Work is complete.

3. Mechanical [Sub]Contractor:

   a. Attend TAB verification testing.

   b. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.

4. HVAC Instrumentation and Control Subcontractor: With the CxA, review control designs for compliance with the OPR and BoD, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.

5. TAB Subcontractor:

   a. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.

      1) Verify the following:

         a) Accessibility of equipment and components required for TAB Work.

         b) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.

         c) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.

         d) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.

         e) Air and water flow rates have been specified and compared to central equipment output capacities.

      2) Identify discontinuities and omissions in the Contract Documents.

3) This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 15 Section "Testing, Adjusting, and Balancing."

b. Additional Responsibilities: Participate in tests specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."

6. Electrical [Sub]Contractor:

a. With the Mechanical Contractor, coordinate installations and connections between and among electrical and HVAC systems.

b. Attend TAB verification testing.

E. Commissioning Documentation

1. The following are in addition to documentation specified in Division 1 Section "General Commissioning Requirements."

a. <Coordinate activities specified in first paragraph below with Owner-Architect and Architect-Consultant agreements.>

2. BoD HVAC: Owner will provide BoD-HVAC documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

3. Test Checklists: CxA, with assistance of the consultant/design professional, shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 1 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:

a. Calibration of sensors and sensor function.

b. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.

c. Control sequences for HVAC systems.

d. Strength of control signal for each set point at specified conditions.

e. Responses to control signals at specified conditions.

f. Sequence of response(s) to control signals at specified conditions.

g. Electrical demand or power input at specified conditions.

h. Power quality and related measurements.

i. Expected performance of systems, subsystems, and equipment at each step of test.

j. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.

k. Interaction of auxiliary equipment.

l. Issues log.

F. Submittals

1. The following submittals are in addition to those specified in Division 1 Section "General Commissioning Requirements."

2. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.

3. Certificate of Readiness: CxA shall compile certificates of readiness from each Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.

4. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Subcontractor as specified in Division 15 Section "Testing, Adjusting, and Balancing."

5. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.

6. Corrective Action Documents: CxA shall submit corrective action documents.

7. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

2.0 PRODUCTS (Not Used)

3.0 EXECUTION

A. Testing Preparation

1. Prerequisites for Testing:

a. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the OPR, BoD, and Contract Documents; and that Certificates of Readiness are signed and submitted.

b. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BoD, and Contract Documents; and that pretest set points have been recorded.

c. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.

d. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.

e. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

f. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.

g. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.

h. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

i. Annotate checklist or data sheet when a deficiency is observed.

j. Verify equipment interface with monitoring and control system and TAB criteria; include the following:

    1) Supply and return flow rates for VAV and constant volume systems in each operational mode.

    2) Operation of terminal units in both heating and cooling cycles.

    3) Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.

    4) Building pressurization.

    5) Total exhaust airflow and total outdoor-air intake.

    6) Operation of indoor-air-quality monitoring systems.

k. Verify proper responses of monitoring and control system controllers and sensors to include the following:

    1) For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.

    2) Report deficiencies and prepare an issues log entry.

l. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 15 Sections.

2. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. For individual room cooling tests, provide temporary heaters to impose a cooling load indicated in BoD. Operational modes include the following:

    a. Occupied and unoccupied.

    b. Warm up and cool down.

    c. Economizer cycle.

    d. Emergency power supply.

    e. Life-safety and safety systems.

    f. Smoke control.

    g. Fire safety.

    h. Stair pressurization system.

    i. Temporary upset of system operation.

    j. Partial occupancy conditions.

    k. Special cycles.

B. TAB Verification

1. TAB Subcontractor shall coordinate with CxA for work required in Division 15 Section "Testing, Adjusting, and Balancing." TAB Subcontractor shall copy CxA with required reports, sample forms, checklists, and certificates.

2. Each Contractor, HVAC Subcontractor, and CxA shall witness TAB Work.

3. TAB Preparation:

    a. TAB Subcontractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 15 Section "Testing, Adjusting, and Balancing."

1) CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.

4. Verification of Final TAB Report:

a. CxA shall select, at random, 10 percent of report for field verification.

b. CxA shall notify TAB Subcontractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.

c. Failure of an item is defined as follows:

1) For all readings other than sound, a deviation of more than 10 percent.

a) For sound pressure readings, a deviation of 3 dB. (Note: Variations in background noise must be considered.)

d. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.

5. If deficiencies are identified during verification testing, CxA shall notify the HVAC [Sub] Contractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.

6. CxA shall certify that TAB Work has been successfully completed.

C. Testing

1. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.

2. Perform tests using design conditions whenever possible.

a. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

b. Alter set points when simulating conditions is not practical and when written approval is received from CxA.

c. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.

3. Scope of HVAC Subcontractor Testing:

   a. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.

   b. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

4. Detailed Testing Procedures: CxA, with HVAC Subcontractor, TAB Subcontractor, and HVAC Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.

5. HVAC Instrumentation and Control System Testing:

   a. Field testing plans and testing requirements are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." The CxA, HVAC Subcontractor, and the HVAC Instrumentation and Control Subcontractor shall collaborate to prepare testing plans.

   b. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.

6. Energy Supply System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of gas, hot-water and solar systems and equipment. Plan shall include the following:

   a. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.

b. Tracking checklist for managing and ensuring that all pipe sections have been tested.

7. Heat-Generation System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of boilers, feed-water equipment, furnaces, and auxiliary equipment. Plan shall include the following:

a. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

b. Tracking checklist for managing and ensuring that all pipe sections have been tested.

8. Refrigeration System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Plan shall include the following:

a. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

b. Tracking checklist for managing and ensuring that all pipe sections have been tested.

9. HVAC Distribution System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:

a. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

b. Tracking checklist for managing and ensuring that all pipe sections have been tested.

10. Vibration and Sound Tests: HVAC Subcontractor shall prepare testing plans to verify performance of vibration isolation and seismic controls. CxA shall witness and certify tests and inspections.

11. <Insert HVAC systems sequence of operations.>

12. Deferred Testing:

a. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.

b. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

13. Testing Reports:

a. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.

b. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.

c. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.

14. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.

END OF SECTION

SECTION 01820

DEMONSTRATION AND TRAINING

1.0 GENERAL

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.

2. Training in operation and maintenance of systems, subsystems, and equipment.

3. [Demonstration and training videotapes].

B. Instructional Time: Instead of establishing an overall length of training time, the specifier should either define the time requirements for each type of system that needs demonstration and training, or include an allowance for demonstration and training. Coordinate requirements with Owner, including possible LEED credit.

C. Instruction Program: Submit copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

D. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

E. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.

F. Preinstruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training.

G. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

H. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. <Insert list of systems and equipment.

I. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria

2. Documentation

3. Emergencies

4. Operations

5. Adjustments

6. Troubleshooting

7. Maintenance

8. Repairs

2.0 PRODUCTS (Not Used)

3.0 EXECUTION

A. Instruction:

1. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

2. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

3. Scheduling: Provide instruction at mutually agreed on times. Schedule training with Owner, with at least [seven] days' advance notice.

4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of [an oral] [a written] [a demonstration] performance-based test.

B. [Demonstration and Training Videotapes]:

1. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.

2. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

3. Narration: Describe scenes on videotape by [audio narration by microphone while] [dubbing audio narration off-site after] videotape is recorded. Include description of items being viewed.

END OF SECTION

SECTION 02000

GENERAL CRITERIA

1.0 BASIC SITE MATERIALS AND METHODS

A. Site design on the College of the Desert campus is subject to review by the Design Review Team (DRT) and Campus Planning prior to final approval. This process will be coordinated through the University Representative.

B. Basic principles of site design have been set by the campus to alleviate future problems in the maintenance and appearance. Emphasis is put on low-maintenance, highly durable and sustainable designs that provide an aesthetic quality consistent with the College's goals.

C. Site drainage is an important consideration to develop for a successful project. These general guidelines shall hold true:

1. Storm drainage shall be directed away from all buildings and structures. If in the rare case this cannot be accomplished, redundant drainage and waterproofing systems will be required.

2. There shall be no potential for ponding water, which would flood into buildings and/or structures, other than those areas that are specifically designated to be detention ponds. The College has experienced problems with flooding and ponding throughout the campus site during storm events. Areas shall drain away from buildings and structures at a minimum slope of 1.0% and maximum slope of 2% in pedestrian walkways. In areas of landscape, the slope may exceed 2% but may be no less than 1%..

3. Building entrances and exits shall be provided with storm water overflow protection such that, if site storm drains fail to function properly, a gravity surface outlet is available at an elevation no greater than six inches below the Building finish floor elevation.

4. Sub-grade walls shall have a drainage system provided. The drainage system shall have minimum 4" diameter clean-outs at every change in direction that totals 135 degrees and at no more than a length of 100 lineal feet. The cleanouts shall be capped, concealed, and marked for future cleaning and maintenance.

D. Handrails for site stairs are to be steel and hot-dipped galvanized. Handrails and guardrail design shall meet applicable code requirements and be DSA accessible approved.

E. The number of fire hydrants to be provided shall be in accordance with the California Fire Code. Fire hydrant placement shall be in accordance with local municipality guidelines and are generally stated here.

1. Fire hydrants along streets shall be spaced a maximum of 300 linear feet and a minimum of 40' away from any structure.

2. Placement of fire hydrants to protect structures shall be also be located a minimum of 40 feet from any building with the exception of detached one- and two-family dwellings. The maximum distance from the nearest fire hydrant to any/all points of the exterior of a structure shall not exceed 150 feet for commercial and industrial occupancies or residential occupancies other than detached one- and two family dwellings (R-1's) shall not exceed 250 feet.

3. The final location approval is a coordinated effort between the College, the State Fire Marshal and OCFA.

F. Erosion and sediment control shall be provided on all projects that commence during the rainy season. Work shall comply with the requirements from the State Water Quality Control Board and a Storm Water Prevention Plan shall be submitted for approval.

2.0 PEDESTRIAN CIRCULATION

A. Pedestrian walkways (including plazas) shall be concrete. Layout of pedestrian walkways shall be well thought out for pedestrian circulation, and provide the shortest possible route between destination and building access points. If a perceived path is 10% less than a planned route, people tend to use their own path rather than the planned path.

B. Pedestrian circulation shall be routed away from vehicular traffic as much as feasible. Pedestrian pathways shall not occur near dumpsters, trash areas, loading docks or service areas.

C. Large transformers, backflow preventers, meters, standpipes and other unsightly service elements shall be located out of view from plazas, walkways, and main building entrances.

3.0 SITE RETAINING WALLS

A. Site retaining walls shall be designed with footings and key for support and to prevent overturning. Retaining walls shall have waterproofing and adequate drainage to prevent additional loading. Provide a gravel and water removal system at the backside, and foundation drains at the base. Drains may be tied into the storm drain or daylighted at an appropriate location. Retaining walls more than 2'-6" in height from top to finished grade are required to have a 3'-6" high guard rail (measured on the high slope side from finished grade) or other approved protective measure. The guardrail is required to prevent falling accidents.

B. Retaining walls shall be designed and reviewed by a licensed structural engineer.

4.0 DRAWINGS AND COORDINATION

A. Projects on the campus do not typically have clearly identified property lines or boundaries. Most buildings are constructed in areas that are currently being utilized as parking lots, pedestrian areas, etc., and may be adjacent to a variety of existing facilities. Project sites may have within their boundaries existing utilities, landscape, or hardscape.

B. Boundary lines shall be established for each project to determine the impact of the work on existing improvements. These boundary lines may be different than the assumed property lines used for building code analysis. The College shall approve the location of these boundaries.

C. The project design drawings shall identify and address areas both within the boundaries and beyond them, such as:

1. Service vehicle access
2. Pedestrian access
3. Existing irrigation and utility systems
4. Existing landscape
5. Fire protection
6. Emergency vehicle access

7. Disabled persons access

8. Identify these areas on the site plans as they exist, and clearly define the work required to address them during construction, as well as their final locations at the completion of the project. The intent is to minimize the disruption during construction, and to have a completed project that blends seamlessly into the campus without any "no man's land" of unfinished work at the project's perimeter.

D. Site drawings for each trade shall be drawn to the same scale when possible, unless plan is an enlargement.

E. Landscape and Irrigation:

1. Review the work area with the College to determine the impact of construction to the existing irrigation system.

2. Identify the location of existing valves, and define the work required to maintain functioning irrigation systems outside the construction site.

3. Temporary irrigation may need to be installed; these requirements shall be clearly defined on the drawings.

4. Verify that existing landscape areas to remain can be accessed for maintenance during construction.

5. Identify trees that are to remain. Provide for protection of trees, including root systems.

F. Fire Department Service

1. Identify existing fire hydrants, Fire Department connections, and Fire Department access to existing surrounding buildings.

2. Maintain fire protection during construction and provide temporary relocation if necessary.

3. Fire hydrants serving existing buildings must be maintained in service.

4. Review changes to Fire Department access with the College and Fire Department for approval.

G. Clearly identify the demolition intent for existing items on site. Designate items as:

1. Remove from site and dispose.
2. Remove and deliver to the College.
3. Protect in place.
4. Remove and store on-site for reuse.

H. Bollards or service gates shall be installed wherever the need exists to prevent unauthorized vehicle access. Bollards for fire lane access shall be PVC breakaway style per College standards.

I. Site Demolition plans shall show demolition, protection, and repair of existing utilities. Document on As-builts the horizontal/vertical location of existing utilities uncovered during construction.

END OF SECTION

SECTION 02200

SITE PREPARATION

1.0 GENERAL

A. Identify existing utilities that must remain active during construction. Provide temporary routing of utilities if necessary to accommodate construction activities without limiting service to existing facilities.

B. Interruption to existing utility services shall be limited and shall be approved in advance by the College's Representative. Shut downs may be limited to weekend/evening hours for critical facilities and utilities. Determine prior to start of work if temporary services are required.

C. The utility company shall only do the work on utility company's lines or service on campus property, unless otherwise directed by them.

D. Definitions

1. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

2. Remove and Salvage: Detach items from existing construction and deliver them to the University for possible re-use.

3. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

2.0 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the College that may be encountered during demolition remain the College's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the College. Except for stripped topsoil or other materials indicated to remain the College's property, cleared materials shall become Contractor's property and shall be removed from Project site.

3.0 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre-demolition Conference: Conduct conference at College Project Site.

4.0 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building and site demolition required.

B. Review Project Record Documents of existing construction provided by the College and/or the Project Architect. The College does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Inventory and record the condition of items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to the College and/or Project Architect.

5.0 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Arrange to shut off indicated utilities with the College and/or utility companies.

2. If utility services are required to be removed, relocated, or abandoned, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Transport and store items in secure area as designated by the College.

4. Protect items from damage during transport and storage.

D. Protect and maintain benchmarks and survey control points from disturbance during construction.

E. Locate and clearly flag trees and vegetation to remain or to be relocated.

F. Protect existing site improvements to remain from damage during construction.

G. Restore damaged improvements to their original condition, as acceptable to the College.

6.0 TEMPORARY EROSION AND SEDIMENT CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan, specific to the project site.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

7.0 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the College and/or Project Architect.

8.0 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by Architect and the College's Representative, items may be removed to a suitable, protected storage location during demolition, cleaned and reinstalled in their original locations after demolition operations are complete.

C. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by the College.

2. Provide temporary services during interruptions to existing utilities, as acceptable to the College and to authorities having jurisdiction.

a. Provide at least 72 hours notice to College Representative if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.

1. Protect existing site improvements, appurtenances, and landscaping to remain.

2. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

4. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

9.0 DEMOLITION, GENERAL

A. General: Demolish indicated existing buildings, structures, and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

2. Maintain adequate ventilation when using cutting torches.

3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: Perform surveys as the Work progresses to detect hazards that may result from building demolition activities.

C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from the College and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

10.0 MECHANICAL DEMOLITION

A. Remove buildings, structures, and site improvements intact when permitted by authorities having jurisdiction.

B. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on next lower level.

C. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.

D. Concrete: Cut concrete full depth at junctures with construction indicated to remain.

E. Masonry: Cut masonry cleanly at junctures with construction indicated to remain.

F. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished at junctures with construction indicated to remain, then break up and remove.

G. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

H. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

11.0 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the College or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the College not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without the College's written permission.

12.0 CLEARING AND GRUBBING

A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

B. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

13.0 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

14.0 EXPLOSIVE DEMOLITION

A. Explosives: Use of explosives is not permitted.

15.0 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to the Project Site specific Geotechnical Investigation Report.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

16.0 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

17.0 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the College's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

18.0 REPAIRS

A. General: Promptly repair damage to adjacent construction caused by building demolition operations.

B. Where repairs to existing surfaces are required, patch to restore surface to original or better condition.

C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

19.0 RECYCLING DEMOLISHED MATERIALS

A. General: Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type.

1. Provide containers or other storage method approved by the College for controlling recyclable materials until they are removed from Project site.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.

5. Transport recyclable materials off College's property and legally dispose of them.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling building demolition materials shall accrue to the College.

20.0 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain the College's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off College's property and legally dispose of them.

21.0 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION

SECTION 02231

TREE PROTECTION AND TRIMMING

1.0 GENERAL

1.1 SUMMARY

A. Protection and pruning of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction will commence in accordance to practices as established by ISA standards.

1.2 QUALITY ASSURANCE

A. Tree Pruning Standard: ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning) and ISA standards."

1.3 EXECUTION

A. Temporary chain-link fencing around tree protection zones. Distance and pole spacing as specified by ISA standards.

B. Mulching: Area inside tree protection zones and within drip line of trees to remain.

C. Excavation: Hand cleared and excavated within drip line of trees and utility trenches tunneled under or around tree roots.

D. Tree Replacement: Trees that die or are damaged beyond restoration during construction. Cost (both labor and material) shall be borne by the Contractor. Contractor shall inventory all trees to remain.

1. New Trees: Same size and species as those being replaced.

END OF SECTION

SECTION 02300

EARTHWORK

1.0 GENERAL

A. Grading plans shall be designed for a balanced site. If site can not be balanced then plan for removal of excess soils from College property. Should disposal be necessary, remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off College's property.

B. Identify the quantity of soil to be imported and/or exported, based upon interpretation of the Geotechnical Report specifically prepared for the project and/or the Grading Plan.

C. At times, the College may have locations on campus available to stockpile excess soil, or borrow sites for soil import. Coordinate with the College for stockpile availability.

D. Refer to Scction 02200, "Site Preparation" for requirements prior to starting any earthwork.

2.0 PROTECTION OF PERSONS AND PROPERTY

A. Provide for protection of buildings and structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

B. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.0 QUALITY ASSURANCE

A. Backfill and Fill Material: Satisfactory soil materials free of clay, rock or gravel larger in any dimension as specified in the project specific Geotechnical Report, debris, waste, frozen materials, vegetable and other deleterious matter.

B. Standard Specifications: Comply with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements for rock materials. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.

4.0 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility. Color coding shall be according to the American Public Works Association (APWA) standards:

1. Blue – potable water and fire suppression lines.

2. Green – sanitary sewer and storm drain lines.

3. Orange – communication, alarm or signal lines.

4. Purple – reclaimed water, irrigation, and slurry lines.

5. Red – electrical power lines, cables, conduit and lighting lines.

6. Yellow – gas, oil, steam, petroleum, or gaseous material lines.

5.0 EXCAVATION

A. Site demolition includes excavation of pavements and other obstruction visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; earth and other materials encountered that are not classified as rock or unauthorized excavation. Verify the definition of "rock", with the Geotechnical Report. Rock should be identified and acknowledged prior to excavation or removal. The process is as follows:

1. Identify and have a written interpretation from the College.

2. Survey the rock prior to disturbing.

3. Remove the rock as required.

4. Re-survey the site.

5. The difference identified is the cubic yards of rock removed that the College may be responsible for.

B. Provide dewatering as necessary to prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area. Water shall not accumulate and pond in excavations, since it will cause softening of foundation bottoms, undercut footings, and cause soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not allow trench excavations to be used as temporary drainage ditches.

D. Provide dust control measures during grading operations.

E. Provide daily street sweeping to clean dirt and debris from adjacent streets and parking lots.

6.0 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dusts. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

7.0 EXISTING UTILITIES

A. Do not interrupt utilities serving facilities occupied by the College or others unless permitted in writing by the College and then only after arranging to provide temporary utility services according to the requirements indicated. See Site Preparation for additional information.

8.0 EROSION CONTROL

A. Protect existing storm drainage structures and pipelines from infiltration of silt and debris.

B. Erosion control shall be monitored in accordance with the guidelines set by the State Water Quality Control Board.

C. Provide Erosion Control Plan, mitigation measures and monitoring as required by the project EIR and LRDP measures.

9.0 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use engineered fill.

3. Under steps and ramps, use engineered fill.

4. Under building slabs, use engineered fill.

5. Under footings and foundations, use engineered fill.

10.0 SOIL MOISTURE CONTENT

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

11.0 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557

12.0 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, line, and elevations indicated.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elvations within the following tolerances:

1. Lawn or unpaved areas: Plus or minus 1 inch

2. Walks: Plus or minus 1 inch

3. Pavements: Plus or minus ½ inch

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10-foot straightedge.

13.0 BASE COURSE

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Shape base course to required crown elevations and cross slope grades.

2. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than percent of maximum dry unit weight according to ASTM D 1557 and as indicated in the Project specific Geotechnical Report.

14.0 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Compace each layer of drainage course to required cross sections and thickness to not less than percent of maximum dry unit weight according to ASTM D 1557 and as indicated in the Project specific Geotechnical Report.

15.0 FIELD QUALITY CONTROL

A. Testing Agency: College will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrades: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by the College's Representative and/or Project Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922 and ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

END OF SECTION

SECTION 02315

EXCAVATION AND FILL

1.0 GENERAL

A. Conform to the Geotechnical Report prepared specifically for the project. Geotechnical Report Recommendations shall take precedence over these standards where it is more restrictive.

B. Single sack slurry may be used in lieu of compacted fill around piping and conduits.

2.0 TRENCHING AND FILL

A. Except where otherwise permitted, sides of trenches shall be vertical, shored, leave in, and shall be uniform width from top to bottom..

B. Place acceptable soil material in layers to require subgrade elevations, for each area classification listed below.

1. In excavations, use satisfactory excavated or borrow material.
2. Under grassed areas, use satisfactory excavated or borrow material.
3. Under walks and pavements, use sub-base material, or excavated or borrow material as recommended by the Geotechnical Report.
4. Sub-base under piping or conduit, shape to fit bottom 90 degrees of cylinder.
5. Under building slabs, use drainage fill material as specified in the project Geotechnical Report.

3.0 BACKFILL AND COMPACTION

A. Backfill excavation promptly, but not until acceptance by College's Representative, include where applicable, waterproofing.

B. Appropriate materials include natural or bank sand that is washed, free of silt, clay, loam, friable or soluble materials and organic matter,

C. Native backfill shall be select material excavated from the trench. Native backfill may be used in place of sand for pipe cover material only. It shall be capable of compaction to at least the relative compaction required. In-place moisture content shall not be more than 5% over optimum when the material is silt or clay and would nor provide a stable subsurface.

D. Provide fill materials in layers not more than 8” in loose depth for material compacted by heavy compaction equipment, and not more than 4” in loose depth for material compacted by hand-operated tampers.

E. Place backfill and fill materials evenly adjacent to structures, piping or conduit. Prevent wedginh action of backfill against structure or displacement of piping or conduit by carring material uniformly around structure, piping or conduit to approximately same elevation in each lift.

F. Backfill the pipe zone with the bedding material as identified by the specific systems contained in this section. Bedding material shall be added to the trench so that it will extend up on the pipe of ½ of its diameter. Additional backfill shall then be installed on the sides of the pipes and tamped to not less than 95 percent compaction to secure full-lenhth bedding and proper pipe wall support. The trench shall then be final graded to provide a secure bedding full length of piping.

G. Before compaction, moisten or aerate each layer to provide optimum moisture content. Compact each layer to require percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy.

H. Native backfill shall be compacted by machine in uniform layers not exceeding 8 inches. Compact to a relative compaction of not less than 95%.

I. The college will test to verify sufficent densities have been achieved. If the first test in any area fails, the Contractor shall pay for any further teating in that area until required densities are obtained. The Geotechnical Engineer shall determine the number and location of tests required. Contractor shall furnish a backhoe and operator upon request at no coat to the College.

4.0 EXECUTION

A. Use native backfill material where proper compaction and a stable surface can be obtained.

B. Trenches shall be converted at the end of each workday.

C. The maximum length of open trench at one time is 600 linear feet.

D. Underpin adjacent structures that may be damaged by excavation work.

E. Maintain trench plate crossings for vehicular and pedistrian traffic at street crossing, driveways and fire hydrants.

F. Maintain uninterrupted flow of storm water into gutters and drainage channels.

G. Prevent surface water run-off into excavation and utility trenches.

H. Bedding Escavation: Excavate trenches below grade of pipe bottom to the following minimum depths:

PIPE TYPE	DEPTH IN INCHES
Cast Iron	6
Ductile Iron	8
Plastic	8
Virified Clay	8
Concrete	4
Welded Steel	6
Corrugated Metal	5
Reinforced Concrete	5

I. Stabilization of Trench Bottom: When trench is unstable due to wet or spongy foundation stabilize trench bottom with gravel or crushed rock. The College will determine suitability of trench bottom and amount of gravel or crushed rock needed to stabilize soft foundation.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION SYSTEMS

1.0 GENERAL

A. The College owns, with very few exemptions, the water distribution piping on campus for domestic, fire suppression (including fire hydrants), and reclaimed systems.

B. The College complies with the Coachella Valley Water District (CVWD) for the design and construction of water and reclaimed water facilities on campus except as modified in this design criteria. Any references to the District's Representative shall mean the College's Respresentative. Inspection will be provided by the College's Representative.

C. The existing water system is provided by the existing well system and storage tank.

D. CVWD water meters are not required for projects on College property provided that the connection is downstream of CVWD's existing meters. The College requires revenue water meters be installed to proportion costs to various end users on campus. Housing water meters can be located outside above ground to serve a group of buildings. Commercial buildings on campus shall be furnished with water meters located inside the mechanical room unless otherwise directed.

2.0 SUBMITTALS

A. Fire hydrant locations shall be approved by the local municipality Fire Marshal and the CVWD. Plans will be submitted with hydrant locations or a meeting with the Fire Marshal shall be as determined by the College's representative.

3.0 DESIGN

A. Residential design flows shall be based on a demand of 130 gallons per capita per day. Design flows for other buildings on campus shall be calculated based on estimated water demands for the proposed project unless otherwise directed. The design requirements used to determine fire flow requirements will be determined based on actual hydrant flow tests. See Section 13900, "Fire Suppression" for additional requirements.

B. Pipe sizes for site utilities shall be based on Campus Master Plan for future construction. Branches for buildings shall be based on hydraulic calculations or other approved engineering method. A minimum 8-inch water service shall serve a fire suppression main. Minimum size for a fire main to a building shall be 6-inches. Fire main shall connect separately to water main in the street and shall not be combined with domestic potable water service to the building unless approved by the local municipality Fire Marshal.

C. Where water lines are run in new streets or service roads, locate the centerline six feet from the face of the curb.

D. The plans shall show, in plan and profile views, the position of other known existing underground utilities as well as proposed underground utilities. Vertical clearance at crossings shall be indicated by showing top of pipe and bottom of pipe elevations at the point of intersection.

E. Fire hydrant requirements on campus include:

   a. Maximum of 300 feet apart.

   b. Locate a minimum of 40 feet away from any structure.

   c. Maximum distance to any/all points of the exterior of a structure shall not exceed 150 feet except for detached one- and two-family dwellings (R-1).

   d. A gate valve shall be placed within six feet on the fire hydrant lateral and shall not be located beneath a parking place or in a location that would prevent access to the valve.

   e. Provide protection from vehicle damage.

   f. Six inch diameter pipe, except for hydrants over 20’-0” from main shall be 8 inch diameter pipe lateral or fire hydrants on the end of a pipe run.

   g. Maximum distance of 100 feet from fire department connection.

F. Renovation or remodel projects involving existing landscape systems which are now connected to the potable water system shall be modified to connect to reclaimed water system.

G. Piping systems which must cross over or under High Temperature Water (HTW) lines shall be protected with rigid conduit, ductile iron pipe, etc., and shall have adequate clearance and/or insulation to prevent damage to pipe or contents from elevated temperatures expected at the crossing. Routing of piping a longer distance is preferred to minimize crossing the HTW pipes.

H. Water service piping connections to existing mains and branch mains shall include saddle taps and service valves. Service valves are to be located at the connection and fully accessible via curb boxes with a triangular iron lid for domestic potable water. Fire hydrant shut-off valves and reclaimed water valves shall have round a triangular iron lid. Fire hydrant valve covers shall be painted red. The service valve shall be submitted for approval before installation.

I. Water meters, pressure reducing stations, or backflow cross connection devices, when provided, shall be located above grade. Location shall be such that these materials are not an unsightly hazard. Coordinate with landscape materials to provide plants to screen these above ground materials withoout blocking OCFA ability to locate the same devices..

J. Valve Arrangements

1. There shall be two control valves at each tee intersection of two distribution mains. If the two distribution mains cross, there shall be three (3) valves and, at major distribution points, there shall be four (4) valves.

2. On long pipe runs, intermediate valves shall be installed so that no more than twenty-eight (28) dwelling units, six hundred (600) feet of main, or five (5) fire hydrants will be out of service at any time. Additional looping of main lines may be necessary to satisfy this condition and the arrangement of valves within the distribution system will be reviewed to identify the optimum network layout.

3. Provide shut-off valves to allow phasing of construction and keep shut-downs to a minimum.

K. Horizontal Separation: State Health Department regulations require a 10-foot minimum horizontal separation between water or reclaimed water and sewer lines. There are special construction methods which may be used where this separation can not be achieved.. Separation other than the State Health Department minimums must be approved.

L. Vertical Separation: Water, sewer, and reclaimed water lines are typically located vertically from the street surface down in order of decreasing quality. Water will be the shallowest and sewer mains will be the deepest. CVWD standard drawings will dictate the clearance requirements for parallel and perpendicular construction of water and sewer lines. Concrete encasement may be required if the clearances can not be achieved.

M. Continuous steel casing of either a water line or a sewer line will also be allowed in accordance with CVWD standards.

N. Pressure reducing stations are required within every building on campus, even if residual pressure is below 80 psi. Pressure reducing station shall only be provided in site piping when directed by the College's Representative.

4.0 PRODUCTS

A. Polyvinyl Chloride (PVC) pipe or ductile iron pipe shall be used for 6-inch through 12-inch domestic water or fire water service piping as specified by CVWD, except only C900 or Class 200 shall be used for PVC pipe. PVC shall only be used below grade. Piping risers and piping above grade shall be ductile iron or stainless steel.

B. Copper piping shall be Type "K" for 4-inch and smaller domestic water piping.

C. Piping for reclaimed water system shall be wrapped with purple tape or be purple PVC ASTM C900, Class 200.

D. In addition to warning tape specified by CVWD, provide #12 insulated solid core copper tracer wire tied to piping for non-metallic piping placed underground. Attach tracer wire to valves and terminate above ground. Show tracer wire termination points on As-Built record drawings. Provide plastic wire ties at 10'-0" on center to secure tracer wire to pipe.

E. Building potable water service installation details shall be modified to delete CVWD water meter and to provide a shut-off valve with valve box at grade near connection to water main.

F. Fire hydrants on campus are considered "public" type and shall have a minimum of two 4" outlets and one 2½" outlet. Paint hydrants with two coats of safety yellow.

G. Fire hydrants shall be James Jones Company, all brass construction, or approved equal.

H. Cross connection devices on campus are only required at the connection of the the fire protection main for sprinkler fire suppression or standpipe systems. Double check backflow assembly shall be installed above grade only. Siamese fire department connection preferred location is to at the detector check backflow assembly. Provide a check valve in the pipe to the fire department connection. By-pass meter shall read in cubic feet per minute.

1. There shall be two control valves at each tee intersection of two distributions.

2. Double check backflow assembly acceptable manufacturers shall be as listed in Section 15140, "Domestic Water Piping." Assembly shall be complete with two OS&Y valves, fusion epoxy coated and listed for fire suppression service.

3. Check valve shall be UL listed for fire suppression service.

4. OS&Y valves shall have break locks or locks that are specified by the OCFA. Two sets of keys shall be given to the College's Representative prior to Substantial Completion.

I. Thrusts blocks shall be per CVWD or as a contractor option; mechanical joint restraint may be used for ductile iron pipe and PVC pipe, EBAA Iron Sales, Inc. Megalug and 2000PV Series. Where pipes are capped for future extension, use mechanical joint in lieu of concrete thrust block.

J. Thrusts blocks shall be per CVWD or as a contractor option; mechanical joint

K. Other materials must be submitted for approval as a substitution.

5.0 EXECUTION

A. Landscape water systems shall only be connected to existing reclaimed water systems and not potable domestic water mains.

B. Installation of backflow assemblies shall not be considered complete until tested by a certified tester. Provide 5-foot clearance on each side around backflow cross connection devices.

C. Lay piping on a bed of the sand, at least 6 inches thick, on firm undisturbed earth. Remove loose rock, clods, and debris from the trench before placing bedding sand and before laying any pipe.

D. Lay piping on a bed of the sand, at least 6 inches thick, on firm undisturbed earth

E. Piping may be tested in sections. Testing shall be done before a final connection to existing utility piping is made, with the provision that subsequent leaks, if developed, shall be corrected. Any part of the system, including all accessories, that fail during testing shall immediately be repaired or replaced with new materials. The system shall be completely re-tested after repair or replacement. This procedure shall be repeated until all parts of the system pass the tests.

F. Ductile iron or copper pipe shall be installed within 5' of the building and under all footings and slabs. Vertical piping and pipes above grade shall be ductile iron or copper.

G. Underground mains shall be flushed at maximum flow during non-peak campus usage time.

H. Fire main and water mains serving fire suppression risers and fire hydrant piping shall be pressure tested and flushed before backfilling according to the procedures set forth in NFPA 24. The Campus Fire Marshal shall witness an inspection of underground installation, back flush, and hydrostatic test. Hydrostatic testing shall be made with before joints are covered. Backfill between joints before testing to prevent movement of piping.

I. Domestic potable water piping shall be disinfected in accordance with AWWA standard C651.

J. Minimum cover of water piping shall be:

Mains in paved areas	42 inches
Mains in unpaved areas	48 inches
Laterals to fire hydrants	48 inches
Laterals 4 inches and smaller to buildings	30 inches
Laterals 6 inches and larger to buildings	36 inches

K. Main line valves shall be accessible during construction, and valve stem tops having over 48-inches of cover shall be provided with extension as per CVWD standards.

L. Fire hydrants shall be set with the bottom flange of breakaway spool 6-inches above the concrete pad or sidewalk and shall be located a minimum of 2.5 feet and maximum of 3.0 feet from curb. Hydrants shall be minimum of 40 ft. from structure. Breakaway bolts in base of hydrant shall face up and be sealed with silicon.

M. Provide blue reflective "Botts" dot in street to indicate fire hydrant location.

N. One of the fire hydrants 4" ports shall face the emergency access roadway.

O. No taps or other connections shall be made to existing water mains prior to conducting an approved pressure test on the new water distribution system. Tapping sleeves shall be pressure tested in an approved manner in the field, in the presence of the inspector, prior to tapping the main line. Tapping of the main line shall not proceed unless the inspector is present.

P. Curbs shall be inscribed with a "W" indicating locations of domestic water services.

Q. Curbs shall be inscribed with tie downs for valve locations.

R. Expose connection point to the existing domestic water system for verification of horizontal and vertical location before starting construction of new piping.

S. Only under emergency circumstances shall a contractor shutdown or interrupt existing lines or utilities. College Facilities Management personnel will perform shutdowns and close the appropriate valves to isolate the area of work. Schedule outages for utility tie-in work in advance and state the maximum duration of shutdown. Operation of the central plant governs. The construction schedule may have to be adjusted to perform work during off-hours.

T. Temporary blow-off assemblies shall be installed at the end of all mains and large service stub-outs for testing and flushing purpose.

U. Air and vacuum relief valves shall be installed at all high points of water mains 10-inches and larger.

V. Water mains to be constructed in landscape slopes shall be constructed with ductile iron pipe (DIP), Class 50, and shall have slope anchors in accordance with CVWD standards. Thrust blocks will also be required at the angle points at both top and bottom of the slope.

W. Maintain minimum 10 foot separation between PVC piping and High Temperature Water (HTW) supply and return piping.

END OF SECTION

SECTION 02530

SANITARY SEWERAGE SYSTEMS

1.0 GENERAL

A. Sanitary sewers shall connect to College owned piping system under campus streets or on campus property. The College's sewer system extends off campus and connects to Coachella Valley Water District (CVWD) system. Installation shall conform to CVWD standards except as modified in this Design Criteria.

B. New buildings shall not be built over any existing sanitary sewer piping unless the piping has been changed to cast iron pipe and fittings.

C. The College will not accept sewer mains smaller than 6-inches in diameter. Sewer mains shall not be constructed in a common trench with a dry utility. Adequate horizontal and vertical spacing shall be maintained in accordance with CVWD standards

2.0 MINIMUM AND MAXIMUM SLOPE

A. Sewer mains shall be designed and constructed to provide a mean velocity of not less than two (2) feet per second (fps) when flowing half-full at the estimated peak flow as calculated using Manning's formula with an "n" value of 0.013. The maximum allowable slope shall be the slope that generates a maximum flow velocity of 8 fps at the peak flow rate as calculated using Manning's equation and an "n" value of 0.013. Peaking factors shall be per Figure 1.

Minimum design of slopes by pipe size:

SEWER SIZE	SLOPE AT:
6	0.0100
8	0.0080
10	0.0055
12	0.0040
15	0.0030
18	0.0020
21	0.0015

1. These are minimum design slopes. Sewers should be designed to provide steeper slopes whenever possible up to the stated maximum slope. Under special conditions, the Engineer may request slopes of less than the minimums stated. The Engineer must submit this request along with back-

up data and calculations to show that the depth of flow at design average flow will be 0.3 of the pipe diameter or greater. The Engineer must also submit computations to show the depths of flow at minimum and average rates of flow. The request shall also detail the reasons why the normal minimum slopes cannot be achieved. The College's Representative shall review the request and supporting data and convey back to the Engineer the design slope to be used.

3.0 FLOW DESIGN CRITERIA

A. The flow rate for residential sewer mains shall be calculated using a base generation rate of 80 gallons per capita per day (gpcpd) and the density and peaking factors per CVWD criteria. Calculate commercial/industrial flow design criteria based on projected generation rates for the specific project.

B. The design peak flow rate in pipes 12-inches and smaller will be limited by the depth ratio of d/D = 0.5; 15" pipes d/D = 0.67 and 18-inches and larger d/D = 0.75, where "d/D" is the ratio of calculated flow depth to pipe diameter.

4.0 STANDARD LOCATION AND ALIGNMENT

A. New sanitary sewer mains that will be under a street are to be located six (6) feet from the centerline of the street in the center of the driving lane. Streets with center median strip shall have the sewer mains located in the center of the driving lane nearest to the center of the street, but shall not be located in the median strip or parking lanes.

B. On curved streets and service roads, sewer mains shall be parallel with the centerline of the street by use of horizontal curves for the alignment.

C. A maximum horizontal separation between sewer and domestic water mains shall be achieved by aligning the sewer on the opposite side of the centerline from the domestic water main.

D. The following minimum radii will be used in the design of horizontal curves:

POLYVINYL CHLORIDE PIPE (PVC)

Pipe Size	6″	8″	10″	12″
Min R	210′	280′	350′	420′

E. Stationing Procedure: Centerline stations for sewer mains shall be shown and will be independent of street stationing. Manholes are to be numbered and the numbers noted on the plans (example: MH #1). Sewer start shall be 00+00.00 at the downstream point of connection and increases upstream to the last manhole on a sewer line. Intersecting sewer lines will be independently stationed from their downstream point of connection and increase upstream to the last manhole or clean out. Each line shall be independently labeled for identification as "Sewer Line A", "Sewer Line B", etc.

F. Minimum Depth: Minimum depth of cover from finish street grade to the top of sewer main pipe shall be seven (7) feet unless otherwise approved by the College. Minimum depth of lateral to building shall be six (6) feet and shall slope at minimum of 2% or ¼″ per foot.

G. A manhole will be required at:

1. The end of each line, change in grade or size, change in alignment, or intersection of two or more mains.

2. Along the main at maximum distances of 300 feet.

H. Manhole Type and Size:

1. Manholes shall be precast reinforced concrete with eccentric cone in accordance with CVWD standards. Minimum diameter shall be 48-inches and larger sizes may be required as shown in the following table:

MANHOLE SIZES

SEWER MAIN (INCHES)	MAXIMUM BRANCH SIZE (INCHES)	MH. SIZE (INCHES)	FRAME AND COVER (INCHES)
8-15″	10″	48″	30″
18-24″	12″	60″	30″
24-36″	15″	72″	36″

EXTRA DEPTH MANHOLE SIZE REQUIREMENTS

DEPTH OF COVER (FEET)	MH. SIZE (INCHES)
0-15	48
15.5-22	60
22.5 and greater	72

I. Manhole Covers:

1. Manhole covers shall be cast-iron in accordance with CVWD standards. Temporary covers may be necessary in new streets. In these cases, the manhole shaft shall be left six (6) inches, minimum, below subgrade. A heavy metal plate acceptable to the College's Inspector shall be provided to cover the manhole opening. Cleats shall be provided in at least four (4) points for the underside of the temporary cover to prevent the temporary cover from moving. These cleats shall extend a minimum of 3-inches from the cover plate and shall be welded to the plate.

2. Plywood shall be cut to the shape and size of the manhole base and placed in the base before the temporary cover is placed on the shaft. At the completion of final paving, the installation of grade rings, as necessary, and the installation of the permanent frame and cover assembly shall raise each manhole to final grade.

J. T-Lock Lined Manholes

1. Manholes can have substantial deterioration due to hydrogen sulfide gasses released from the sewage flow. In order to mitigate the problem, the following criteria have been established to govern the requirement to line manholes with a PVC T-Lock liner:

   a. If the sewer has a slope of 7% or greater, all the manholes will be lined with T-Lock.

   b. Where there is a change in slope from steep to flat, of 5% or greater, the manhole at the grade change and the next manhole upstream will be lined with T-Lock.

K. Cleanouts:

1. Use of clean-outs as shown on CVWD Standard Drawing S-9 shall be limited to the following instances unless approved by the College.

   a. Short sections of sewer main, less than 250-feet, that will be extended in the future.

   b. At the end of a sewer main where the distance to the next downstream manhole is not more than 300 feet.

   c. Commercial and industrial-type building's sewer lateral installations at the assumed property line.

   d. Between manholes, if there is a reverse curve in the sewer main, to facilitate cleaning of the main line.

   e. Special instances such as on a sewer lateral where the dwelling unit is set back more than 100-feet from the assumed property line, or where there is a large slope up to the building pad from the property line, and a grade change in the lateral is necessary.

   f. On a lateral where the overflow level of the lowest wastewater fixture in the building is below the rim elevation of the uphill sewer manhole on the main line. In this situation, the rim elevation of the clean-out installed at the assumed property line shall be at least 6-inches below the overflow elevation of the lowest wastewater fixture on the lateral.

L. Force Main Criteria: The size of sewer force mains shall be determined during the design phase of the project and only after a comparative study of the construction cost and pumping costs for several alternative sizes. In no case shall a force main be less than 6-inches in diameter. The capacity of the force main shall be the design peak flow from the pump station calculated from Manning's equation using "n" = 0.013. The nominal design velocity for a force main shall be 3.0 fps, with minimum velocity of 2.0 fps, and maximum allowed 6.0 fps. The discharge shall be into a manhole with a smooth flow transition to a gravity sewer. The manhole shall be epoxy coated on the interior or PVC lined.

M. Separation Between Sewer and Water and Reclaimed Water Line: Horizontal and vertical separation between sewer mains and water and reclaimed water lines will be provided in accordance with CVWD standards.

N. Sewer laterals shall be constructed from the main line and to each individual building. Sewer laterals shall have a minimum six (6)-inch diameter. Housing projects shall have at least one 6-inch lateral to serve each building in the project that contains more than one dwelling unit. .

5.0 PRODUCTS

A. Pipes and Fittings

1. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D 3033, type PSP, ASTM D 3034, type PSM, SDR 35.

2. Fittings: PVC, Elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.

3. Sewer force mains shall be PVC pipe meeting AWWA C-900 and Class 150 pipe standards.

B. Sanitary Sewer Manholes

1. Provide pre-cast reinforced concrete sanitary manholes, complying with CVWD standards. Manhole covers shall be labeled "COD SEWER".

2. Provide rubber joint gasket complying with ASTM C 443 at joints.

C. Clean-Outs

1. Provide pipe extension to grade with ferrule and countersunk clean out plug. Provide a round cast-iron access frame over clean-out, with heavy duty secured scoriated cover with lifting device.

2. Provide at each exit from the building a two-way clean out using Tyler fitting No. 010647 or 010654 for 3 and 4 inch pipe with two clean-out plugs at grade. Use fittings to make up a similar two-way clean out arrangement for 6 inch and larger pipe sizes.

D. Identification: In addition to warning tape above buried piping, provide a #12 insulated solid core copper tracer wire tied to piping for non-metallic piping placed underground that could not be located based on manhole locations. Attach tracer wire to clean-outs and terminate above ground. Show tracer wire termination points on As-Built drawings. Secure tracer with plastic ties at 10′-0″ in center.

E. Alternate materials shall be submitted as a substitution.

6.0 EXECUTION

A. Installation

1. Inspect piping before installation to detect apparent defects. Mark defective materials with paint and promptly remove from site.

2. Manhole spacing to be limited to 300 lineal feet maximum.

3. Expose connection point to the existing sewer system for verification of location and elevation before installation of any new piping.

4. Trench backfill shall be compacted to 90% relative density as determined by the five-layer test method (California 216G). Tests will be required every 300-feet of trench. Submit written results of compaction testing. If in dedicated street or future street, compaction will be no less than 90% relative compaction and be tested every 50 feet of trench. In all cases, the upper 18 inches of backfill under vehicular pavements shall be compacted to no less than 95% relative compaction.

5. Maintain minimum 10 foot separation between PVC piping and High Temperature Water (HTW) supply and return piping.

6. Make joints between different types of pipe materials with standard manufactured adapters and fittings intended for that purpose.

B. Tap Connections

1. Use commercially manufactured wyes for branch connections. Field cutting into piping main will be permitted for connection to mains two pipe sizes larger than branch.

2. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3,000 psi, 28-day compressive strength concrete.

3. For branch connections from side into existing underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection through pipe or structure wall to conform to shape of, and be flush with, inside wall. On outside of pipe or structure wall, encase entering connection in 6" of concrete for a minimum length of 12" to provide additional support or collar from connection to undisturbed ground. Provide 3,000-psi concrete.

4. Use epoxy-bonding compound as interface between new and existing piping materials.

5. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure. Remove debris, concrete, or other extraneous material that may accumulate.

C. Cleaning Piping

1. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

2. In large, accessible piping, brushes and brooms may be used for cleaning.

3. Place plugs in ends of uncompleted piping at end whenever work stops.

4. Flush lines between manholes to remove collected debris.

D. Interior Inspection

1. Inspect piping to determine whether line displacement or other damage has occurred. Make inspections after lines have been installed between manholes, or manhole locations, and approximately 2-ft of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and re-inspect.

E. Test the sewer collection system and lateral sewers.

1. Infiltration and air testing of sewer lines shall be in accordance with the CVWD's standards.

2. Sewer lines shall be balled in the presence of the Inspector before completion of leakage tests.

3. Pipeline leakage tests shall be made in the presence of the Inspector, only after backfill has been completed, compaction tests on backfill have been made, and the Inspector has accepted the backfill.

4. Sewer lines are to be inspected by the College using a closed circuit television system. A video tape recording may be made of the inspection. Any defects will be corrected at no additional cost to the College.

F. Curbs shall be inscribed with an "S" indicating locations of all sewer laterals.

G. Curbs shall be inscribed with ties for manhole locations.

END SECTION

SECTION 02620

SUBDRAINAGE

1.0 GENERAL

A. Subsurface drainage shall be provided for every sub-grade wall and retaining walls on campus. Subsurface drains shall slope by natural grade to storm drain system if possible. If gravity drainage is not possible, provide a sump pump and pit to pump drainage water into storm drain. Sump pumps shall be as specified in Division 15, Plumbing section.

2.0 PRODUCTS

A. Subsurface drainage piping (four-inch pipe size) shall be perforated polyvinyl chloride (PVC) piping conforming to ASTM D 2729, wall thickness 0.075 inches. Use non-perforated fittings of the same material and strength. Piping and fittings for piping connecting subdrainage system to storm drain system shall be as required for storm drain piping.

3.0 EXECUTION

A. Installation of Pipelines

1. Inspect each pipe and fitting before and after installation; remove those that are found defective from site and replace with new. Provide proper facilities for lowering sections of pipe into trenches.

2. The laying of pipe shall proceed upgrade from the lower end of the line, and shall have a uniform pitch to the outlets. Lay perforated pipe without filling the pipe joints, but with positive provision for centering each section of pipe in the bell or groove of the placed section. Provide vertical pipe at the high points in each drain run, for testing and clean out purposes. Connect the vertical pipe sections into the drains by means of tees, and extend to grade. Fit the upper hub ends with screwed plugs.

B. Connections to Existing Lines: Notify College's Representative in writing at least 14 days prior to connection that is to be made. Obtain approval before interrupting service. Conduct work so that there is minimum interruption of service on existing line.

C. Maintain minimum 10 foot separation between PVC piping and High Temperature Water (HTW) supply and return piping.

END OF SECTION

SECTION 02630

STORM DRAINAGE

1.0 GENERAL

A. Storm drainage system on the campus shall drain through piping and open channels for final dispersion into the Coachella Valley Water District (CVWD) system.

B. Underground storm drain systems shall be provided for:

1. When flooding or street overflow will cause serious damage to College buildings or property, and to insure building protection for the 100-year storm.

2. When future upstream development will cause drainage problems.

3. When a minimum of one through street lane in each direction cannot be maintained above the theoretical design storm frequency.

4. To eliminate the need for cross gutters.

5. To eliminate nuisance water surface flow, maximum spacing between catch basins shall be 400 feet, except in residential areas spacing shall be 300 feet.

2.0 DESIGN

A. Drainage design requirements shall be in accordance with the latest CVWD standards

B. Design calculations and flow maps for each contributory area shall be submitted with the plans.

C. Drainage systems shall be designed along with site grading to insure building pads are a minimum of one-foot above the elevation of the theoretical 100-year storm flow.

D. During design, consider storm runoff from areas surrounding the site, in addition to storm runoff from the project building and site. Prepare calculations to support design.

E. Storm drain systems must be designed with sufficient cover so that the water mains and service laterals can be built over the top of the storm drain mainline and laterals.

F. Sulfate resistance is required for concrete pipe when pipe is carrying sulfate-bearing waters, or when pipe is buried in soil containing sulfates. Specify Type II (moderate sulfate resisting) cement when water-soluble sulfates (as SO_4) in the soil are in the range of 0.1 to 0.2 percent and, for water, are in the range of 150 to 1,000 parts per million. Specify Type V (sulfate resisting) cement when soils contain in excess of 0.2 percent water-soluble sulfate and water samples contain in excess of 1,000 parts per million. In areas where reactive aggregates are known to occur, specify low alkali cement pipe

G. New buildings shall not be built over any existing storm drainage piping unless the piping has been changed to cast iron pipe and fittings or alternately protected.

3.0 HYDROLOGY

A. Criteria used for hydrology studies shall be based on CVWD standards. The 25-year design frequency shall be used for sump conditions and storm drains downstream of sump conditions.

D. The hydrology map shall be on a topographic map of sufficient scale to show legible elevations, drainage patterns and quantities of runoff.

E. The site must be shown on the hydrology map including on-site and off-site topography showing the entire tributary drainage area.

F. Show Q's (with time of concentration) flowing in the streets. Designate Q100, and Q25. If one side of a street carries more Q than the other side, show it.

G. Show cross-over Q's and where they occur.

H. Show street flow confluences and their calculations.

I. Show Q's approaching entering, and carried over from catch basins.

J. Identify catch basins by numbers or letters.

K. Show and verify with legible contours or other adequate means, Q's entering the project. If previous studies were used, reference them.

L. Show Q's leaving the project.

M. Show north arrow and scale.

N. Show names or some other designation for streets in and around the project.

O. Show name and telephone number of the Engineer who performed the hydrology study.

P. If the project contains more than one soil group (A, B, C or D), delineate each group.

Q. The drainage areas shall close and the acreage shall be shown. Areas should close at points of confluence and at pickup points.

R. Off-site drainage areas must be shown with a reasonable analysis of the interim and ultimate Q's from those areas. Include the necessary supporting calculations or reference a previous acceptable study, which is either already on file or will be supplied with the submittal.

S. Initial areas should be limited to 10 acres with a maximum flow path of 330 feet.

T. Show Flood Hazard Zone designations, map panel number and effective date in accordance with Flood Insurance Rate Maps (FIRM) published by FEMA.

4.0 HYDROLOGY CALCULATIONS

A. Software shall be AES or equal and previously approved for use by the College for Hydrology Calculations. Non-computer generated hydrology calculations must be in accordance with the CVWD standards using Q25 for the calculations.

5.0 HYDRAULICS

A. Hydraulic Design Criteria shall be as stated in the CVWD standards.

B. Grate type catch basins shall not be allowed on streets.

C. Parkway culverts are discouraged and shall not be used without approval from the College.

6.0 PLAN PREPARATION

A. Storm Drains - Show the 100-year and 25-year hydraulic grade line plots, as appropriate, water surface elevations, top of curb elevation at catch basins, and include hydraulic elements: Q's Vn, slopes, pipe size, flow line elevations and pertinent stationing.

B. Catch Basins - Show sizes including L and H of opening and height of catch basin. Show type.

7.0 DESIGN CRITERIA

A. Pipes

1. D-loads shall be in conformance with the CVWD standards.

2. A bedding detail is required for each type of pipe proposed.

3. Use of factor of n = 0.013 for RCP and cast-in-place pipe (CIPP).

4. Concrete collars shall be used as required by the CVWD.

5. A minimum radius of 22½ feet shall be used for any horizontal bend.

6. Slope anchors shall be provided at each ten foot change in elevation when the slope exceeds 33%.

7. Asbestos Cement Pipe (ACP) shall not be used. ACP has been installed on some past College projects.

8. Thick wall RCP with 1½" minimum cover inside shall be used when velocity exceeds 20 feet per second. Maximum velocity shall not exceed 45 feet per second.

9. Minimum slope of a pipe shall be 0.001 (0.1%).

10. CIPP may be used as an alternate. Accompanying soils report must confirm adaptability of soils to cast-in-place construction. Construction of the CIPP shall conform to the provisions of the ACI Standard 346 and Title No. 66-22. Trench to accept CIPP shall be dug in undisturbed soil, and continuous inspection by the College will be required. Prior to the acceptance of any CIPP storm drain, and in-place loading test may be required at the discretion of the College. Such test shall be in conformance with Section 9.4 of the above-referenced ACI Standard 346 and performed solely at the expense of the Contractor. Open PCC Lined Channels:

12. Structural calculations will be required.

13. Structural details shall be shown on the plans.

B. Manholes are required at the following locations:

1. Beginning or ending or curves.

2. Pipe size changes.

3. Angle points and as required at junctions.

4. Maximum 500 feet intervals (300 feet maximum for pipe less than 24" diameter).

C. Manholes shall be restricted to, in order of preference:

1. Grade areas

2. Parking lane

3. Service road

4. Street

5. Center of travel lane nearest right curb

6. Center of travel lane to the left of the travel lane nearest right curb

D. Abandonment of Underground Facilities:

1. If existing culverts, pipes, or other facilities are abandoned or removed, provisions must be made for drainage.

2. If facilities are abandoned, it will be necessary to either backfill with sand or cement slurry and seal the ends with brick and mortar or crush in place. Treatment of abandoned facilities will be as directed by the College.

E. Surface Drainage Transitions:

1. If it is necessary to grade to drain, the grade on the ditch shall be shown on the plan.

2. The length of ditch construction shall be shown on the plan.

3. Keep mud and debris out of drainage by grading around improvements.

4. Provide AC swales or aprons to protect improvements.

5. The need for grading 50 feet to 100 feet upstream from proposed improvements must be checked.

6. Insure ponding does not occur upstream.

7. Insure water quality and erosion control. File Notice of Intent (NOI) with the State Water Resources Control Board for construction involving five (5) or more acres to comply with NPDES Construction Permit requirements.

8.0 PRODUCTS

A. Pipeline and Culvert Materials

1. Cast-Iron Soil Piping and Fittings: ASTM A 74, service-weight. Jointing materials for cast-iron soil piping shall be compression-type rubber gaskets conforming to ASTM C 564.

2. Clay Pipe and Fittings shall only be used when connecting to existing clay pipe. Clay pipe shall conform to ASTM C 700, standard strength, except pipe under roadways shall be extra strength, bell-and-spigot piping only. Jointing materials for clay piping shall conform to ASTM C 425.

B. Concrete Pipe and Fittings:

1. For pipe culverts, non-reinforced pipe may be used in sizes 12 to 24 inches in diameter, inclusive, provided that the pipe meets applicable requirements for reinforced concrete pipe of equal diameter and under the same conditions of loading.

2. Storm drainage pipe shall be non-reinforced concrete pipe conforming to ASTM C 14, reinforced concrete pipe conforming to ASTM C 76. Culvert pipe shall be non-reinforced pipe conforming to ASTM C 14, reinforced pipe conforming to ASTM C 76, reinforced concrete arch culverts conforming to ASTM C 506, reinforced concrete elliptical culverts conforming to ASTM C 507. Class of concrete shall be based on geotechnical evaluation. Circular pipe with elliptical reinforcement shall have a readily visible line no less than 12 inches long. Line shall be painted or otherwise applied on the inside and outside of the pipe at each end so that when the pipe is laid in the proper position, the line will be at the center of the top of the pipe. Fittings and specials shall conform to the applicable requirements for the pipe and shall be of the same strength as the pipe. Cement used in manufacturing pipe and fittings shall be type conforming to class of concrete conforming to ASTM C 150.

3. Jointing Materials for Concrete Piping: Gaskets and pipe ends for rubber gasket joint shall conform to ASTM C 443. Provide primers and lubricants as recommended by the manufacturer. Concrete pipe joints shall be suitable for use with joint sealant.

C. ABS Composite Plastic Pipe and Fittings: Acrylonitrile-Butadiene Styrene (ABS) or Poly (Vinyl Chloride) (PVC) composite pipe and fittings, ASTM D 2680. Jointing Materials for ABS Composite Plastic Piping: ASTM D 2680 solvent cement and primer or ASTM D 3212 elastomeric gasket joints. Ends of pipe and fittings shall be suitable for either Type SC or Type OR joints.

D. PVC Plastic Pipe and Fittings: ASTM D 3034, shall be SDR 35, having ends adaptable for elastomeric gasket joints. Joints and Jointing Material for PVC Plastic Piping shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

E. Corrugated Plastic Piping shall be high density polyethylene pipe (HDPE) conforming to AASHTO M294, Type S for 12” to 36” pipe size and AASHTO MP6-95, Type S for 42” and 48” pipe size. Pipes shall be joined with a bell and spigot joint. The bell shall be an integral part of the pipe. Inside surface of pipe shall be smooth. The joint shall use a gasket to form a silt-tight connection. The pipe manufacturer shall install gaskets in the bell. Joint shall remain silt-tight when subjected to a 1.5-foot axial misalignment. Fabricated fittings shall be welded on the interior and exterior at each junction.

F. Storm Sewer Manholes: Provide precast reinforced concrete storm sewer manholes complying with City of Irvine standards.

G. Warning Tape and Tracer Wire: Underground-Type Plastic Conductive Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct burial service, not less than 6" wide x 4 mils thick. Provide green tape with black printing reading, “CAUTION STORM LINE BURIED BELOW.”

H. Provide in addition to warning tape, a #12 insulated solid core copper tracer wire installed parallel to piping for non-metallic piping placed underground. Attach tracer wire to clean outs and terminate above ground. Show tracer wire termination points on As-Built drawings.

I. Grates shall be cast iron and designed and located for bicycle safety and access compliance. Maximum space between grates shall be ½ inch wide in one direction. If grating have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

9.0 EXECUTION

A. Installation

1. Install pipe and fittings in accordance with the recommendations of the pipe manufacturer and as noted below.

2. Installation of Cast-Iron Soil Piping: Make joints with the rubber gaskets made specifically for this piping. Assemble in accordance with the recommendations of the pipe manufacturer.

3. Installation of Clay Piping: Install pipe and fittings in accordance with the requirements of ASTM C 12 for pipe laying. Make joints with a compression joint material specifically made for this piping and assemble in accordance with the recommendations of the manufacturer of the pipe.

4. Installation of Concrete Piping: Install pipe and fittings in accordance with the provisions for rubber gasket jointing and jointing procedures of ACPA 01-103 or of ACPA 01-102, Chapter 9. Make joints with gaskets. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe. Protect gaskets from sun, blowing dust, and other deleterious agents. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets. Align each pipe section with the previously installed pipe section, and pull the joint together. If, while pulling the joint, the gasket becomes loose and can be seen through the exterior joint recess when the pipe is pulled up to within one inch of closure, remove the pipe and remake the joint.

5. Installation of ABS or PVC Composite Plastic Piping: Install pipe and fittings in accordance with the recommendations of the plastic pipe manufacturer. Make joints with the primer and solvent cement; assemble in accordance with the recommendations of the pipe manufacturer. Handle solvent cement in accordance with ASTM F 402.

6. Installation of PVC Plastic Piping: Install pipe and fittings in accordance with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with a gasket; assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

7. Installation of Corrugated Plastic Piping: Install pipe and fittings in accordance with the recommendations of the HDPE pipe manufacturer.

B. Manhole, Curb Inlet, and Catch Basin Construction - Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent drainage sections. For changes in direction of drains and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. For precast concrete construction, make joints between sections with gaskets made for installing joints in concrete piping. Give a smooth finish to the inside joints of precast concrete manholes, curb inlets, and catch basins. Make joints between concrete manholes and pipes entering manholes with the resilient connectors or mortared to produce a watertight joint; install in accordance with the recommendations of the connector manufacturer

C. Metal Work: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron and steel to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blowholes that may impair their strength or appearance. Give exposed surfaces a smooth finish. Clean surfaces of steel frames and covers to bare metal by a blasting process. Where surfaces cannot be cleaned satisfactorily by blasting, clean to bare metal by wire brushing or other mechanical means. For surfaces contaminated with rust, dirt, oil, grease, or other contaminants, wash with solvents until thoroughly clean. Immediately after cleaning, coat surfaces with a pretreatment coating. If primed surfaces are damaged before removal from the shop, retouch with primer.

D. Field Painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in masonry or concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. After installation, clean steel covers and steel or concrete frames not buried in masonry or concrete to bare metal of mortar, dirt, grease, and other deleterious materials. Apply a coat of primer and apply a topcoat, color optional. Do not paint surfaces subject to abrasion.

E. Field Tests and Inspections: The College's representative will conduct field inspections and witness field tests. Perform field tests and provide labor, equipment, and incidentals required for testing.

F. Pipeline Testing: Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show nearly a full circle of light through the pipeline when viewed from the adjoining end of line. The College may use closed circuit television to find any defects that require correction.

G. Cleaning Piping: (see Sanitary Sewage Section)

H. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

I. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred. Make inspections of lines between manholes, after approximately 2' of backfill is in place, and again at completion of project. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.

J. Tap Connections

1. Make connections of existing piping and underground structures per CVWD junction details. Finish work will conform as nearly as practicable to requirements for new work.

2. Use commercially manufactured wyes for branch connections. Field cutting into piping will not be permitted. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3000 psi 28 day compressive strength concrete.

3. For branch connections from side into existing 24" or larger piping, or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection passing through pipe or structure wall to conform to shape and be flush with inside wall, unless otherwise indicated. On outside of pipe structure wall, encase entering connection in 6" of concrete for minimum length of 12" to provide additional support or collar from connection to undisturbed ground.

4. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

5. Maintain minimum 10 foot separation between PVC piping and High Temperature Water (HTW) supply and return piping.

END OF SECTION

SECTION 02768

DECORATIVE CONCRETE PAVEMENT

1.0 GENERAL

A. General Requirements:

1. Field Conditions: Verify drawings dimensions with actual field conditions. Inspect related work and adjacent surfaces.

2. This section supplements Section 02751 – Concrete Pavement.

3. Finish all surfaces to present a uniform appearance throughout the area involved, and throughout adjacent areas with the same treatment.

4. Where finishing occurs adjacent to finished metal or other finished surfaces, particularly where serrated or indented, remove all traces of cement film before it hardens. This applies particularly to stair nosings and similar items.

B. Samples: Submit duplicate 12 inch square samples of proposed finishes requested by the Architect. Finish work shall match samples as approved by Architect.

C. Field-Constructed Mockup: Cast 6 foot square mockup of each concrete type scheduled to demonstrate typical joints, surface finish, texture, color, and standard of workmanship. Provide control joint and expansion joint in each mockup.

1. Building mockup in the location and the size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Obtain Architect's approval of mockups before starting construction.

4. If Architect determines that mockup does not meet requirements, demolish and remove it from the site and cast another until the mockup is accepted.

5. Keep approved mockup undisturbed during construction as a standard for judging completed pavement.

2.0 PRODUCTS

A. Portland Cement: Refer to Section 02751 – Concrete Pavement

B. Aggregates: Refer to Section 02751 – Concrete Pavement

C. Water: Refer to Section 02751 – Concrete Pavement

D. Concrete Surface Retarder: Water-soluble, liquid set retarder with color dye, capable of temporary delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

E. Curing and Protection Paper: Use an approved product conforming to ASTM C171 standards.

F. Color and Hardeners: The coloring material shall conform to ASTM C979 standard for color stability.

G. Divider Strips Embedded in Concrete Finish: One piece extruded zinc alloy strips of the correct type and size, required by manufacturer.

H. Slip Resistant Additives: Only uniform slip-resistant concrete finishes, such as broomed, swirl, lightly sandblasted, or slip-resistant imprinted textures shall be applied. A floor hardener that produces dense, hard surfaces which improves slip resistance shall be applied.

I. Curing and Hardening Compound: Refer to Section 02751 – Concrete Pavement

J. Expansion Joints: Refer to Section 02751 – Concrete Pavement

3.0 EXECUTION

A. Floating: Bring slabs to proper level, using screeds and strikeoff with a straightedge. Remove excess water and laitance. Compact by rolling with weighted rollers and by tamping with grid tampers. Float with power rotary floating machine. Thoroughly hand tamp areas not accessible for rolling. Float areas not accessible for power floating by hand, using a wood float. Test surface with a 10' straightedge, and eliminate high and low spots of 1/8" or more. Cumulative tolerances are not allowed.

1. Screeds: Of such type and construction, and so spaced and located as to provide surface tolerances specified. Use continuous screeds to provide

surface over which to drag straightedges. Refer to Section 02751 – Concrete Pavement for requirements that apply to this work.

B. Metal Divider Strips: Where concrete floors finish against other materials, set combination screed and divider strip, secured in place and protected by shores until concrete on opposite side is installed. Insure that top of screed is at the exact required relationship with the top of the two finished surfaces to finish flush.

C. Embedded Items: Set items as exact required elevations, level and in proper relationship to other work. Where items have a drainage function, insure that slabs slope to them properly. Adjust finish work to properly connect and fit to other work.

D. Defective Finishing: Finish which is not true to line and plane, which is not thoroughly troweled and properly surfaced as required, which varies in excess of requirements along a 10' straightedge, which scuffs or has a rough top surface (except where required), which does not connect properly to adjoining work, which does not slope to drains, which does not match approved samples, or is not properly cured, will be deemed defective. Remove and replace with proper work and material conforming with contract requirements, and to limits directed by the Architect.

E. Protection: Protect all finished work from damage by impact or from building rubbish. Protect work of others from damage by this work. Protect exposed slabs and slabs which receive applied coatings from soiling from foot traffic and subsequent work performed after finishing; use protective paper cover hereinbefore specified.

F. Markings: At expansion joints and elsewhere as indicated on the drawings, provide markings with a rounded edging or marking tool to a 1/4" radius. In textured work, edge and mark with a combination edging and smoothing tool approximately 1-1/2" wide.

1. Where so indicated, or where required tooled markings may have been inadvertently omitted, provide markings cut into surface of cured concrete with a diamond abrasive saw. Properly coordinate this work with the work of other trades in order to avoid damage to adjacent surfaces. Unless detailed otherwise, cut sawed markings 1/8" wide by 3/4" deep.

2. Make marking lines straight or curved where required by the drawings, equally spaced and parallel to adjacent lines or walls, edges and other construction, and of uniform depth and cross section, with intersections accurately formed.

G. Schedule of Finishes:

1. The applicator of process concrete finishes must examine the substrate and the conditions under which work is to be performed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to the applicator.

2. Protect adjacent materials and finishes from dust, dirt, and other surface or physical damage during finishing operations. Provide all protection as may be required and remove from site at completion of the work.

3. Float finish all slab surfaces which are to receive trowel finishes and other surface or physical damage during finishing operations. Provide all protection as may be required and remove from site at completion of the work.

4. Float finish all slab surfaces which are to receive trowel finishes and other finishes as specified and noted on drawings. Check and level surface plane to a tolerance not exceeding 1/8" in 10' when tested with a 10' straight edge.

H. Slab Finishes:

1. Steel trowel finish: Same as monolithic trowel finish, except omit burnish troweling.

2. Wood float finish: Float to screeds. When ready, finish with wood floats to a uniformly textured surface. Apply on surfaces to receive waterproofing membrances, resilient floorings, carpet and wood flooring.

3. Sweat trowel finish: Same as steel float finish, except perform last troweling with circular motion and slight lifting of trowel to produce uniformly swirling nonslip finish.

4. Rough finish: Float to screeds. When surface water disappears, roughen surface in two directions with stiff wire brooms or garden rakes. Apply on slabs to receive mortar underbeds.

5. Abrasive finish: Same as steel trowel finish. Just before final troweling, uniformly apply abrasive aggregate at minimum rate of 1/4 pound per square foot, and lock into cement matrix with last troweling. Lightly brush green, set concrete surface to expose grains and remove cement film. Apply on all

concrete stair treads and landings. A medium broom finish to all paving unless otherwise specified.

6. Broom finish: Provide a rough broom finish on all slabs scheduled to receive a ceramic tile floor on setting bed.

7. Steel trowel finish: After concrete is sufficiently hardened to prevent drawing moisture and fines to the surface, finish trowel in two operations. Perform first operation with a power rotary trowel until matrix no longer accumulates on the trowel. Do not use cement, sand, or a mixture thereof to absorb excess moisture and do not add water to facilitate troweling. Perform second troweling until there is a distinct ringing sound under the trowel and a smooth, hard-burnished surface is obtained.

8. Colored Concrete: Exposed concrete floors shall receive a colored and slip resistant finish. Color shall be of the [Integral color] [dry-shake] type, applied in strict conformance to manufacturer's instructions. A non-slip aggregate (natural aluminum oxide) shall be applied to the colored concrete surface while still in its plastic state. Application shall be compatible with coloring material and be applied per manufacturer's instructions.

9. Exposed Aggregate Concrete, Rock Salt Finish Concrete:

   a. Sample: Contractor shall provide one foot square samples of the specified paving for approval.

   b. Slab thickness: 4” minimum

   c. Aggregate shall be 1/4” to 3/8” size pea gravel. Submit loose sample for approval to Architect.

   d. Installation: Finish surface to grade and cross-section with steel trowel to produce an even surface. Score lines shall be made with a 1/8" radius jointing tool. See drawings for locations of score lines. Edge lines at existing sidewalk, paving edges, and at expansion joints shall be made with a 1/4" radius jointing tool.

10. Rock Salt finish installation:

   a. Salt: Coarse and/or extra coarse rock salt, not pellet form.

b. Application: 100 pounds per 600 square feet. Spread coarse rock salt first and tamp into concrete, then apply extra coarse rock salt and tamp into the concrete. Do not spread both sizes of rock salt in one application. (Indicate percentage of each size of rock salt to be used.) Concrete finish shall be sweat-trowel finish before applying salt.

c. Curing: Cure concrete by moisture wring, moisture-retaining-cover curing, or curing compound, or a combination of these. On colored concrete use color curing compound or wax recommended by manufacturer of color additive used in the concrete.

11. Non-slip aggregate Finish: All handicapped ramps shall be given a medium rough rotary trowel finish, per approved sample.

END OF SECTION

SECTION 02780

UNIT PAVERS

1.0 SUMMARY

A. Pre-cast Concrete Unit Pavers set in aggregate setting bed.

B. Pre-cast Concrete Unit Pavers pavers set in mortar setting bed.

C. Edge restraints for Precast Concrete Unit Pavers.

1.2 QUALITY ASSURANCE

A. Preconstruction compatibility and adhesion testing.

B. Mockups for each form and pattern of Pre-cast Concrete Unit Paver Assembly

1.3 MATERIALS

A. Pre-cast Concrete Unit Pavers; Solid, interlocking units, complying with ASTM C936 “Standard Specification for Solid Interlocking Concrete Paving Units”.

1. Thickness: 60mm (Pedestrian); 80mm (Vehicular)

2. Unit Sizes: Per Contract Drawings.

3. Compressive Strength: Meet or exceed 7,200 PSI per ASTM C140.

4. Water Absorption: No greater than 5% per ASTM C140

5. Portland Cement: ASTM C150.

6. Aggregates: ASTM C33.

7. Color: Per Contract Drawings.

8. Texture: Per Contract Drawings.

B. Edge Restraints: Cast-in-Place Concrete

C. Geo-textile Filter Fabric: Non-woven polypropylene filament material UV resistant, engineered to allow water permeability and deter soil permittivity per ASTM D-4491.

D. Sub-Base Material:

1. Graded Aggregate for light-traffic sub-base: Meet CALTRANS Standard Specification, Section 26, for Class II Aggregate Base.

2. Graded Aggregate for heavy traffic (including fire truck) sub-base: Meet CALTRANS Standard Specification, Section 26, for Class II Aggregate Base.

E. Sand Bedding/Leveling Course and Sand Jointing Material:

1. Clean, washed, fine-textured, sharp, neutral pH, no salinity; 100% passing through a #4 (1/4”) screen, 1-5% passing through a #200 screen.

2. Organic Joint Sand Stabilizer: non-toxic, organic binder powder that is colorless, odorless, non-staining, UV resistant, and does not provide a surface coating to the Unit Pavers.

F. Portland Cement: ASTM C 150, Type I or II with latex additive.

G. Latex-Portland Cement Grout: Packaged, job-mixed grout combined with liquid latex at Project site.

H. Finished Surface Sealant. clear, non-flammable, UV-stabilized, non-yellowing solution which cures to reduce staining, soiling, discoloration, efflorescence, and acts as a invisible water-repellant coating.

1.4 INSTALLATION

A. Joint Pattern: As indicated on Contract Drawings or Match Existing.

B. Aggregate Setting-Bed and Sand Leveling Course:

1. Geotextile Filter Fabric over Aggregate Base over Compacted Sub-grade.

2. Sand Leveling course of 1 to 1-1/2 inches.

3. Precast Concrete Pavers set in pattern with 1/16- to 1/8-inch Sand-filled vibrated joints.

C. Mortar Setting-Bed:

1. Mortar setting bed applied over cement-paste bond coat over concrete sub-base.

2. Precast Concrete placed with 3/8-inch joints, filled with grout.

D. Sealer Application

END OF SECTION

SECTION 02795

POROUS PAVING

1.0 GENERAL

A. Summary: This Section includes furnishing and installing of porous paving.

1.2 PRODUCTS

A. Turfblock Pavers:

1. Units: 1 in. by 2.36 in. rigid rings of injection molded HDPE with integral grid and rings in a square spacing pattern with rings spaced 13 per square foot, with integral post and eye alignment and interlock system.

2. Aggregate Base and Subbase: Class II, per ASTM C-33.

3. Sand Bed: Clean, sharp sand.

B. Turfstone Pavers:

1. Pre-cast Units: Muller Supply Company, Lodi, CA 95240, Tel. 209-334-3781.

2. Sand Laying Course: "Concrete" sand, 1 in. maximum depth.

3. Aggregate Base and Subbase: Class II Aggregate Base per ASTM C-33.

C. Grasscrete Paving:

1. Poured-in-Place Concrete Turf Paving: Thickness and steel reinforcement per Geotechnical recommendation. Contractor shall be licensed by Bomanite Corporation, Palo, 415-321-0718.

2. Minimum Compression Strength: 3,000 PSI, per ASTM C140.

D. Grassrings Paving:

1. Units: Polyvinylchloride rings on flexible geotextile fabric by Ritterings, USA Inc.

2. Base: Caltrans Class II.

3. Geotechnical Grid: High-strength geogrid plastic.

E. Porous Concrete Paving:

1. Cast-in-Place Concrete: Thickness and fiberglass reinforced plastic reinforcement per Geotechnical recommendation.

2. Cement: Type II Portland Cement, meeting ASTM C-150.

3. Aggregate: 3/8”, meeting ASTM C33.

4. Minimum Compression Strength: 3,000 PSI, per ASTM C140.

5. Base: Granular or gravel.

F. Soil Infill: Amended Imported Topsoil per Soil Preparation - Division 02.

G. Lawn Planting: See Lawns and Grasses, Division 02.

1.3 EXECUTION

A. Verification: Verify installation of subgrade and sprinkler irrigation under other Sections.

B. Sub-base: Install aggregate layer and sand leveling bed as detailed. Screed level and smooth.

C. Paving Units: Install plumb, level, aligned with adjacent work. Where necessary, cut all units with a masonry saw. Retain all edges.

D. Poured in Place Concrete Turf Paving: Install per manufacturer's latest specifications.

E. Grassrings Paving:

1. Subgrade: Compact subsoil and install aggregate base and geotechnical grid.

2. Grassrings: Install per manufacturers specifications.

F. Cast-in-Place Porous Concrete Paving:

1. Subgrade: Compact subsoil and install aggregate base.

2. Pour slurry, screed, and roller compact.

3. Cove cure minimum 7 days.

G. Soil and Planting: Install after acceptance of paving. See Soil Preparation - Division 02, Lawns and Grasses - Division 02, Planting - Division 02.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEMS

1.0 GENERAL

A. Work Included in this Section:

1. Landscape Irrigation System, including all work materials, appliances, tools, equipment, facilities, transportation, and services necessary to install the complete irrigation system.

2. Record drawings.

3. Irrigation work shall be coordinated with all other trades.

B. Work Not Included in this Section:

1. Grading

2. Landscaping

3. Electrical

C. Quality Assurance:

1. Permits: Obtain and pay for all permits and inspections required by outside agencies.

2. Ordinances and regulations: Local, municipal and state laws and rules and regulations governing or relating to any portion of this work are herby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor.

3. Protection: Erect and maintain barricades, warning signs and lights and provide guards as necessary or required to protect all persons on the site.

4. Underwriter Laboratories: Electrical wiring, controls, motors and devices shall be U.L. listed and so labeled.

5. Installer qualifications (for solvent and rubber gasket joints): Each person shall be trained by the manufacturer's representative in techniques for making correct joints prior to performing work on site.

6. Work of this section which is allied with the work of other trades shall be coordinated as necessary.

7. Superintendent: A superintendent satisfactory to the Owner shall be present on the site at all times.

8. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in this Contract furnish directions covering points not shown in the drawings and specifications.

9. The Contractor shall not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage or area dimensions exist that might have been considered in the engineering or layout.

D. Water Meters: Contractor shall pay for all fees required to make connection to meter and water costs during construction and maintenance.

E. Point of Connection: Make connection of irrigation system main line at [Size of main line in inches] Main or water meter in approximate location shown.

F. Record Drawings: Record dimensioned locations and depths for each of the following:

1. Point of Connection.

2. Sprinkler pressure line (mainline) routing.

3. Flow meters.

4. Gate valves.

5. Sleeves/Conduit.

6. Remote control valves.

7. Quick coupling valves.

8. Fertilizer injection system.

9. Control wire routing.

G. Miscellaneous Items to be furnished:

1. 6 wrenches for disassembling each type of sprinkler head used.

2. 2 operating keys suitable to operate each type of valve used.

3. 6 quick coupler valve keys to fit type of couplers used.

4. 6 quick coupler lock type cover keys.

5. 1 set of automatic controller cabinet keys for each controller used.

6. 3 sets of maintenance and parts manuals for controller, remote control valves, shut-off valves, quick coupler valves, rotary heads, and all other mechanical devices with moving parts used in this contract.

7. Present in hardback three-ring binder.

H. Guarantee: A letter of guarantee from each manufacturer shall be submitted to the Owner guaranteeing his materials for a period of one year against material defects and workmanship. In cases where longer guarantees are required by these specifications, such guarantees shall be submitted.

2.0 PRODUCTS

A. Specifying by name: Whenever any material is specified by name and number thereof, such specifications shall be deemed to be used for the purpose of facilitating a description of the materials and established quality, and shall be deemed and construed to be followed by the words "or approved equal". No substitution will be permitted which has not been submitted for approval within [number of days] days after the contract has been awarded. Three (3) copies of descriptive literature, including pressure loss curves, nozzle performance characteristics, etc., shall be furnished for any materials submitted as "equal" substitutes. No item will be considered as "equal" if it is constructed of different materials or alloy or is of a different principle of operation. Piping, tubing, conduit, valve, or any device through which the flow of water must pass shall not cause a greater resistance, turbulence, or pressure loss due to friction than that material as engineered and designed into this system.

B. General: All materials shall be new and of size and type as called out on the drawings. All materials of like kind shall be of one manufacture.

C. Valve Boxes for Main Shut-Off Valves: Size and type shall be called out on the drawings.

D. Backflow preventer and enclosure: Backflow preventer shall be of size and type as called out on the drawings, complete with gate valves and test cocks provided by the manufacturer of the device. Wye strainers at backflow prevention units shall be 85% red brass, American National Standard Institute (ANSI) with 40 mesh monel screen. Enclosure shall have minimum 3" clearance from backflow preventer unit and installed in a concrete slab according to the manufacturer's recommendations.

E. Red Brass Pipe: Shall be Federal Specification No.WW-P-351 medium weight, IPS, with threads to conform to ASA Specification B2. Fittings shall be medium pattern, banded, threaded with standard taper pipe threads.

F. Fittings – Steel: 150 lb. galvanized malleable iron, banded.

G. Unions – Steel: Galvanized steel with brass to iron seat, minimum 300 lb. WOG, ground joint.

H. Risers – Ferrous Metal: Shall be galvanized steel pipe (to strainer assembly). Material for sprinkler head risers shall be as called out on the drawings.

I. Pipe Wrap: Galvanized steel pipe to strainer assemblies shall be field wrapped as detailed or to 6 inches above finished grade. Use ten mil PVC tape, two layers (half-lapped) to equal forty mil thick total wrapping. Field wrap all joints with same materials leaving identification marks visible, re-apply wrap as recommended by tape manufacturer.

J. PVC Pipe (General): All pipe to be permanently and continuously marked with manufacturer's name, pipe size (IPS) and schedule (D-1785-68 for schedule pipe), manufacturer's lot number and NSF approval. Pipe with dents, ripples, wrinkles, die or heat marks is not acceptable. Pipe shall be delivered to the site in 20 foot lengths.

K. Tracer Wires: A No. 12. Green Type TW plastic-coated copper tracer wire shall be installed with non-metallic main lines.

L. Reclaimed Water PVC Pipe, Valves, Heads, and Valve Boxes (General): Pipe, valves, heads and valve boxes being used to transport reclaimed water shall be purple in color and meet the special requirements of the Water Agency and Health Department.

M. Threaded PVC Nipples: Schedule 80, Type 1, 3 inch minimum length, except where detailed otherwise on drawings. PVC domestic main to drinking fountains shall be PVC Schedule 80 solvent welded plastic pipe; gray in color, meeting ASTM D-1785.

N. PVC Mainline: Shall be 1120/1220 normal impact, 2" through 12" use Schedule 40 with integrally thickened bell ends, solvent weld type meeting ASTM D-1785, 2 through 22", use Class 315, solvent weld type meeting ASTM D-1785, 3" and larger use Class 200 O-ring gasketted pipe. All pressure supply lines under vehicular paving shall be installed in a PVC Schedule 40 sleeve.

O. PVC Laterals (Non-Pressure Piping): Normal impact, Schedule 40, solvent weld type meeting ASTM D-1785.

P. Fittings – PVC: For make-up shall be of same chemical compound as pipe on which it is installed. Use Schedule 40 medium-wall fittings for any "all socket" connections. Use Schedule 40 heavy-wall fittings for all fittings with one or more threaded outlets. Fittings for ring-type connections shall be compatible with the pipe on which they are used.

Q. PVC Pipe Compound: Plastic pipe and threaded fittings: Assemble using teflon tape applied to male threads only.

R. Primer: For PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe. Primer shall be chemically compatible with the pipe, fittings and solvent.

S. Solvent: For PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe. Solvent shall be chemically compatible with the pipe, fittings and primer.

T. Sprinkler Risers: The riser shall be PVC Schedule 80 to fit sprinkler opening in swing joint assembly and proper length as detailed on the drawings.

U. Valves:

1. Ball Valves: 2 1/2 inches and smaller bronze ball valve (unless otherwise noted on drawings); ASTM B-584 Alloy-844, 150 PSI saturated steam-600 WOG rating. 2 piece body, chrome plated ball, blowout-proof stem UL listed.

2. Check Valves: Swing check valve, 2 inches and smaller on non-pressure lines: bronze or plastic construction, 100 pound S.W.P. female i.p.s. Swing check valves, 2-1/2 inches and larger on pressure lines: cast iron, 150 pound class with no-slam feature.

3. Couplers: Same manufacturer as quick coupling valve; cast bronze, machined shank, coupler to include operating handle. Top of coupler equipped with 3/4" hose swivel.

4. Gate Valves: 2 1/2 inches and smaller (unless otherwise noted on drawings): ASTM B62 brass body, 150 pound saturated steam rated; with screwed joints; non-rising stem; screwed bonnet solid disc. Provide with brass or bronze handwheel. 3 inches and larger (unless otherwise noted on Drawings): ASTM A-126 class B, iron body 150 pound W.O.G. with flanged joints, non-rising stem; bolted bonnet and double disc, equipped with operating nut, or as otherwise approved.

5. Quick Coupler Valves: 150 lb. cast bronze body, self-closing metal cover with yellow rubber protective caps, locking type. Threaded track, one inch size.

6. Remote Control Valves: All bronze globe type, contamination proof, slow closing, 150 lb.; electrically operated, 24 volt, epoxy encapsulated waterproof, solenoid to be an integral part of the unit; throttling device with cross arm on top; manual operated to cause valve to open and close with out use of electricity. Manual operator shall be provided by the factory and not fabricated by the Contractor. Valves shall be of same manufacture as automatic controller unless noted otherwise.

7. Mater Valve: Shall be normally open master valve, with a voltage range from 17 to 40 VAC self cleaning slow closing iron and bronze construction with a 5 year warrantee.

V. Automatic Controller: 120 volt, single phase, 60 cycle electric clock control unit in weatherproof, vandal-resistant metal cabinet, hinged locking door. Shall incorporate the following features: 8 day variable cycle, 0 to 99 minutes timing integrally variable; automatic, semi-automatic, and manual operation; manual immediate-station-advance; station-in-operation indicator; 24-hour start clock; on-off and repeat device. No delay between stations. To operate 24 volt valves. Contains pump-starting-stopping circuit. Master switch cuts all power circuits except starting clock. Controller shall be as called out on the drawings.

W. Valve Boxes: Valve boxes unless otherwise noted shall be fabricated from a durable plastic material resistant to weather, sunlight and chemical action of soils. They shall be green in color. The cover shall be secured with a stainless steel bolt mechanism. The cover shall be capable of sustaining a load of 1500 PSI. Valve box extensions shall be by the same manufacturer as the valve box.

1. Quick coupling valve boxes shall be round. The cover shall be heat branded with the letters "QCV," 2" high.

2. Gate valve boxes shall be round. The cover shall be heat branded with the letters "GV," 2" high.

3. Remote control valves shall be 12" X 18". The cover shall be heat branded with the letters "RCV" and the valve number in characters 2" high.

4. Splice boxes shall be 12" X 18". The cover shall be heat branded with the letters "SB," 2" high.

5. Valve boxes for moisture sensing stations shall be 12" X 18". The cover shall be heat branded with the letters "MSS," two inches high.

6. Traffic area boxes: concrete cast iron lid designed for vehicular traffic use.

X. Electrical Requirements to Automatic Controllers: All connections between electrical services and equipment shall be in rigid galvanized electrical conduit, with conduit and wiring size as required. Electrical equipment installed outside building shall be NEMA 4 type. No running threads accepted; use nipples. Conduit system shall be 660 volt insulation, NEC standard annealed copper wire and shall be minimum AWG #12 TW or RW. Protect each controller by a code approved ground connection. Supply to be 120 volts, 60 cycle, single phase, one amp. Use only galvanized steel fasteners in securing controllers in position.

Y. Electrical Requirements from Automatic Controllers (24 volts):

1. Control and Common Wire: To remote control valves wires shall be U.F. type, U.L. approved, AWG number 14 solid strand copper wire with minimum 4/64" PVC coating, 600 volt, 75 C. "Common" wire to be white coated. Each

controller to have a different color pilot wire where more then 2 controllers are on a site.

2. Flow Sensor Cable: A PVC jacketed, two conductor cable. The conductors shall be 16 AWG 7 stand annealed copper, conforming to ASTM B-3 and B-8 with heat and moisture resistant PVC, covered with a .004 wall of stabilizing nylon conforming to UL 83 heated at 90 degrees Celsius. It is recommended that the flow sensor cable be installed in a 1" PVC schedule 40 conduit to protect it from rodents and physical abuse.

3. Wire Connectors for Direct Burial Conductors (24 volt): Splices, where permitted, shall be waterproofed using Rain Bird or Pen-Tite Connectors.

4. Di-Electric Isolation: Provide between all connections joining ferrous and non-ferrous metals, or old (existing) ferrous and new ferrous metals.

5. Concrete: 2,500 lb. strength at 28 days. Fine aggregate may be granular sand.

3.0 EXECUTION

A. General: All work shall be performed by competent, experienced workmen and in a manner to coincide with methods as set forth by the manufacturers of the equipment to be used and as acceptable to the Owner.

1. Contractor shall be responsible for damages caused during his operations to any existing underground utility lines including existing irrigation control wires, storm sewers, sanitary sewer systems, gas lines, potable water lines, irrigation lines, telephone cables, gasoline or oil lines, electrical cables, or any other systems (buried or overhead).

B. Site Reviews: Before any work commences, a conference shall be held with the Owner and Contractor regarding general requirements of this work. Prior to trenching, Contractor shall be responsible for verifying existing pressure at point of connection.

C. Verification of Dimensions: Verify all horizontal and vertical site dimensions prior to staking of heads. Do not exceed spacings shown on drawings for any given area.

D. Irrigation System Refurbishment: The Contractor shall abandon, remove and dispose of all previous irrigation lines and sprinkler heads within the areas of the proposed improvements.

E. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

F. Work Space: The Contractor shall erect fences or guards as are required for the protection of the public and protection of construction materials, and maintain same in good repair until the completion of the work under the contract.

G. Trenching: Do all excavation for installation of all work included in contract. Mechanical trenching machines shall be type to cut trenches with straight, parallel sides. Trenches to be only wide enough as may be required to lay the pipe and control wires. "Pulling" of main line pipe and/or control wires will not be permitted. Contractor shall use all possible care to protect existing trees and plants during trenching.

H. Backfill: After the work has been installed to depths as detailed on the drawings, flushed, tested, and proven tight in the presence of the Owner, backfill with fine granular materials as approved by the Owner.

I. Laying of Lines: Lines shall be staked and installed in the locations shown on the drawings. Discrepancies between drawings and site shall be brought to the attention of the Architect prior to trenching. Do not exceed maximum spacings shown on drawings, nor exceed the GPM on the pipe sizes shown. Assemble all pipes free from dirt and scale; ream and deburr. Piping and electrical sleeves under concrete shall be set in place prior to paving work. If pipe must be laid after paving is in place, it shall be done by jacking, boring, or hydraulic driving. If cutting or breaking of any paving is necessary, it shall be done and replaced with like material at the expense of the Contractor.

1. Unless installed in a PVC sleeve, all pipes under pavement surface to be installed a minimum of 24 inches below A.C. paving with a 6-inch bedding and a 6-inch cover of sand backfill.

2. Replace and restore all surfaces to original condition, including grade and landscaping. Restoration work shall match the original work in every respect, including type, strength, texture and finish.

3. In new paved areas, coordinate installation of piping and wires under paved areas with General Contractor.

4. If the only piping installed is over 20 feet long, pressure testing is required for that section at the time of installation. Upon completion of piping installation, the entire system must be tested.

5. If wire under paved areas cannot be continuous, all splices shall be enclosed in an approved box.

J. Assembly of Metal Pipe: Do not bend or spring pipe; make all offsets or changes in direction with fittings. Cut threads with sharp, clean dies to conform to ASA specifications B2. Make up joints by applying oil base compound to male threads only. Remove excessive compound after makeup.

K. Assembly of PVC Pipe: Handle with care when loading, unloading, transporting and storing to avoid damage. Store pipe and fittings under cover before using. Transport in vehicle with bed of sufficient length to carry pipe flat and fully supported.

L. Joining of Ring Seals: Provide for expansion and contraction at each end. Use rubber ring and lubricate with non-toxic lubricant.

M. Joint Restraints: Ductible iron joint restraints shall be installed on all fittings and gate valves for all IPS-Size, ring joint PVC pipe. The joint restraint shall be capable of securing PVC pipe to PVC pipe and PVC pipe to ring joint gate valves without the use of threaded linkages.

N. Locating and Assembling Valves: Install backflow assemblies in shrub areas at minimum height permitted by local code. Paint assemblies with 2 coats of flat black enamel.

1. Hose Bibs: Locate bibs in shrub areas within 12 inches of header or hardscape.

2. Quick Coupler Valves: Unless otherwise indicated, locate valves within 12 inches of hardscape.

3. Manual Contol Valves: Locate as indicated on Drawings within 12 inches of hardscape, with access sleeve, unless otherwise noted.

4. Fill all area under valve box with minimum 3 cubic feet of pea gravel before box is installed.

O. Flushing of Lines: Mains shall be flushed before attaching remote control valves, quick coupler valves and with pipe centerloaded. Laterals shall be flushed before sprinkler heads are in place. Cap all risers, apply pressure, remove caps in sequence starting at the control valve. Replace caps before removing caps to follow.

P. Laying of Control Wires (24 volt): Lay wires in common trench with main lines unless otherwise approved. Splicing allowed only every 500 feet. Provide 2 feet expansion loop at splice. Use concrete electrical junction box with bolt down lid at each splice point. White coated common wire in junction boxes to be tagged with 1/4" wide embossed plastic labeling tape showing controller designation.

Q. Protection during Hydromulching: If seeding of any portion of the site is to be done by hydromulching methods, Contractor shall protect all sprinkler heads in the areas to be hydromulched by slipping plastic bags of appropriate size over each head prior to hydromulching operation. All bags shall be removed after cessation of hydromulching and properly disposed of.

R. Adjusting System: Adjust entire system prior to coverage test and again at conclusion of maintenance period.

1. Set all shut-off valves in the system to full open position.

2. Adjust all stationary heads to equal and uniform coverage using adjusting screws in each sprinkler head and by control of the throttle device in each remote control valve.

3. Adjust all rotary head systems using pitot tube with pressure gauge attached. Adjust all radii to fit requirements on drawing if heads are equipped with such a device.

4. Adjust arcs of all adjustable arc type heads so as to prevent overspray on areas to be kept dry. This can also mean the replacement of nozzles or arcs in stationary heads to nozzles of difference cut, i.e., 180^{o} nozzles to change to 120^{o} nozzles, etc.

5. At proper time of plant growth, or when directed by the Owner, Contractor shall set automatic controller to operate as noted on the drawings and shall at that time readjust all remote control valves in the system to operate heads at optimum performance based on night time pressures and simultaneous demands through the supply lines.

S. Site Cleaning: Clean all debris from site, remove all storage rooms and all other constructions and make site ready for planting work to follow.

T. Lowering of Heads, Valve Boxes, Quick Coupler Valves, etc.: All equipment that may be damaged by mowing shall be set flush to finished grade as called out on the drawings, prior to final acceptance of the work.

U. Guarantee: The Contractor shall guarantee the entire irrigation system against defects in materials and workmanship for a period of one year from the date of acceptance of the work. The Contractor shall furnish a Faithful Performance Bond in the amount of 10% of the amount bid for the installation of the irrigation system to be in force for the one year guarantee period.

END OF SECTION

SECTION 02870

SITE FURNISHINGS

1.0 GENERAL

A. Scope of Work:

1. Furnishing and installing benches.
2. Furnishing and installing bike racks.
3. Furnishing and installing trash containers.
4. Furnishing and installing picnic tables.
5. Furnishing and installing tree grates

2.0 PRODUCTS

A. Benches: Benches with back shall be constructed of 2" x 3" redwood rails individually fastened to steel bands.

B. Bench Without Back: Backless benches shall be constructed of solid wood, fastened together with internal steel rods. Shall be made of 2" x 6" redwood slats.

C. Bike Rack: A steel pipe looped style bike rack shall be used. Standard 2-3/8" (60 mm) diameter ASTM schedule 40 steel pipe.

D. Trash Containers: Pre-cast concrete trash receptacle shall be made of a mixture of cement, aggregate, additives and natural pigments reinforced with steel. A high quality type III cement conforming to current ASTM C-150 standard specifications shall apply. The formula shall produce as average compressive strength of 5000 P.S.I. in 28 days. No. 2 and No. 3 rebar rated at 80,900 P.S.I. tensile strength and wire welded mesh reinforcement shall be used.

E. Picnic Tables: All table tops and seats shall be made with ¾" #9 expandable metal welded inside a strong 2" x 2" angle iron frame with a protective plastisol coating. Extra bracing under frames shall be made with 1-1/2" x ¼" flats.

F. Tree Grates: All tree grates shall be cast iron. All gray iron shall conform to ASTM A-48, class 35 or better.

3.0 EXECUTION

A. General: Installation shall be in the locations shown on the drawings after approval of precise location by Owner. Install according to manufacturer’s written instructions and according to approved shop drawings. Install all metal supports and post in footings prior to installing any concrete slab.

B. Any item not embedded shall be surface mounted to a concrete slab using minimum 3/8” x 3” long lag screws in expansion shields.

C. Pre-Cast Concrete Bollards, Trash Containers, Benches, etc.:

1. Centering: All wood centering required for the setting of precast concrete work under this contract will be furnished and erected by the General Contractor.

2. Setting: The precast concrete shall be set accurately, true to line and level by competent precast concrete setters, with full flush joints, filling all anchor holes, welding or bolting as required.

3. Backing: Space between back of the cast stone to be filled with semi-dry, coarse sand and cement grout – 1 inch minimum.

4. Protection: Precast concrete shall be properly protected from damage by means of boards or other suitable covering where necessary until completion of the work.

5. Cleaning: The face of all precast concrete shall be thoroughly cleaned upon completion with the weak acid solution applied vigorously with fiber brushes and then drenched with clean water.

6. Pointing: All face joints shall be brushed out clean ½ inch in depth and after a thorough wetting of the face shall be pointed flush with mortar composed of one part stainless cement to two parts clean, fine white sand and sufficient cold lime putty to make a mixture as stiff as can be worked.

7. Caulking: When required joints hall be caulked with sealant compound according to manufacturer’s directions, backing to be approved compressible filler.

8. Wood Products: All non-pressure treated wood products listed under the section are to be sealed with a clear penetrating sealant to help prevent moisture damage to the wood product.

9. Concrete footings: All site furnishings which are embedded in the ground shall have a 12″ x 18″ minimum concrete footing. If the manufacturer has a specified method of installation, it shall take precedence over the above footing.

END OF SECTION

SECTION 02900

LANDSCAPE PLANTING

1.0 GENERAL

1.1 SUMMARY

A. Layout, soil preparation, bed establishment, excavation for and planting of Plant Material (trees, palms shrubs, ground covers, vines, espaliers, cacti/succulents, perennials, annuals).

B. Edgings.

C. Planters.

1.2 QUALITY ASSURANCE

A. Topsoil analysis of existing and imported topsoil.

1.3 WARRANTY

A. COD Representative to spot check trees, palms and plant material prior to install for quality standard adherence to ANSI 260.1.

B. COD Representative will inspect installed plants prior to start of maintenance.

C. Plant Materials (except Annuals): One (1) year.

1.4 PLANT ESTABLISHMENT PERIOD

A. Plant Materials: 90 days.

1.5 PLANT MATERIALS

A. Shade and Flowering Trees: ANSI Z60.1, nursery grown.

1. Shade Trees: Container grown.
2. Small Upright & Spreading Trees: Container grown.

3. Palm Trees: Field grown.
4. Low Branching: Container grown.

B. Deciduous Shrubs: Per ANSI Z60.1, nursery grown, container grown

C. Coniferous Evergreens: Per ANSI Z60.1, nursery grown, specimen quality; container grown.

D. Native Plant Material-ANSI Z60.1 Nursery grown, container grown, bare root specimens.

E. Ground Covers: ANSI Z60.1, nursery grown; container grown.

F. Plants: ANSI Z60.1, nursery-grown annuals, perennials, cacti/succulents espaliers, and fast-growing vines.

G. Topsoil: Amend existing surface soil, supplements shall be based on agricultural suitability and fertility soils report.

H. Inorganic Soil Amendments: As required per Agronomic Soil Fertility Analysis.

I. Organic Soil Amendments: As required per Agronomic Soil Fertility Analysis. If needed, amendment shall come from local composting facility that recycles local green waste.

J. Fertilizers: Organic-based Commercial fertilizer and slow-release fertilizer, as required per Agronomic Soil Fertility Analysis.

K. Mulches: Decomposed granite shall serve as mulch.

L. Stakes and Guys: Only if needed, Lodgepole Pine Wood stakes, with cinch ties. Remove nursery stakes immediately upon planting trees. Lodgepoles to be removed on year after installation.

M. Landscape Edgings: Steel Edging with Stakes or Cast-in-Place Concrete.

N. Tree Grates and Frames: To be Determined.

O. Planting soil mix includes topsoil with inorganic soil amendments, organic soil amendments, and, fertilizer ratios determined by Agronomic soil analysis test. Topsoil is to match native soil.

1.6 INSTALLATION

A. Planting Soil Mix Depth for Planting Beds: 6 inches Minimum using native soil on native plants.

END OF SECTION

SECTION 07412

METAL WALL PANELS

1.0 GENERAL

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system

B. Performance Requirements:

1. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft <Insert rate> of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.

2. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of [20] <Insert number> percent of inward-acting, wind-load design pressure of not less than [6.24 lbf/sq. ft] <Insert pressure difference> and not more than 12 lbf/sq. ft.

3. Water Penetration: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than [6.24 lbf/sq. ft.] <Insert pressure difference> and not more than 12 lbf/sq. ft.. Water Leakage: As defined according to AAMA 501.1

4. Minimum Design Wind Pressure: <Insert Number>.

5. Deflection Limits: [1/180][1/240].

6. Thermal Movements for Metal-Faced Composite Wall Panels: Provide composite wall panel assemblies that allow for noiseless thermal movements resulting from the following range in ambient temperatures and that prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects: Ambient Temperature Range: 0 to 150 deg F .

7. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 236 or ASTM C 518.

C. Installer Qualifications: An employer of workers trained and approved by manufacturer.

D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

E. Manufacturer's Warranties:

1. Materials and Workmanship: [Two] <Insert number> years.

2. Siliconized-Polyester Panel Finishes: [10] <Insert number> years.

3. Fluoropolymer Panel Finishes: [20] <Insert number> years.

4. Weathertightness: [Five] [10] <Insert number> years.

2.0 PRODUCTS

A. Substrate Boards: Provide sheathing boards, equal to ASTM C 1177 Glass-Mat Gypsum Sheathing Board, behind all metal wall panels.

B. Concealed-Fastener, Lap-Seam Metal Wall Panels:

1. Profile: [ ].

2. Material: [Zinc-coated (galvanized) steel] [Aluminum-zinc alloy-coated steel] [Aluminum] sheet.

3. Exterior Finish: [Fluoropolymer] [Siliconized polyester].

C. Foamed-Insulation-Core Metal Wall Panels:

1. Profile: [Lap] [Standing] [Batten] seam.

2. Material: [Zinc-coated (galvanized) steel] [Aluminum-zinc alloy-coated steel] [Stainless-steel] sheet.

3. Exterior Finish: [Fluoropolymer] [Siliconized polyester].

D. Laminated-Insulation-Core Metal Wall Panels:

1. Edge: [Wrapped] [Shiplap] [Framed].

2. Material: [Zinc-coated (galvanized) steel] [Aluminum-zinc alloy-coated steel] [Aluminum] sheet.

3. Exterior Finish: [Fluoropolymer] [Clear anodized] [Color anodized].

E. Honeycomb-Core Metal Wall Panels:

1. Edge: [Wrapped] [Shiplap] [Framed].

2. Core: [Aluminum]. Do not use kraft paper core.

3. Material: [Zinc-coated (galvanized) steel] [Aluminum-zinc alloy-coated steel] [Aluminum] sheet.

4. Exterior Finish: [Fluoropolymer] [Clear anodized] [Color anodized].

F. Metal-Faced Composite Wall Panels:

1. Material: Aluminum.

2. Panel Thickness: [0.118 inch (3 mm)] [0.157 inch (4 mm)] [0.197 inch (5 mm)] [0.236 inch (6 mm)].

3. Core: [Standard] [Fire retardant] extruded thermoplastic.
4. Exterior Finish: [Fluoropolymer] [Clear anodized] [Siliconized polyester].

G. Metal Soffit Panels:
1. Profile: [Match metal wall panels] [Flush] [Reveal joint].

2. Material: [Zinc-coated (galvanized) steel] [Aluminum-zinc alloy-coated steel] [Aluminum] sheet.

3. Exterior Finish: [Fluoropolymer] [Siliconized polyester].

H. Fabrication: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.

2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances, to withstand design loads, and to avoid “oil-canning”.

I. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

J. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

K. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

3.0 EXECUTION

A. Substrate Board: Install substrate board over framing on entire wall surface.

1. Install substrate board with long joints in continuous straight lines, perpendicular to direction of metal wall panel seams with end joints staggered between rows. Tightly butt substrate boards together.

2. Comply with [UL] [FMG] requirements for fire-rated construction.

B. Install flashings and other sheet metal to comply with requirements specified in Section 07620- Sheet Metal Flashing and Trim.

C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

D. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.

2. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.

3. Install screw fasteners in predrilled holes.

4. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

5. Apply sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing.

6. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

END OF SECTION

SECTION 07540

SINGLE-PLY MEMBRANE ROOFING

1.0 GENERAL

A. This Section Includes the Following:

1. Installation shall be complete with manufacturer's recommended accessories and performing such incidental or other work as may be necessitated by these operations.

2. Installation of rigid board and tapered insulation.

B. The building exterior shall be protected from damage or soiling from roofing operations.

C. Contractor's five-year guaranty required. [Manufacturer's 20-year NDL warranty]

D. Third party field inspection services shall be retained by the owner to provide Quality Assurance oversight.

E. Exterior Fire-Test Exposure per ASTM E-108: Proposed roof system shall conform to Underwriters Laboratories (UL) Class A.

F. Roof Membrane Attachment: Proposed roof system shall conform to roofing manufacturer's uniform building code and factory mutual I-60 requirements.

G. Pre-Application Conference: Conduct a pre-application conference to include the Owner and his inspector, Architect, Contractor roof applicator and roof manufacturer's representative prior to application of roofing.

2.0 PRODUCTS

A. Manufacturer: Sarnafil, Inc., Cypress, CA 90630, 800/421-1662.

B. Roofing Membrane: 60-mil reinforced virgin polyvinyl chloride (PVC) with plasticizers, modifiers and lacquer coating formed to uniform flexible sheets, complying to ASTM D4434-96 Type II Grade I.

C. Auxiliary Materials: Provide sealants, adhesives, flashing accessories and other materials as recommended by manufacturer.

3.0 EXECUTION

A. Inspection and Preparation:

1. Installer shall examine substrates and conditions under which roofing work is to be performed and shall notify Architect and Owner in writing of unsatisfactory conditions.

2. Do not proceed with roofing work until unsatisfactory conditions have been corrected in a manner acceptable to owner.

3. Inspect surfaces over which roofing and flashing are to be applied. Do not install roofing over surfaces until they are sound, clean, dry and free of all dirt and debris and in acceptable condition to receive new roofing materials.

B. General Installation – Total Installation Concept:

1. A total and new roofing system shall be provided. A patched, spliced or added-to or –on roofing system will not be acceptable under any circumstances.

2. If a section of roof requires reworking or patching, the entire area or section of roofing shall be replaced. This shall mean from edge or expansion joint to edge or expansion joint in both directions.

C. Installing Rigid Insulation:

1. Install rigid [R-value] insulation.

2. Install tapered insulation crickets to provide positive drainage.

D. Membrane Application:

1. Apply membrane by adhesion per manufacturer's requirements.

2. Heat weld seams together as recommended by manufacturer.

E. Base Flashing Ply Installation:

1. Adhere flashing per manufacturer's requirements under existing sheet metal counterflashing.

F. Flashings:

1. Pipes and other penetrations shall have prefabricated or field fabricated PVC flashings per manufacturer's guidelines.

G. Roof Drains:

1. Provide a smooth transition from drain bowl to deck surface. Water shall not dam up at the drain basin.

2. Install clamping ring and drain covers supplied with drain.

3. Test all drains for proper flow and watertightness. Correct defects.

H. Water Cut-Off:

1. When precipitation is eminent, a water cut-off shall be constructed at all open edges. Construct the cut-off with the same membrane as that used for the roofing system. Cut-off must be able to withstand extended periods of wet weather.

I. Cleaning:

1. Clean up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

2. Remove markings from finished surfaces.

J. Protection:

1. Provide protective surfaces to protect membrane from the work of other trades.

END OF SECTION

SECTION 07920

JOINT SEALANTS

1.0 GENERAL

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 12" long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6" beyond end of sealant for inspection of substrate.

C. Sealant Work shall be installed by a firm which has been in the business of installing similar materials for at least 5 consecutive years; and can show evidence of satisfactory completion of 5 projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

D. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contract or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field-test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types to Project joints.

F. Manufacturer shall provide a 5 year material warranty.

G. Installer shall provide a 2 year labor warranty.

2.0 PRODUCTS

A. Compatibility: Provide joint sealants, backing, and other related material that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Furnish the products of only one manufacturer for each sealant type. Sealant colors to be selected by Architect to match the adjoining surfaces.

C. Sealant Types:

1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C 834, Types OP and S, Grades NF and NS, formulated to be paintable.

2. Sealant 2: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25.

3. Sealant 3: One-part mildew-resistant silicone sealant, complying with ASTM C 920, Type S, Grade NS, Class 25.

4. Sealant 4: One-part non-sag urethane sealant, complying with ASTM C 920, Type S, Grade NS, Class 25.

5. Sealant 5: Multi-part pouring urethane sealant, complying with ASTM C 920, Type M, Grade P, Class 25.

6. Sealant 6: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D 217.

   a. Acoustical Sealant for Exposed and Concealed Joints: Manfacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

   b. Acoustical Sealants for Concealed Joints: Manfacturer’s standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

D. Penetrations Through Fire Barriers: Refer to Firestopping Specification Section.

E. Joint Backing: ASTM C 1330 or ASTM D 1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

F. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

G. Bond Breaker: Pressure sensitive plastic tape recommended by sealant manufacturer.

H. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

3.0 EXECUTION

A. Joints and spaces to be sealed shall be completely cleaned of dirt, dust, mortar, oil, and other foreign materials which might adversely affect Work. Where necessary, degrease with and solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants. If recommended by manufacturer, remove paint and other protective coatings from surfaces before priming and installation of sealants. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.

B. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance.

C. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and waterproofing.

D. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations, and ASTM C 1193 as applicable.

E. Concrete, masonry, and other porous surfaces, (if recommended by manufacturer), shall be primed before installing sealants.

F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth.

G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.

H. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint.

I. Install sealants to depths indicated, or if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.

2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

J. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

Sealant Application Schedule:

	Location	Type	Color
A.	Exterior & Interior joints in horizontal surfaces of concrete; Between metal & concrete masonry and mortar.	Sealant 5	To match adjacent material
B.	Exterior door, entrance & window Frames; Exterior & interior vertical joints in concrete & masonry; Metal flashing.	Sealant 2 or 4	To match adjacent material
C.	Joints within glazed curtain wall System; Skylight framing system; Aluminum entrance system glass and glazing.	Sealant 2	Translucent or Black
D.	Interior joints in ceramic tile at plumbing fixtures.	Sealant 3	Translucent or White and
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces

G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 6	Match Adjacent Surfaces

END OF SECTION

SECTION 08111

STEEL DOORS AND FRAMES

1.0 GENERAL

A. Standard hollow-metal steel doors and door and window frames. Avoid use of nonstandard door frames and special height doors

B. Quality Standard: ANSI A250.8. Fire-rated units: NFPA 80.

C. Acoustical Performance: When tested in complete conformance with the latest revision of ASTM E 90 "Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions," and when rated in complete conformance with ASTM E 413 "Classification for Rating Sound Insulation," the STC ratings of the specified door/frame/seal/hardware assemblies shall not be less than the ratings specified in the contract documents.

2.0 PRODUCTS

A. Exterior Doors: Metallic-coated (galvannealed) steel sheet faces. ("Wipe Coat" galvanized finish is not acceptable). Level 3, extra-heavy duty (16 gage), Model 2 (seamless).

B. Interior Doors: Cold-rolled steel sheet faces. Level 2, heavy duty (18 gage), Model 2 (seamless).

C. Exterior Frames: Metallic-coated (A40 galvannealed) steel sheet; fully welded. Thickness: 0.067 inch (14 gage). Provide bituminous paint coating at interior surface of grout-filled frames.

D. Interior Frames: Cold-rolled steel sheet, welded (Do not use knock-down frames). Thickness: 0.053 inch (16 gage).

E. Door Louvers:

1. Exterior: Louvers not recommended on exterior doors. If required, exterior units shall be vandal-resistant security louver equal to Anemostat PLSL, galvanized.

F. Door Silencers: Use push-in rubber type at frames. “Stick-on” silencers not allowed.

G. Fabrication

1. Fit and assemble units in manufacturer’s plant. Close top and bottom edges of doors flush as an integral part of door construction.

2. Prepare doors and frames in plant to receive hardware. Comply with applicable requirements of ANSI A250.6 and ANSI A115. Factory-install heavy-gage reinforcement plates for attaching hardware with machine screws. Securely fasten plates by welding.

3. Reinforce all doors for closers, whether or not closers are indicated.

4. Tolerances: SDI 117.

H. Prime Finish: Manufacturer’s standard, factory-applied rust-inhibiting primer complying with ANSI A250.10.

3.0 EXECUTION

A. Placing Frames: Comply with SDI 105. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings. Provide at least 3 wall anchors per jamb. For openings 90" or more in height, install an additional anchor at hinge and strike jambs.

1. Metal Stud Partitions: Frames filled with insulation.

2. Masonry Walls: Frames filled with mortar.

3. Concrete Walls: Frames filled with grout.

B. Door Installation: Comply with ANSI A250.8.

1. Fire-Rated Doors: Install with clearances specified in NFPA 80.

2. Smoke-Control Doors: Install to comply with NFPA 105.

C. After installation, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible primer.

END OF SECTION

SECTION 08411

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.0 GENERAL

A. Section Includes:

1. [Exterior] [Interior] aluminum-framed storefronts.

    a. Glazing is retained mechanically with gaskets on four sides.

2. [Exterior] [Interior] manual-swing aluminum doors.

3. [Exterior] [Interior] aluminum door frames.

B. Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.

2. Thermal movements.

3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.

4. Dimensional tolerances of building frame and other adjacent construction.

5. Failure includes the following:

    a. Deflection exceeding specified limits.

    b. Thermal stresses transferred to building structure.

    c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.

    d. Noise or vibration created by wind and thermal and structural movements.

e. Loosening or weakening of fasteners, attachments, and other components.

f. Sealant failure.

g. Failure of operating units to function properly.

C. Structural Loads:

1. Wind Loads: [As indicated on Drawings] [Insert specific loads].

2. Seismic Loads: [As indicated on Drawings] [Insert specific loads].

D. Deflection of Framing Members Normal to Wall Plane: Limited to [Insert deflection limit] or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

E. Structural-Test Performance: Systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

2. When tested at [Insert number] percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding [Insert number] percent of span.

3. Test Durations: As required by design wind velocity but not less than 10 seconds.

F. Temperature Change: Systems accommodate 120 deg F, ambient; 180 deg F, material surfaces.

G. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of systems of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of [1.57 lbf/sq. ft.] [6.24 lbf/sq. ft.].

H. Water Penetration Under Static Pressure: Systems do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft].

I. Condensation Resistance: Fixed glazing and framing areas of systems have condensation-resistance factor (CRF) of not less than [Insert CRF] when tested according to AAMA 1503.

J. Average Thermal Conductance: Fixed glazing and framing areas of systems have average U-factor of not more than [Insert U-factor] when tested according to AAMA 1503.

K. Product Data: For each type of product indicated.

L. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

    a. Coordinate with door hardware specified in Section 08710.

M. Samples: For each exposed finish.

N. Product test reports.

O. Installer Qualifications: Acceptable to manufacturer and capable of preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

P. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups as specified.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

Q. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate within specified warranty period.

R. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: [Insert number] years from date of Substantial Completion.

2.0 PRODUCTS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, and conforming to following:

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM B 308.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer. Conform to following:

1. Structural Shapes, Plates, and Bars: ASTM A 36.

2. Cold-Rolled Sheet and Strip: ASTM A 1008.

3. Hot-Rolled Sheet and Strip: ASTM A 1011.

C. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

F. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

G. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

H. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

I. Glazing: As specified in Section 08800.

J. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

K. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible other system components with which it comes in contact.

a. Color: [Black] [As selected by Architect from manufacturer's full range of colors].

L. Doors: Manufacturer's standard glazed doors, for [manual] [automatic] swing operation.

1. Door Construction: [1-3/4-inch overall thickness, with minimum 0.125-inch] [2-inch overall thickness, with minimum 0.188-inch] thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

2. Door Design: [As indicated] [Medium stile; 3-1/2-inch nominal width] [Wide stile; 5-inch nominal width] [Insert description].

3. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

4. Glazing Stops and Gaskets: [Beveled] [Square] snap-on, extruded-aluminum stops and preformed gaskets. Provide nonremovable glazing stops on outside of door.

M. Door Hardware: As specified in Section 08710.

N. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

O. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

P. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07920.

Q. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

S. Form aluminum shapes before finishing.

T. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

U. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2.
2. Accurately fitted joints with ends coped or mitered.

3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from [exterior] [interior].

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

V. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

W. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

X. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.

2. At exterior doors, provide weather sweeps applied to door bottoms.

Y. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

Z. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

AA. Clear Anodic Finish: Class I, color anodic coating complying with AAMA 611.

BB. Color Anodic Finish: Class I, color anodic coating complying with AAMA 611.

1. Color: [Match Architect's sample] [As selected by Architect from full range of industry colors and densities].

CC. High-Performance Organic Finish: Three-coat thermocured system with fluoropolymer topcoats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

1. Color and Gloss: [Match Architect's sample] [As selected by Architect from manufacturer's full range].

2. For exact finish, insert names of coating manufacturers and products.

3. Use clear top coat on entrance doors and areas subject to human contact.

3.0 EXECUTION

A. General:

1. Fit joints to produce hairline joints free of burrs and distortion.

2. Rigidly secure nonmovement joints.

3. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

4. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 07920 and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Section 08800.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.

2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Section 07920 to produce weathertight installation.

I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.

2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.

b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

J. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

K. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

L. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

M. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 08520

ALUMINUM WINDOWS

1.0 GENERAL

A. Section includes [casement] [double-hung] [fixed] [horizontal-sliding] [and] [projected] windows.

B. See Section 08800 for glazing requirements for aluminum windows, including those specified to be factory glazed.

C. Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of minimum test size required by AAMA/WDMA 101/I.S.2.

D. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/WDMA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated:

1. Deflection: Based on passing AAMA/WDMA 101/I.S.2, Uniform Load Deflection Test or on glass framing system designed to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less at design pressure based on structural computations.

2. Basic Wind Speed: As indicated in miles per hour at 33 feet above grade. Determine wind loads and resulting design pressures applicable to Project according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 6.4.2, "Analytic Procedure"; based on mean roof heights above grade as indicated on Drawings.

E. Air Infiltration: Maximum rate not more than [Insert rate and test pressure] when tested according to AAMA/WDMA 101/I.S.2, Air Infiltration Test.

F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling [Insert pressure] when tested according to AAMA/WDMA 101/I.S.2, Water Resistance Test.

G. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.

H. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of [Insert value], where windows are indicated to be thermally improved.

I. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum [Insert value] at 15-mph exterior wind velocity and winter condition temperatures when tested according to [AAMA 1503] [ASTM E 1423] [NFRC 100].

J. Solar Heat-Gain Coefficient: Provide aluminum windows with a whole-window SHGC maximum of [Insert value], determined according to NFRC 200 procedures.

K. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

   1. Temperature Change: 120 deg F, ambient; 180 deg material surfaces.

L. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2.

M. Specific Product Performance Requirements: Comply with Section 2.2 of AAMA/WDMA 101/I.S.2.

N. Product Data: For each type of aluminum window indicated.

O. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, and operational clearances.

   1. Include structural analysis data indicating structural test pressures and design pressures from basic wind speeds indicated and deflection limitations of glass framing systems, signed and sealed by qualified professional engineer, licensed in California, responsible for their preparation.

P. Samples: For each exposed finish.

Q. Field quality-control test reports.

R. Product test reports.

S. Maintenance data.

T. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.

U. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

V. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA "Glazing Manual" unless more stringent requirements are indicated.

W. Mockups: Build mockups to demonstrate aesthetic effects.

1. Build mockups as shown on Drawings.

2. Perform tests specified. Modify mockup construction and perform additional tests as required to achieve specified minimum acceptable results.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

X. Preinstallation Conference: Conduct conference at Project site.

Y. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials and workmanship within [Insert number] years from date of Substantial Completion.

Z. Warranty Period for Metal Finishes: 10 years from date of Substantial Completion.

AA. Warranty Period for Glass: [Insert number] years from date of Substantial Completion.

2.0 PRODUCTS

A. Glass: [Clear, insulating-glass] [Insert glass type, description, and performance requirements for] units complying with Section 08800.

B. Glazing System: [Manufacturer's standard factory-glazing system that produces weathertight seal.] [Manufacturer's standard factory-glazing system as indicated in Section 08800].

C. Insect Screens: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on [inside] [outside] of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows Architectural C-24 class.

D. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, [adjustable rollers,] and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.

2. Finish: Match aluminum window members.

3. Finish**:** [Anodized aluminum] [Baked-on organic coating] in color selected from manufacturer's full range.

E. Aluminum Wire Fabric: 18 by 16 mesh of 0.011-inch-diameter, coated aluminum wire.

1. Wire-Fabric Finish: [Natural bright] [Charcoal gray] [Black].

F. Wickets: Provide [sliding] [or] [hinged] wickets, framed and trimmed for a tight fit and durability during handling.

G. Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/WDMA 101/I.S.2 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.

1. Casement Windows: [C] [HC] [AW].

2. Double-Hung Windows: [C] [HC] [AW].

3. Fixed Windows: [C] [HC] [AW].

4. Horizontal-Sliding Windows: [C] [HC] [AW].

5. Projected Windows: [C] [HC] [AW].

H. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

J. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

K. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

L. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

M. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062 inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

N. Glazing Stops: Provide snap-on glazing stops coordinated with Section 08800 and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

O. Aluminum Anodic Finish: [Class I, clear anodic coating complying with AAMA 611] [Class I, color anodic coating complying with AAMA 611].

1. Color: [Match sample] [As selected from full range of industry colors and densities].

P. Aluminum High-Performance Organic Finish: [Two] [Three]-coat thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

1. Color and Gloss: [Match sample] [As selected from manufacturer's full range].

3.0 EXECUTION

A. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

B. Set sill members in full bed of sealant or with gaskets, as indicated, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/WDMA 101/I.S.2.

E. Adjust operating sashes and ventilators, screens, and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

F. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

G. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

H. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

I. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

J. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

K. Testing Services: Testing and inspecting of installed windows shall take place as follows:

   1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method [A] [B], by applying same test pressures required to determine compliance with AAMA/WDMA 101/I.S.2 in Part 1 "Performance Requirements" Article.

   2. Testing Extent: [Insert number or description] windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.

   3. Test Reports: Shall be prepared according to AAMA 502.

L. Remove and replace windows where test results indicate that they do not comply with specified requirements.

M. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 08600

HIGH PERFORMANCE DAYLIGHT SYSTEM

1.0 GENERAL

A. SECTION INCLUDES
High Performance Daylight System skylights, consisting of skylight dome, reflective tube, and diffuse assembly; configuration as indicated on Drawings.

1. Accessories, as specified.

B. REFERENCES

1. Comply with applicable performance standards of International Code Council (ICC), ICBO/ICC AC-16 Acceptance Criteria for Plastic Skylights.

C. PERFORMANCE REQUIREMENTS

1. Air Infiltration Test: Air Infiltration maximum 0.10 cfm per foot of crack length at 6.24 psf pressure differential when tested in accordance with ASTM E 283.

2. Water Resistance Test: No uncontrolled water leakage at 6.00 psf pressure differential with water rate of 5 gallons/hours/sf when tested in accordance with ASTM E 331.

3. Uniform Load Test: No breakage, permanent damage to fasteners, hardware parts, or damage to make daylight system inoperable, or cause permanent deflection of any section in excess of 1 percent of its span at either a maximum Positive or Negative Load of 35 psf for 21 inch unit. Test units with a safety factor of 3 for positive pressure and 2 for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.

4. Class 'B' Burning Brand - Self-extinguish without transferring the fire to the dome Per: U.B.C. Standard 15-2 Class 'B' Burning Brand Test. See UL 790.

5. Self-Ignition Temperature - Greater than 650 degrees F Per: U.B.C. Standard 26-6. See ASTM D 1929.

6. Smoke Density - Rating no greater than 75 Per: U.B.C. Standard 26-5. or no greater than 450 Per U.B.C. 8-1 (See ASTM E 84).

7. Rate of Burn - Minimum Burning Rate: 2.5 inches/min Classification CC-2: U.B.C. Standard 26-7. See ASTM D 635.

D. QUALITY ASSURANCE

1. Manufacturer Qualifications: Engaged in manufacture of daylight system for minimum 10 years.

E. PROJECT CONDITIONS

1. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

F. WARRANTY

1. Daylighting System: Manufacturer's standard warranty for 10 years.

2. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.

2.0 PRODUCTS

A. High Performance Daylighting System.

1. General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICBO/ICC AC-16. Components made and assembled by one manufacturer.

2. Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

3. Roof Dome Assembly: Glazing: 0.143 inch minimum thickness injection molded acrylic classified as CC2 material and meeting characteristics of Duradome DR-101 blend.

4. Low-Angled Sun Reflector: light intercepting transfer device, made of same material as main tube, to capture low angle sunlight.

5. Roof Flashing Base: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube.

6. Base Material: Sheet steel, corrosion resistant conforming to ASTM A 653, 0.028 inch thick.

7. Base Style: Self mounted, 4 inches high.

8. Dome Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact ABS; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

9. Dome Seal: Polypropylene Fiber Pile weather strip 0.27 inch by 0.27 inch.

10. Reflective Tube: Aluminum sheet, thickness 0.015 inch, with high reflectance specular finish on exposed reflective interior surface; specular reflectance 99 percent for visible spectrum, less than 93 percent for total solar spectrum at 1.5 degree field angle.

11. Color: As defined by CIE L color model shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.

12. Tube Diameter: To be determined.

13. Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from around tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration; 23.8 by 23.8 inches square frame to fit standard suspended ceiling grids or hard ceilings.

14. Transition Box: Box made of opaque polymeric material, classified as CC2, 0.060 inch thick.

15. Lens: OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame. Visible Light Transmission: 90 percent at 0.125 inches thick.

16. Security Bars 0.375 inch stainless steel bar across flashing diameter opening.

17. Daylight Dimmer: Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; actuator rated at 0.1 amp per unit; controlled by low voltage, series circuited, 4 conductor, size 22 cable, and low voltage DC DP/DT switch; providing daylight output between 2 and 100 percent.

B. ACCESSORIES

1. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

2. Sealant: Copolymer based elastomeric sealant as provided or recommended by manufacturer.

3.0 EXECUTION

A. INSTALLATION

1. Install in accordance with manufacturer's printed instructions.

2. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.

B. PROTECTION

1. Protect installed products until completion of project.

2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08712

DOOR FINISH HARDWARE

1.0 GENERAL

A. Governing Agencies
1. California Building Code (CBC) 2001 Edition
2. National Fire Protection Association (NFPA)
3. Underwriters Laboratories (UL) and Intertek
4. American Disabilities Act of 1990 (ADA) requirements

1.1 SUBMITTALS

A. Keying Schedule: Prepared by or under the supervision of [Installer} {Architectural Hardware Consultant}, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

B. Product Data: Submit manufacturer's product data containing drawings or a cut of all hardware items at same time hardware schedule is submitted. Make submittal in a neat brochure form and include an index list of all items, with manufacturer's names and catalog numbers. If proposing a substitute, submit that product data attached to one showing specified item and indicate savings to be made. Include a list of all manufacturers used and they're nearest representative with address and phone number.
1. Submit manufacturer's technical data and installation instructions for electronic security hardware.

C. Hardware Schedule: Submit copies of schedule at earliest possible date prior to delivery of hardware. Organize schedule into "Hardware Sets" in the same format as listed in the specification (horizontal schedule not acceptable), with an index of doors and heading, indicating complete designations of every item required for each door or opening. Include the following information.
1. Type, style, function, size quantity and finish of each hardware item.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
6. Mounting locations for hardware.

7. Door and frame sizes and materials.

D. Keying Schedule: Submit three copies of separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks have been fulfilled.

1.2 QUALITY ASSURANCE

A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Scheduled Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, unless they are not equal in design, size, weight, finish, function, or other quality of significance. Do not make substitutions after Architect's acceptance of hardware supplier's completed hardware schedule.

C. Hardware supplier must be a direct factory contract supplier who has in his employment an experienced Architectural Hardware Consultant who is available at all reasonable times during the course of the work, for project hardware consultation to the Owner, Architect and Contractor.

D. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.

E. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the type and size of each door required, and complies with the requirements of the door and doorframe labels. Door closers, seals and ball bearing hinges are required whether listed in hardware schedule or not.

1. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating "Fire Door to be Equipped with fire Exit Hardware", and provide UL label on exit device indicating "Fire Exit Hardware".

F. Keying Conference: Conduct conference at Project site to comply with requirements in Div 1. In addition to Owner, [Construction Manager], Contractor and Architect conference participants shall also include Installers, Architectural Hardware Consultant [and Owners security consultant]. Incorporate keying system including, but not limited to the following:

1. Function of building flow of traffic, purpose of each area, degree of security required and plans for future expansion.

2. Preliminary keying system schematic diagram.

3. Requirements for key control system.

4. Address for delivery of keys.

5. [Insert requirements to suit Project].

1.3 SEQUENCING

A. Coordination: Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information in the contract documents. Deliver individually packaged hardware items at the times and to the locations (shop or field) for installation, as directed by the Contractor.

   1. Coordinate the provisions of reinforcement, in stud walls, for wall stops and holders.

   2. Provide for all doors to swing to maximum degree whether shown on plan or not.

B. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work, to confirm that adequate provisions will be made for the proper installation of hardware.

C. Inspection: Hardware supplier shall inspect all hardware furnished within 10 days of Contractor's request and include with his guarantee a statement that this has been accomplished. Inspector or Contractor will sign off the hardware as being complete and correctly installed and adjusted. All further corrections of defective material to be the responsibility of the manufacturer or his representative.

D. Site Inspection: Carefully inspect project for location and the extent of hardware required to complete the work. Where there is a conflict between the Specifications and the existing hardware, furnish hardware to match existing.

1.4 WARRANTIES

A. Provide warranty from hardware suppliers as follows:

1. Closers: Ten years.

2. Cylindrical Locks: Seven years

3. Panic Devices: Three years.

4. All Other Hardware: Two years.

2.0 PRODUCTS

2.1 MANUFACTURERS

Key System	Schlage 'Primus' level 3G. Contact campus locksmith for keying on all projects.
Locksets	Mortise: Schlage L9000P 06L 613 finish for exterior applications. Schlage ND Series Rhodes 613 finish for interior applications.
Padlocks	Kryptonite by Schlage: PL1000 Series. Contact campus locksmith for keying.
Exit Devices	Von Duprin CD99 Series (medium & wide stile doors) & CD33 Series (narrow stile doors). Use key removable, 'KR' and rim devices at pairs of doors. Use IC cylinder cores at panic devices.
Mullions	Von Duprin 'KR' series.
Surface Closers	LCN: 4040/4041 Series with ED arms everywhere.
Access Control	Schlage: Security Managements System, Schlage CM Locks, VIP Locks and Wyreless Locks.
Floor Closers	Do not specify. Not used.
Auto Flush bolts	Ives: FB 30, 40, 50, 60 Series.
Pivots	Ives 7200 series. For 3/4" offset use 7215 series minimum.
Hinges	Interior doors: Ives CB Series Exterior: Pemko DFM83HD Series continuous hinge at exterior doors.

Overhead Stops	Glynn-Johnson 90 series. Use only where floor or wall stops are inadvisable. Use in coordination with extra heavy duty hinges at these locations.
Anti-Vandal Pulls	Ives VR900 Series.
Floor Stops	Interior: Ives FB436/438 Exterior: FS444/FX4428 for floor mounted bumper.
Door Plates	Kick plates: Ives 8400 Series, 10” H x 2” less than door width, (1”LDW at non-mullion pairs) Push/Pull Plates: Ives 8200 Series and 8303-8 Series.
Thresholds	Pemko 271A x FHSL or as detailed on plans/drawings. Furnish handicapped ramp thresholds where required at existing conditions.
Door Seals	Pemko 303AS Series. Avoid adhesive type seals

2.2 HARDWARE FINISHES

A. Comply with BHMA A156.18. Generally, finish to be 626 satin chrome and 630, satin stainless steel.

B. Areas using 626 shall have push, pulls and kick plates of 630, satin stainless steel unless otherwise noted.

C. The interior finish of areas such as toilet rooms shall be 630, satin stainless steel.

D. Spray door closers to match, unless otherwise noted.

E. Seals and Thresholds: Match lock finish unless otherwise specified.

2.3 MATERIALS

A. Locks: Mortise type. Strikes to be curved with box construction, and have lips of sufficient length to clear trim and protect clothing.

B. Keying: Keying of cylinder locks shall be coordinated with the Owner. For estimate purposes use Grand-masterkey charge. Under Owner's direction, key to new system to be approved by Owner's representative in writing. Furnish construction key system with keys that can be rendered inoperative by the turn of the change key. Stamp all keys "Do Not Duplicate".

1. For the protection of the Owner all locks and cylinders shall be keyed at the factory of the lock manufacturer where permanent records are maintained.

C. Hinges: Out swinging exterior doors shall have non-removable (NRP) pin. All hinge open widths shall be a minimum, but of sufficient size to permit door to swing 180 degrees. Furnish three hinges per leaf to 7'-6" height, add one each two feet extra and at pivots.

D. Floor hinges shall have maximum degree dead stop that trim of adjacent structure permits.

E. Panic Hardware: Furnish all sets with sex bolts unless otherwise specified.

F. Surface Door Closers: To be of the full rack and pinion type with removable non-ferrous case complete with sex bolts. Place closer inside building, stairs, room, etc. Closers shall be non-handed, non-sized, and adjustable from size 2 through 6 unless otherwise specified.

1. Adjust closers to following maximum operating pressures:

a. Exterior Doors: 5 pounds.

b. Interior Doors: 5 pounds.

c. Required Fire Doors: The Authority having jurisdiction may increase the maximum effort to operate doors required to be fire rated to achieve positive latching, but in no case shall the pressure exceed 15 lbs.

2. Set all closers with moderate back-check.

G. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over. Drop brackets would be required at narrow head rails.

H. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where sound or light seal occurs.

I. Kick Plates: Provide with four beveled edges. Furnish with machine or wood screws of bronze or stainless steel metal.

J. Screws: All exposed screws shall be Phillips head.

K. Seals: All seals with 10B hardware to be dark duranodic. Solid neoprene to be Mil.

Spec. R6855-CL III, Gr. 40; sponge neoprene to be Mil. Spec. R6130, Type II, Group C.

1. When "290AS" seals are specified, install on the 1-1/2 inch minimum stop, before closers or panics.

L. Provide stops with risers as required.

3.0 EXECUTION

3.1 HARDWARE LOCATIONS FOR INSTALLATION

A. Comply with following mounting heights as specified in "Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames" by the Door Hardware Institute, except as specifically indicated or required to comply with governing regulations, including Title 24, California Code of Regulations, and except as may be otherwise directed by Architect.

B. Hinges:

1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.

2. Top Hinge: 5 inches from door top to top of hinge.

3. Center Hinge: Center between top and bottom hinge.

4. Extra Hinge: 6 inches from bottom of top hinge to top of extra hinge.

C. Lock: 38 inches from bottom of door to center of lever or knob.

D. Push Bar: 44 inches from bottom of door to center of bar.

E. Push Plate: 44 inches from bottom of door to center of plate.

F. Pull Plate: 42 inches from bottom of door to center of pull.

G. Panic: 39 13/16 inches from finished floor to center of pad.

H. Deadlock Strike: 38 inches from floor, centered.

I. Floor Stops and Holders: Install maximum 4 inches from face of wall or partitions.

Floor stops shall not be located in the path of travel.

3.2 INSTALLATION

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Adjust and check each operating item of hardware and door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly.

C. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Owner’s continued adjustment, maintenance and removal and replacement of door hardware.

3.3 SCHEDULE OF FINISH HARDWARE

A. The following is a door index and schedule of hardware to be furnished for this work. The material listed shall conform throughout to the requirements of the foregoing specification

END OF SECTION

SECTION 08800

GLASS AND GLAZING

1.0 GENERAL

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.

2. Doors.

3. Curtain walls.

4. Entrances and Storefronts.

5. Interior borrowed lights.

6. Skylights.

7. Sloped glazing.

B. Interspace: Space between lights of an insulating-glass unit that contains dehydrated air.

C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

E. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

F. Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

G. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lights in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements.

2. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

3. Probability of Breakage for Vertical Glazing: 8 lights per 1000 for lights set vertically or not more than 15 degrees off vertical and under wind action.

4. Probability of Breakage for Sloped Glazing: 1 light per 1000 for lights set more than 15 degrees off vertical and under wind action.

5. Minimum Glass Thickness for Exterior Lights: Not less than 6.0 mm.

6. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

H. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

I. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lights, properties are based on units with lights of thickness indicated.

2. For laminated-glass lights, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite [Insert dimension] and a nominal [1/2-inch-wide interspace].

J. Product Data: For each glass product and glazing material indicated

K. Samples: 12-inch-square, for each type of glass product indicated, other than monolithic clear float glass.

L. Glazing Schedule: Use same designations indicated on Drawings.

M. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.

N. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

O. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.

P. Glazing for Fire-Rated [Door] [Window] Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

Q. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

R. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: “Glazing Manual”, “Laminated Glass Design Guide”.

2. AAMA Publications: AAMA GDSG-1, “Glass Design for Sloped Glazing”, and AAMA TIR-A7, “Sloped Glazing Guidelines”.

3. IGMA Publication for Sloped Glazing: IGMA TB-3001, “Sloped Glazing Guidelines”.

4. IGMA Publication for Insulating Glass: SIGMA TM-3000, “Glazing Guidelines for Sealed Insulating Glass Units”.

S. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component light of units with appropriate certification label of the Insulating Glass Certification Council.

T. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups [as shown on Drawings] [Insert requirements].

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

U. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard forms made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, within specified warranty period indicated.

V. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard forms made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, within specified warranty period indicated.

2.0 PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2. Provide heat-strengthened float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lights and to comply with glass design requirements.

3. For uncoated glass, comply with requirements for Condition A.

4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).

5. Provide fully tempered float glass in place of annealed or heat-strengthened float glass where safety glass is indicated.

C. Ceramic-Coated Vision Glass: Float glass with ceramic enamel applied by silk-screened process and complying with ASTM C 1048, Condition C (other coated glass), Type I (transparent flat glass), Quality-Q3, Specification No. 95-1-31 in GANA "Engineering Standards Manual," and other requirements specified.

D. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.

E. Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with color neutral metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.

F. Sputter-Coated Float Glass: ASTM C 1376, float glass with color neutral metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

G. Pyrolytic-Coated Self-Cleaning, Low-Maintenance Glass: Float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

H. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral (PVB) of thickness indicated.

I. Insulating-Glass Units: Factory-assembled units consisting of sealed lights of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and specified requirements.

1. Provide heat-strengthened float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lights and to comply with glass design requirements specified.

2. Overall Unit Thickness and Thickness of Each Light: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lights at unit's edge.

3. Sealing System: Dual seal.

4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements: Spacer Material: Aluminum with black, color anodic finish and manufacturer's standard corner construction.

J. Fire-Protection Rating: [Insert rating] [As indicated for the assembly in which glazing material is installed], and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

K Film-Faced Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of a 3/16-inch-thick, ceramic glazing material, faced on one surface with a clear glazing film.

L. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lights of clear ceramic glazing material laminated together to produce a laminated light of 5/16-inch nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft.

M. Specially Tempered Monolithic Glass: Proprietary Category II safety glazing product in the form of a specially tempered [Insert dimension] thick monolithic light.

N. Laminated Glass with Intumescent Interlayers: Proprietary Category II safety glazing product in the form of multiple lights of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), fully tempered float glass laminated with intumescent interlayers.

O. Gel-Filled, Dual-Glazed Units: Proprietary Category II safety glazing product in the form of two lights of Condition A (uncoated surfaces), Type I (transparent flat glass), Class 1 (clear), fully tempered float glass; with a perimeter metal spacer separating lights and dual-edge seal enclosing a cavity completely filled with clear, fully transparent, heat-absorbing gel.

P. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.

2. EPDM, ASTM C 864.

3. Silicone, ASTM C 1115.

4. Thermoplastic polyolefin rubber, ASTM C 1115.

Q. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.

2. EPDM.

3. Silicone.

4. Thermoplastic polyolefin rubber.

R. Provide glazing sealants of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: [Match Architect's samples] [As selected by Architect from manufacturer's full range].

S. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral-Curing Silicone Glazing Sealants.

2. Acid-Curing Silicone Glazing Sealants.

T. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

U. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800.

V. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800.

W. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

X. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

Y. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

Z. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lights in place for installation indicated.

AA. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement.

BB. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

CC. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating

DD. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

3.0 EXECUTION

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lights and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

E. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

F. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 08911

ALUMINUM CURTAIN WALLS

1.0 GENERAL

A. Section includes conventionally glazed aluminum curtain walls systems, and aluminum doors and frames occurring in curtain wall system.

B. General: Provide aluminum curtain wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.

2. Thermal movements.

3. Movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

4. Dimensional tolerances of building frame and other adjacent construction.

5. Failure includes: Deflection exceeding specified limits; Thermal stresses transferred to building structure; Framing members transferring stresses, including those caused by thermal and structural movements, to glazing; Noise or vibration created by wind and thermal and structural movements; Loosening or weakening of fasteners, attachments, and other components; Sealant failures.

C. Structural Loads:

1. Wind Loads.

2. Seismic Loads.

3. Periodic Maintenance Equipment Loads.

D. Structural Test Performance: Systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

2. When tested at [Insert number] percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding [Insert number] percent of span.

3. Test Duration: As required by design wind velocity but not less than [Insert number] seconds.

E. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to [Insert deflection limit] or an amount that restricts edge deflection of individual glazing lights to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to [Insert deflection limit].

   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.

F. Temperature Change: Systems accommodate 120 deg F, ambient; 180 deg F, material surfaces.

G. Air Infiltration: For systems, maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. [Insert pressure].

H. Water Penetration Under Static Pressure: Systems do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of [Insert pressure].

I. Condensation Resistance: For systems, condensation-resistance factor (CRF) of not less than [Insert CRF] when tested according to AAMA 1503.

J. Average Thermal Conductance: For systems, average U-factor of not more than [Insert U-factor] when tested according to AAMA 1503.

K. Acoustical Performance: When tested in conformance with latest revision of ASTM E90, and when rated in conformance with ASTM E413, the STC ratings of specified curtain wall assemblies, including glazing, shall not be less than ratings specified.

L. Product Data: For each product indicated.

M. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in California, detailing fabrication and assembly of glazed aluminum curtain wall systems.

N. Samples: For each exposed finish.

O. Product test reports.

P. Field quality-control test reports.

Q. Installer Qualifications: Acceptable to manufacturer and capable of preparing data for glazed aluminum curtain-wall systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

R. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

S. Preinstallation Conference.

T. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including, but not limited to, excessive deflection.

    b. Noise or vibration caused by thermal movements.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Water leakage.

e. Failure of operating components to function normally.

2. Warranty Period: [Insert number] years from date of Substantial Completion.

U. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: [Insert number] years from date of Substantial Completion.

2.0 PRODUCTS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, conforming to following:

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.

3. Extruded Structural Pipe and Tubes: ASTM B 429.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer. Conform to following:

1. Structural Shapes, Plates, and Bars: ASTM A 36.

2. Cold-Rolled Sheet and Strip: ASTM A 611.

3. Hot-Rolled Sheet and Strip: ASTM A57.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads.

4. Finish exposed portions to match framing system.

5. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing Gaskets and Sealants: As recommended by manufacturer for joint type.

H. Glazing: As specified in Section 08800.

I. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

J. Glazing Sealants: As recommended by manufacturer for joint type and as specified in Section 08800.

K. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.

1. Overall Panel Thickness: [As indicated] [Insert thickness].

2. Exterior Skin: Aluminum.

3. Interior Skin: [Aluminum] [Manufacturer's standard galvanized steel sheet].

4. Thermal Insulation Core: Manufacturer's standard [Insert insulation].

5. Surface-Burning Characteristics: For exposed interior surfaces of panels, when tested according to ASTM E 84 as follows: Flame-Spread Index: 25 or less; Smoke-Developed Index: 450 or less.

L. Venting Windows: As specified in Section 08520.

M. Doors: Manufacturer's standard glazed doors, for [manual] [automatic] swing operation.

1. Door Construction: [1-3/4-inch overall thickness, with minimum 0.125-inch] [2-inch overall thickness, with minimum 0.188-inch] thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

2. Door Design: [As indicated] [Medium stile; 3-1/2-inch nominal width] [Wide stile; 5-inch nominal width] [Insert description].

   a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: [Beveled] [Square] snap-on, extruded-aluminum stops and preformed gaskets.

   a. Provide nonremovable glazing stops on outside of door.

N. Door Hardware: As specified in Section 08710.

O. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

P. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

Q. Perimeter Fire-Containment Systems (Safing Insulation).

R. Insulating Materials: Specified in Section 07210.

S. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

T. Form aluminum shapes before finishing.

U. Fabricate components that, when assembled, have the following characteristics:

1. Sharp profiles, straight and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.

6. Provisions for reglazing from exterior.

V. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

W. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.

2. Seal joints watertight, unless otherwise indicated.

3. Pressure equalize system at its interior face.

4. Install glazing to comply with requirements in Section 08800.

X. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

Y. Clear Anodic Finish: Class, clear anodic coating complying with AAMA 611.

Z. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

AA. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.

2. At exterior doors, provide weather sweeps applied to door bottoms.

BB. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

CC. Color Anodic Finish: Class, color anodic coating complying with AAMA 611.

1. Color [Match Architect's sample] [As selected by Architect from full range of industry colors and densities].

DD. High-Performance Organic Finish: [Two] [Three] [Four]-coat thermocured system with fluoropolymer topcoats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA [2604] [2605].

1. Color and Gloss: [Match Architect's sample] [As selected by Architect from manufacturer's full range].

2. For exact finish, insert names of coating manufacturers and products.

3. Use clear top coat on entrance doors and areas subject to human contact.

3.0 EXECUTION

A. General:

1. Fit joints to produce hairline joints free of burrs and distortion.

2. Rigidly secure non-movement joints.

3. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

4. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

5. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08800.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.

2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install sealants as specified in Section 07920.

I. Install insulation materials as specified in Section 07210.

J. Install perimeter fire-containment systems (safing insulation) as specified.

K. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment: Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch; Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch; Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

L. Water Spray Test: After the installation of minimum area of 75-feet- by-2-story glazed aluminum curtain-wall system has been completed but before installation of interior finishes has begun, test a 2-bay area of system designated by Architect according to AAMA 501.2.

1. Repair or remove work where test results indicate water penetration of systems.

2. Perform additional testing to determine resistance to water penetration of replaced or additional work.

END OF SECTION

SECTION 08952

FIBERGLASS-SANDWICH-PANEL WINDOW/SKYLIGHT ASSEMBLIES

1.0 GENERAL

A. Assemblies Incorporating Fiberglass Sandwich Panels and Aluminum Frame Systems:

1. Wall assemblies.

2. Roof (sloped, overhead) assemblies.

3. Skylight assemblies.

B. System Description: Structurally reinforced translucent panel system, with support framing, battens, cap strips, related flashings, anchorage and attachment devices.

C. Performance:

1. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170°F without causing detrimental effects to system or components.

2. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

3. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.

4. Design and size members to withstand design dead loads plus minimum 20 pound live load.

D. Submit certified test reports, made by an independent testing organization for translucent panel system. Test results based on face sheet performance only will not be acceptable. Reports shall verify that material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if current and indicative of products used on specific project. Test reports required are:

1. Flame Spread and Smoke Development (ASTM E 84) or UL Listing (UL 723).

2. Burn Extent (ASTM D 635).

3. Color Difference (ASTM D 2244).

4. Impact Strength (UL 972).

5. Tensile Bond Strength (ASTM C 297) after aging by ASTM D 1037.

6. Shear Bond Strength (ASTM D 1002) after 5 different aging conditions.

7. Beam Bending Strength (ASTM E 72).

8. Insulated "U" Factor (by NFRC 100): ASTM C 236, E 1423 and C 1199.

9. Class A Roof Covering Burning Brand (ASTM E 108).

10. UL Test 790 Fire-Resistance of Roof Covering Materials (if required).

11. ICBO (ICC) Research Report Listing. Submit proof of regular, independent quality control monitoring.

E. Samples: Submit samples illustrating prefinished aluminum surface, specified panel with skins, including glazing edge and corner. Provide mockups for each form of construction and finish.

F. Manufacturer's and Erector's Qualifications:

1. Translucent panel system manufacturer must be listed by the International Conference of Building Officials (ICBO) which requires quality control inspections by an approved agency for sandwich panel construction conducted at least once each year to include manufacturing facilities, sandwich panel components and production sandwich panels for

conformance with "Acceptance Criteria for Sandwich Panel" and have a current ICBO (ICC) Evaluation Report for specific system affirming that system can be installed in compliance with CBC, Title 24, Part 2, Chap. 26, Sect. 2603.7.

2. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of similar materials, for a period of at least 10 consecutive years; and which can show evidence of these materials being satisfactorily used on at least six project of similar size, scope and type within such a period. At least three of the projects shall have been in successful use for 10 years or longer.

3. The manufacturer shall be responsible for the configuration and fabrication of the skylight system.

4. Erection shall be by an installer which has been in the business of erecting similar materials for at least five consecutive years; and can show evidence of satisfactory completion of projects of similar size and scope, and is approved by the manufacturer.

G. Store translucent panels on the long edge, above the ground, blocked and under cover to prevent warping.

H. Provide wrapping or strippable coating to protect prefinished aluminum surfaces. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

I. Warranty: Submit written warranty, executed by the manufacturer, agreeing to repair or replace translucent panels that fail in materials or workmanship within specified warranty periods:

1. Warranty against delamination; color change in excess of 8 Delta Units: 10 years after date of Substantial Completion, pro-rata after 5 years.

2. Warranty against exterior face surface erosion and reinforcing fiber exposure: 10 years after date of Substantial Completion.

3. Metal Finish: 10 years.

2.0 PRODUCTS

A. Translucent Faces: Manufactured by insulated skylight system fabricator specifically for architectural use on sandwich panels. Provide exterior face sheets with manufacturer's standard erosion barrier embedded within the resin. Standard commercial grade sheets, sheets faced with plastic film laminants, and thermoplastic (polycarbonate, acrylic) sheets are not acceptable.

B. Flammability for Interior Face Sheet: Flamespread rating no greater than 20 and smoke development no greater than 300 (unless otherwise dictated by sheet location or manufacturer requirement) when tested in accordance with ASTM E 84. Burn extent no greater than 1 inch per ASTM D 635.

1. The interior face sheet shall be UL Listed. Faces shall not deform, deflect or drip when subjected to fire or flame; or delaminate when exposed to 300°F for 25 minutes per UBC.

C. Weatherability:

1. Overall Degradation Factor: 10 or less; ASTM D 3841, Method B.

2. The full thickness of the exterior face shall not change color more than 4.0 Hunter or CIE units (Delta E by ASTM D 2244) after five years outdoor weathering South Florida at 45 degrees facing South, determined by the average of at least three white samples with and without a protective firm or coating to insure maximum, long term color stability. Color stability shall be unaffected by abrasion or scratching.

3. Face sheet shall not darken more than 0.2 Adams units (DELTA L by ASTM D 2244) when exposed to 150 degrees for two weeks.

D. Appearance:

1. The face sheets shall be uniform in color to prevent splotchy appearance.

2. Exterior Face Sheets: .070 inch thick [ ] color.

3. Interior Face Sheets: .045 inch thick [ ] color.

4. Faces shall not vary more than plus 10% in thickness.

5. Faces shall be completely free of ridges and wrinkles which prevent proper surface contact in bonding to aluminum grid core. Clusters of air bubbles and pinholes which collect moisture and dirt will not be acceptable.

E. Strength: Exterior face sheet shall be uniform in strength and repel an impact equal to 60 ft. lbs. without fracture or tear when impacted by a 3-1/4 inch diameter, 5 lb. free falling ball per UL 972, and be resistant to penetration by pencil point, or other small sharp objects. Tests relating to failure only at complete penetration will not be adequate.

F. Non-Combustible Grid Core:

1. Extruded Aluminum: ASTM B 221; 6063 Alloy, T6 or 6005-T5 Temper.

2. Fabricate extruded aluminum I-beams with provision for mechanical interlocking of muntin-mullion and perimeter to prevent high and low intersections which would interfere with full bonding surface to contact with face material. Width of I-beam shall be no less than 7/16 inch. Machine aluminum I-beam for the grid to tolerances of not greater than + .002 inch. Welded or web interlocked grid core not acceptable. Cardboard or fiberglass grid core is not acceptable.

3. Panels shall withstand 1200°F fire for minimum one hour without collapse or exterior flaming.

G. The laminate adhesive to bond fiberglass to aluminum shall be heat and pressure resin-type engineered for structural sandwich panel use, with minimum 25 years field use. Adhesive shall pass testing requirements specified by the ICBO Acceptance Criteria for Sandwich Panel Adhesive." Minimum strengths as follows:

1. Tensile Strength: 750 psi per ASTM C 297 before and after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.

2. Shear Strength: by ASTM D 1002, minimum after exposure to five separate conditions:

a. 50% relative humidity at 73°F: 540 psi.

b. Accelerated Aging by ASTM D 1037 at room temperature: 800 psi.

c. 182°F: 100 psi.

d. Accelerated aging by ASTM D 1037 @ 182°F: 250 psi.

e. 500 Hour Oxygen Bomb by ASTM D 572: 1400 psi.

H. Battens and Perimeter Closure Systems: Extruded 6063-T6 and 6063-T5 aluminum screw clamp-tite closure system.

1. Provide all battens and perimeter closures with 300 series self-tapping stainless steel screws. Aluminum battens and cap plates shall be field installed.

2. Receiving channels for self-tapping stainless steel screws to be continuous the length of each member and extruded as part of the member. Threaded receiving channel not acceptable.

I. Flexible Sealing Tape: Manufacturer's standard sealing tape preapplied to closure system at the factory under controlled conditions.

J. Perimeter Flashing: Sheet aluminum, ASTM B 208; 3003 alloy, H14 temper.

K. Aluminum Finish: High Performance Pigmented Organic Coating; Manufacturer’s factory-applied coating which meets or exceeds performance and test provisions of AAMA 2605 for ten years minimum and following requirements:

1. Minimum 70% PVDF (Kynar 500 or Hylar 5000) resin system base with pigmentation. Non-chalking, resistant to ultraviolet deterioration, atmospheric pollutants, most chemicals including acids, alkalies, gases, salt solutions and water, and be of uniform color throughout and colorfast.

2. Provide manufacturer’s standard 2 coat system, consisting of specially formulated inhibitive primer and fluoropolymer color coat with a minimum dry thickness of 2.5 mils.

3. The fluoropolymer coating shall remain adhered to the aluminum substrate with no blistering or peeling and color change shall be no greater than 5 delta E units after 10 years outdoor exposure at 7 degree south in South Florida.

L. Fabricate translucent panels to provide the following:

1. Thickness: 2-3/4 inches. [ ].
2. "U" Factor: [ ].
3. Light Transmittance: [ ].
4. Shading Coefficient: [ ].
5. Panel Deflection: Not to exceed 1.9 inches at 30 lbs. per sq. foot in 10 feet per ASTM E 72.
6. Grid Pattern: Selected by Architect from manufacturer's options.

M. Panel Fabrication:

1. Pre-assemble translucent panels and perimeter frame where practical and seal at factory. Ship panels to job site in rugged shipping units; ready for erection.
2. Translucent panels shall be a true sandwich panel of flat fiberglass sheet bonded to a grid core of mechanically interlocking extruded aluminum I-beams and laminated under controlled process of heat and pressure. Tape bond systems are not acceptable.
3. Adhesive bonding line shall be straight, cover entire width of I-beam and have a neat, sharp edge. In order to insure bonding strength, white spots at intersections of muntins and mullions shall not exceed 4 for each 40 sq. ft. of panel, nor shall they be more than 3/64 inch in width.
4. Rigidly fit and secure joints and corners. Make joints and connections flush, hairline, and weatherproof. Develop drainage holes with moisture pattern to exterior.
5. Prepare components to receive anchor devices. Fabricate anchorage items. Arrange fasteners, attachments, and jointing to ensure concealment from view.

3.0 EXECUTION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3. Where aluminum will contact pressure-treated wood, separate dissimiliar materials by methods recommended by manufacturer.

B. Installation:

1. Install system and perimeter flashings following manufacturer's instructions and final submittal and shop drawings.

2. Use method of attachment to structure permitting sufficient adjustment to accommodate construction tolerances and irregularities. Accommodate thermal and mechanical movements.

3. Provide alignment attachments and shims required to permanently fasten system to building structure. Align assembly free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

4. Clean all aluminum prior to application of sealant.

5. After other trades have completed work on adjacent material, carefully inspect translucent panel installation and make adjustments necessary to insure proper installation and weathertight conditions.

6. Fasteners holding down panels to primary structures shall be spaced and sized to comply with supporting engineering calculations.

7. Install framing components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.

C. Cleaning:

1. Remove protective material from prefinished aluminum surfaces.

2. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION

SECTION 09511

ACOUSTICAL CEILINGS

1.0 GENERAL

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Product Data: For each type of product indicated.

C. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items.

D. Samples: For each exposed finish.

E. Product test reports.

F. Research/evaluation reports.

G. Maintenance data.

H. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

I. Fire-Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Indicate rating, testing agency, and testing agency's design designation on Drawings.

2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84. Flame Spread: 25 or less in Smoke-Developed Index: 50 or less.

J. Seismic Standard: Comply with the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

2. CISCA "Guidelines for Systems Requiring Seismic Restraint": Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4".

3. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings".

4. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads".

5. Requirements of California Building Code, Title 24, Part 2, Section 2501A.5, and complying with D.S.A. Product Acceptance Document and requirements of D.S.A. IRM-3, Metal Suspension Systems for lay-in Panel Ceilings.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at Project site.

M. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to [5% for standard panels] [10% for non-standard panels] of quantity installed.

2.0 PRODUCTS

A. Acoustical Panel Standard: Comply with ASTM E 1264.

B. Metal Suspension System Standard: Comply with ASTM C 635 and D.S.A. Requirements.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung", unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: [Cast-in-place] [Expansion] anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to [Insert safety factor] times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to [Insert safety factor] times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Seismic perimeter stabilizer bars, seismic struts, and seismic clips.

F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

G. Classification: Provide [fire-resistance-rated] panels complying with ASTM E 1264 for type and form as follows:

1. Type III, mineral base with painted finish; Form [1, nodular] [2, water felted] [4, cast or molded].

2. Type IV, mineral base with membrane-faced overlay; Form 1, nodular; with [glass-fiber cloth] [washable vinyl-film] overlay.

3. Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with [vinyl overlay on face] [vinyl overlay on face and back] [vinyl overlay on face, back, and sealed edges] [fiberglass-fabric overlay on face].

4. Type XII, glass-fiber base with membrane-faced overlay; Form [1, plastic] [2, cloth] [3, other].

5. Type XX, other types; described as high-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.

H. Color: White, unless otherwise indicated.

I. Light Reflectance (LR): Not less than [Insert LR].

J. Acoustical Performance: Provide ceiling panels with minimum Noise Reduction Coefficient (NCR) as follows when tested in conformance with ASTM C 423 on a Type E400 mounting per ASTM E 795:

1. NRC: 0.65 for classrooms and offices.

2. NRC: 0.95 for rooms used for audio playback, audio recording, distance learning, and web-based broadcasts.

3. Ceiling Attenuation Class (CAC): Not less than [Insert CAC].

4. Articulation Class (AC): Not less than [Insert AC].

K. Edge/Joint Detail: [Square] [Reveal sized to fit flange of exposed suspension system members] [Flush reveal sized to fit flange of exposed suspension system members] [Beveled, kerfed and rabbeted] [Insert manufacturer's special proprietary edge detail].

L. Thickness: [Insert thickness].

M. Modular Size: [24 by 24 inches] [24 by 48 inches] [Insert size].

N. Double-Web,[Fire-Rated] Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A, not less than G30 coating designation, with prefinished [15/16-inch] [9/16-inch] wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.

2. End Condition of Cross Runners: [Override (stepped)] [Butt-edge] type.

3. Cap Material: [Steel] [Aluminum] cold-rolled sheet.

4. Cap Finish: [Painted white] [Painted in color as selected from manufacturer's full range] [Painted to match color indicated by manufacturer's designation] [Painted to match color of acoustical unit] [Plated with metallic finish, as selected from manufacturer's full range] [Plated with metallic finish indicated by manufacturer's designation] [Natural finish for aluminum].

3.0 EXECUTION

A. Comply with [ASTM C 636] [UBC Standard 25-2] [D.S.A. Standard] and seismic design requirements indicated, per manufacturer's written instructions and CISCA "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required [and, if permitted with fire-resistance-rated ceilings,] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.

2. Do not attach hangers to steel deck tabs [or to steel roof deck].

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

END OF SECTION

SECTION 09680

CARPET

1.0 GENERAL

A. Section includes Carpet and Carpet Tile.

B. Product Data: For each product indicated.

C. Shop Drawings: Show the following:

1. Carpet type, color, and dye lot.
2. Seam locations, if any.
3. Pattern type, repeat size, location, direction, and starting point.
4. Pile direction.
5. Insets and borders.
6. Edge, transition, and other accessory strips.
7. Transition details to other flooring materials.

D. Samples: For each color and texture required.

1. Carpet: 12-inch square Sample.
2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.
3. Carpet Tile: Full size sample.

E. LEED Submittals: Manufacturers' product data for carpet and carpet tile, and installation adhesive, including printed statement of VOC content.

F. Product Schedule: For carpet and carpet tile. Use same designations indicated on Drawings.

G. Maintenance data.

H. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

I. Comply with CRI 104, Section 5, "Storage and Handling."

J. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

K. Environmental Limitations: Do not install [carpet] [carpet tiles] until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

L. Do not install [carpet] [carpet tiles] over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by [carpet] [carpet tile] manufacturer.

M. Special Warranty for Carpet and Carpet Tile: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.

   1. Warranty Period: [Insert number] years from date of Substantial Completion.

N. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. for standard carpet and 10%, but not less than 20 sq.yd. for custom carpet.

   2. Carpet Tile: Full size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

2.0 PRODUCTS

A. Tufted Carpet Performance Characteristics:

1. Fiber Content: [100 percent nylon 6, 6] [100 percent nylon 6].

2. Pile Characteristic: [Insert characteristic] pile.

3. Pile Thickness: [Insert inches] for finished carpet per ASTM D 6859.

4. Face Weight: [Insert oz./sq. yd.].

5. Backing System: [Insert proprietary name].

6. Width: [12 feet] [Insert width].

7. Applied Soil-Resistance Treatment: [Manufacturer's standard material] [Insert treatment].

8. Antimicrobial Treatment: [Manufacturer's standard material] [Insert treatment].

9. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

10. Tuft Bind: Not less than [Insert tuft bind] per ASTM D 1335.

11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.

12. Electrostatic Propensity: Less than 3.5kV per AATCC 134.

B. Woven Carpet Performance Characteristics:

1. Fiber Content: [Insert fiber and content by percentage].

2. Face Construction: [Insert construction].

3. Pile Characteristic: [Level-loop] [Cut] [Cut-and-loop] pile.

4. Pile Thickness: [Insert inches] for finished carpet per ASTM D 6859.

5. Face Weight: [Insert oz./sq. yd. (g/sq. m)].

6. Backing: [Manufacturers standard.]

7. Applied Soil-Resistance Treatment: [Manufacturer's standard material] [Insert treatment].

8. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

9. Electrostatic Propensity: Less than 3.5kV per AATCC 134.

C. Carpet Tile Performance Characteristics:

1. Fiber Content: [100 percent nylon 6, 6] {100 percent nylon 6].

2. Pile Characteristic: [Level loop] [Cut] [Cut-and-loop] pile.

3. Pile Thickness: [Insert inches] for finished carpet tile per ASTM D 6859.

4. Surface Pile Weight: [Insert oz. /sq.yd.].

5. Backing System: [Insert proprietary name].

6. Size: [Insert dimension].

7. Applied Soil-resistance Treatment: [Manufacturer’s standard material] [Insert treatment].

8. Antimicrobial Treatment: [Manufacturer’s standard material] [Insert treatment].

9. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

10. Tuft Bind: Not less than [Insert tuft] per ASTM D1335.

11. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.

12. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).

13. Antimicrobial Activity; Not less than 2 mm halo of inhibition for gram-positive bacteria; not less than 1 mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.

14. Electrostatic Propensity: Less than 3.5kV per AATCC 134.

D. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by [carpet] [carpet tile] manufacturer.

E. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed [carpet] and [carpet tile] and is recommended or provided by [carpet] [carpet tile] manufacturer.

F. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

3.0 EXECUTION

A. Comply with CRI 104 and [carpet] [carpet tile] manufacturers' written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."

2. Carpet Tile Installation: Comply with CRI 104, Section 14, “Carpet Modules”, and with carpet tile manufacturer’s written installation instructions.

B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Carpet Tile Installation: As recommended in writing by carpet tile manufacturer.

D. Extend [carpet] [carpet tile] into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Install pattern parallel to walls and borders.

END OF SECTION

SECTION 09900

PAINTING

1.0 GENERAL

A. Adequately indicate on Drawing Schedules all items, interior and exterior, to be painted, including items not part of building such as railings and retaining walls. Indicate sheen level and color of each painted item.

B. Samples for Verification:

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

C. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to job bid and before start of painting project.

1. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA), including VOC content.

D. Deliver materials to Project Site in original, new and unopened packages and containers bearing manufacturer's name and label.

E. Storage: Store paint materials in a single suitable place in compliance with health and fire regulations. Keep such storage place neat and clean. Remove oily rags, waste and the like from building each night and take every precaution to avoid danger of fire.

2.0 PRODUCTS

A. Provide best quality commercial grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as standard, "best-grade product" will not be acceptable.

B. Unless otherwise specified or approved, use paint products of one manufacturer. Oils, thinners, dryers, primers and catalysts shall be as recommended and approved for use by manufacturer of Topcoat paint. Provide materials for use within each system that are compatible with one another and substrates indicated.

1. Generally, do not use oil-based or alkyd paints unless requested by Owner, specified, or recommended by paint system manufacturer.

C. Colors required or listed by Architect are not necessarily the stock colors available in any one particular manufacturer's range. The non-availability of the colors selected by the Architect will be sufficient reason to disqualify any manufacturer not capable of providing such colors.

D. High performance coatings that have a minimum 10 year life expectancy and warranty are recommended for areas subject to increased wear or abrasion. Discuss use of such coatings with Owner.

1. EXTERIOR H. P. COATING SCHEDULE

a. Ferrous Metal
(Exterior Aliphatic Urethane)

Prime Coat: Cross-Linked Cycloaliphatic Amine Epoxy

2nd & 3rd Coats: High Build Aliphatic Polyurethane (Satin)
or
Acrylic Aliphatic Polyurethane (High Gloss)

b. Galvanized Metal / Aluminum / Anodized Aluminum
(Exterior Aliphatic Urethane)

Pretreatment: (If Required) Cross-Linked Epoxy

Prime Coat: Cross-Linked Cycloaliphatic Amine Epoxy

2nd & 3rd Coats: High Build Aliphatic Polyurethane (Satin)
or
Acrylic Aliphatic Polyurethane (High Gloss)

2. INTERIOR H.P. COATING SCHEDULE

a. Ferrous Metal / Galvanized Metal / Aluminum / Anodized Aluminum

(Interior / Exterior Waterborne Acrylic)

Prime Coat: Multi-Purpose Waterborne Acrylic

2nd & 3rd Coats: Waterborne Acrylic (Gloss)
or
Waterborne Acrylic (Semi-Gloss)

b. Ferrous Metal / Galvanized Metal / Aluminum
(Interior / Exterior Waterborne Epoxy)

Prime Coat: Red or Gray Primer

2nd & 3rd Coats: Waterbased Epoxy

c. Concrete / Plaster / Brick Masonry
(Interior / Exterior Waterborne Epoxy)

Prime Coat: Acrylic Epoxy Masonry Primer

2nd & 3rd Coats: Waterbased Epoxy

d. Concrete Block Masonry

Prime Coat: Block Filler

2nd & 3rd Coats: Waterbased Epoxy

3.0 EXECUTION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

B. Clean and prepare surfaces to be painted following paint manufacturer's written instructions and as specified, for each particular substrate condition.

C. Moisture Content: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the maximum levels specified, or as otherwise recommended by the manufacturer.

D. Provide barrier coats over incompatible primers or remove and reprime.

E. Existing Painted Surfaces:

1. Before painting or finishing over existing paint or finishes, paint small inconspicuous locations representing each condition to test for compatibility. If problems are encountered, do not proceed without Architect’s instructions.

2. Do not apply water-base paints over existing oil-based painted surfaces unless surface has been “scuff-sanded” and properly primed with paint manufacturer’s recommended primer. Test original surfaces to verify where oil-based paints were used.

3. Apply coatings conforming to the respective schedules listed herein, except that pretreatments, sealers, fillers and prime coats need not be provided on surfaces where existing coatings are soundly adhered and in good condition.

4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces. Paint entire wall or ceiling surface to the nearest outside or inside corner.

F. Mix and prepare painting materials following manufacturer's directions.

G. Apply paint following manufacturer's printed directions. Use applicators and techniques best suited for substrate and type of material being applied. Apply additional coats in the event full coverage is not obtained or the required total thickness of paint does not comply with the mil thickness recommended by the paint manufacturer.

H. Backprime or seal immediately upon delivery to jobsite all wood, interior and exterior, scheduled for paint finish.

I. Protection: Protect work of other trades against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect. Protect floors and all adjacent surfaces from paint smears and droppings. Use dropcloths to protect floors. Cover fixtures and mask off areas where required.

J. Provide "Wet Paint" signs and barricades to protect newly-painted finishes. At completion of work of other trades, touch-up and restore damaged and defaced painted surfaces.

K. Upon completion of the work of this Section, deliver to the Owner an extra stock of one new gallon of each color, type, and gloss of finish (topcoat) paint used in the work, tightly sealing each container, and clearly labeling with contents and location where used.

END OF SECTION

SECTION 10101

VISUAL DISPLAY SURFACES

1.0 GENERAL

A. Submittals

1. Product Data: Include methods of installation for each type of substrate to receive units.

2. Samples: Submit samples for each type and color of markerboard, tackboard, trim and accessories required.

3. (Shop Drawings).

B. Unless otherwise acceptable to the Owner, furnish all visual display boards by one manufacturer for the entire project.

C. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.

b. Surfaces become slick or shiny.

c. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

2.0 PRODUCTS

A. Markerboards

1. Porcelain-On-Metal: Balanced, high-pressure laminated, 3-ply construction, with facing sheet, core, and backing.

2. Face Sheet: Enameling steel, not less than 24 gage.

3. Markerboard Cover Coat Finish: Manufacturer's special writing surface (SWS) with gloss finish intended for use with liquid chalk markers.

4. Core: Plywood or hardboard not less than 1/4 inch thick.

5. Backing Sheet: Manufacturer's standard 0.005 inch thick aluminum foil, or 0.015 inch aluminum sheet.

6. Backing Panel: Plywood or hardboard treated for moisture resistance, 1/4 inch thick. In lieu of separate 1/4 inch backing, board core may be 1/2 inch thick.

B. Tackboard

1. Natural Cork: Single layer 1/4 inch thick, seamless compressed fire-grain cork sheet, face sanded for natural finish, complying with MS MIL-C15116, Type I.

   a. Unless otherwise indicated, make up rigid panels by factory laminating under pressure to 1/4 inch thick plywood or hardboard backing.

2. Plastic Impregnated Cork: Seamless sheet, 1/4 inch thick with washable vinyl finish, of ground natural cork compressed with resinous binder and integral color throughout entire thickness and laminated to burlap backing.

   a. Unless otherwise indicated, make rigid panels by factory laminating under pressure to 1/4 inch thick plywood or hardwood backing.

3. Vinyl Fabric-Faced: Use only when directed by Owner.

C. General: Fabricate frames and trim of not less than 0.062 inch thick aluminum alloy, size and shape to suit type of installation. Provide straight, single-length units wherever possible and keep joints to a minimum. Miter corners to a neat, hairline closure. Provide manufacturer's standard "narrow" trim units, approximately 1/2 inch wide. Provide trim on all sides of units.

1. Finish for Exposed Aluminum Trim, Accessories and Fasteners: Satin anodized AA-M31A31.

2. Trim: [Provide snap-on trim, with no visible screws or exposed joints]. [Provide slip-on trim, to eliminate grounds]. [Provide screw-on trim, with Phillips flat-head screws].

D. Marker Trough: Provide continuous aluminum troughs for each markerboard.

[1. Box type, slanted front and cast aluminum end closures].

[2. Solid extrusion, manufacturer's standard ribbed section].

E. Map Rail: Provide map rail at top of each markerboard with the following accessories for each map rail:

1. Display rail; continuous cork approximately 2 inches wide, integral with map rail.

2. End stops; one at each end of map rails.

3. Map hooks with flexible metal clips; 2 for each 4 feet of map rail or fraction thereof.

F. Special Visual Display Units

1. Horizontal Sliding Panels:

2. Vertical Sliding Panels:

3. Swing Leaf Panels:

G. Assembly: Provide factory-assembled units unless field-assembled units are indicated.

H. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to the Architect.

I. Provide mullion trim at joints between markerboard and tackboard. Provide manufacturer's standard vertical joint system between abutting sections of boards, consisting of H-shape divider bar, maximum 1/2 inch face, color to match boards.

J. New units in existing facilities: Coordinate finish of trim with existing.

3.0 EXECUTION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work.

B. Install boards in locations and mounting heights as shown on the drawings and in accordance with the manufacturer's instructions. Provide all grounds, clips, backing materials, brackets and anchors, trim, and accessories for a complete installation. Anchor into solid blocking or framing.

C. Deliver factory-built units completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length, as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit at the factory, disassemble for delivery, and make final joint at a site. Use splines at joints to maintain surface alignment and smooth joints.

D. Coordinate job-assembled units with grounds, trim, and accessories. Join all parts with neat, precision fit.

E. Install units with concealed hangers plumb and level, in accordance with the manufacturer's printed instructions.

END OF SECTION

SECTION 10155

TOILET AND SHOWER COMPARTMENTS

1.0 GENERAL

A. Owner to advise which types to use based on the following options. This Section includes [phenolic-core] [solid-polymer] units as follows:

1. Toilet Enclosures: [Overhead braced] [Floor and ceiling anchored].

2. Entrance Screens: [Overhead braced] [Floor and ceiling anchored].

3. Urinal Screens: [Wall hung-flange supported] [Post supported; floor-to-ceiling post].

B. Submittals

1. Product Data: For each type of product indicated.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

3. Samples: For each exposed finish.

C. Products and layout to comply with California Building Code, ANSI A 117.1, and ADAAG.

2.0 PRODUCTS

A. Phenolic-Core Units:

1. Door, Panel and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch-thick panels. Core Color: Manufacturer’s Standard dark color.

2. Pilaster Shoes and Sleeves (Caps): Stainless steel, ASTM A 666, Type 302 or 304.

3. Brackets (Fittings): Full-Height (Continuous) Type: Manufacturer's standard design; [stainless steel] [aluminum].

B. Solid-Polymer Units

1. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

2. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design.

3. Brackets (fittings): Full-Height (Continuous) Type: Manufacturer's standard design; [extruded aluminum stainless steel].

4. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

C. Hardware and Accessories: Manufacturer's standard design, “institutional grade” heavy-duty operating hardware and accessories.

1. Material: [Clear anodized aluminum] [Stainless steel]. Do not use cast zinc alloy (zamac).

D. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

E. Support Posts for Urinal Screens: Manufacturer's standard aluminum post with floor shoe for anchoring to floor construction.

F. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

G. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

H. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

I. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.

2. Latch and Keeper: Manufacturer's standard [recessed] [surface-mounted] latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible.

3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible.

3.0 EXECUTION

A. Anchor through stud walls to solid wood blocking or metal backing plates furnished and installed under other sections. Attach to masonry walls with expansion bolts. Do not use nylon sleeves or toggles.

B. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.

b. Panels and Walls: 1 inch.

C. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10431

SIGNS

1 .0 GENERAL

A. Drawings, Data and Sample Submittals:
Submit Shop Drawings, Product Data and Samples for the work to be performed under this contract, within 30 calendar days from Award of Contract.

B. Engineering and Code Requirements: Sign Contractor shall provide all engineering of sign and graphic items including, but not limited to: footings, internal structure, electrical and mechanical parts. All items shall be engineered to satisfy all applicable codes and regulations shall be stamped by a Structural Engineer, and display a wet seal with signature on all drawings submitted for approval and review.

C. Prototypes: These must be approved by the Client prior to fabrication of any parts, panels or posts. Submit prototypes of any details that may affect design intent/exterior appearance, such as panel edge treatment.

D. The Contractor is responsible for protection of work. All work deemed unsatisfactory or damaged shall be replaced by the Contractor at his expense. Contractor shall submit a design mix for approval, 5 days prior to scheduling any concrete pours.

2.0 PRODUCTS

A. Aluminum Plate: For exterior surfaces of sign, provide 1/8" flat panel (not rolled stock), alloy #3003, H14 mill finish or as required to meet fabrication or engineering requirements.

B. Aluminum "U" Channels: Provide aluminum of the necessary shape, wall thickness and alloy to meet fabrication, engineering and code requirements.

C. Acrylic Plastic: Provide plexiglass as manufactured by Rohm & Haas or equivalent. Finish shall be clear unless otherwise noted on the Drawings.

D. Hardware: Provide and install all incidental hardware necessary for the proper functioning of the sign. Hardware shall be stainless steel.

E. Fasteners: Exposed fasteners shall be permitted only where specifically stated in the Drawings, and shall be stainless steel, and painted or finished to match adjacent surfaces, unless otherwise specified.

F. Stainless Steel Items: Provide a low carbon content stainless steel, alloy #302 or #304 of 18 gauge or thickness as necessary. If decorative or readily visible, verify finish and direction of grain with the Designer or as stated on the Drawings.

G. Vinyl: 3M premium grade vinyl unless otherwise specified, with a minimum 5 year exterior and 7 year interior guarantee.

H. Photopolymer Tactile and Braille: Exterior grade for all outdoor locations. Verify all current State and Federal codes in order to ensure that photopolymer tactile and Braille are in compliance.

I. Painting: Surfaces of all items requiring a painted finish shall be properly prepared. Tool marks and other imperfections shall be filled and sanded or buffed out. Joint filler shall be sanded flush and smooth. Clean surface before applying paint or letter by removing all chalk, dust, dirt and grease and oils. Sufficient primer coats or undercoats shall be applied to achieve a smooth and uniform surface. All painted items shall be spray painted, following the paint manufacturer's recommendation concerning thinning and application. Apply additional coats when undercoats, stains or other conditions show through the color coat of paint, until paint is of a uniform finish, color and appearance.

J. Panels:

1. Linear Polyurethane Paint: Provide pre-treatment and primer in accordance with manufacturer's recommendation. Add ultra-violet inhibitors to paint subject to sunlight exposure.

2. Clear Linear Polyurethane Finish: Provide pre-treatment, primer and finish coat in accordance with manufacturer's recommendation. Apply 1.5 to 2 mils to dry film thickness.

3. Graffiti Coat: Apply a non-yellowing, clear, low gloss hard film suitable for application on Linear Polyurethane on metal as a finish coat over all exterior signs. Follow manufacturer's instructions on number of coats for exterior use where spray can painting may be expected. Spray application per manufacturer's instructions. Verify gloss with the Designer prior to fabrication. Verify if the coating is to be permanent or sacrificial with the

designer prior to fabrication. Supply the Owner with written directions on graffiti removal procedures, per manufacturer's instructions.

K. Pre-cast Concrete Bases: After full curing and sandblasting of pre-cast concrete elements are complete, apply Graffiti Melt as manufactured by Genesis Coatings or equivalent and per manufacturer's recommendations. Provide cleaning and reapplication instructions to the Owner.

L. Silk-Screening: Inks shall have a light fastness rating of 7-8 on the din 16525 (Wool Scale) or equivalent industry standard. Ink type shall be acceptable to the manufacturer of the substrate used. Screens shall be 254 polyester monofilament, mesh tensioned to no less than 18 newtons. Ink coverage shall be even, uniform and opaque unless otherwise specified.

M. Individual Cut-Out Letters: Provide individual cut-out letters from acrylic, aluminum or stone in thickness and colors as noted on the Drawings, Computer Laser Cut or Water-Jet Cut as provided by Architectural Fabricators, Sacramento, CA or equivalent. The edges of all letters shall be fine sanded smooth without imperfections to match the face surface/texture or as noted on Drawings.

3.0 EXECUTION

A. Job Conditions: Installer shall examine the site condition, structures, substrata and other conditions under which the specialty signs are to be installed, and submit notes of Conditions detrimental to the proper and timely completion of the Work. The Work shall not proceed until unsatisfactory conditions have been corrected.

B. Excavation:

1. Excavated earth, spoils and debris shall be exported from site and disposed of off campus to a legal disposal site.

2. Over excavated sites made deeper than indicated on Drawings, may not be backfilled. Upon determination and with approval by the Owner, fill void with concrete as specified for foundation, at no additional expense to the Owner.

3. Contractor shall provide all equipment, barricades, trench plates, traffic control and related safety equipment as necessary to leave the site in a safe condition for campus use. Exposed trenches and open excavations must be properly secured prior to leaving the job site each day.

4. Work performed over landscaped and exposed irrigation area, may require the contractor to provide protection as necessary to prevent damage.

C. Sign Installation: Shall be carried out in a neat and proper manner equal to the finest quality standards of the signage industry.

D. Location Drawings: Shall be followed when installing signs and graphic items. Item numbers, which are found in the Graphic Schedule, identify specific sign units and their locations. Drawings show general location for each sign. Specific locations shall be determined by walking the Site with the Owner's Representative and Consultant. Sign Contractor shall provide removable numbered water-resistant stakes or labels as applicable for each sign to be placed at time of walk-through. Double stake to indicate width of sign and orientation to the roadway. Sign Contractor shall also field measure selected locations and note dimensions on their plan, should stakes be accidentally removed prior to installation.

E. Installed Signs: Shall be clean, properly aligned, level and true to line and dimension, flush to surface or as detailed and specified, free of excess visible adhesive, if used. Damage to sign or surrounding surfaces or other imperfections will not be accepted. Any code required labels and shut-off switches to be on exterior of sign shall be concealed from normal viewing and all other labels shall be located inside the sign enclosure.

F. Pin Fasteners: Where pins or other mechanical fasteners are used, also provide silicone or epoxy adhesive to prevent unauthorized removal of signs. All fasteners, structures and units must be structurally sound and comply with applicable code requirements and restrictions, including state seismic regulations.

G. Protective Materials: All wrappers, coverings, identifying stickers, papers, etc. shall be removed from the sign itself and the Site at the completion of installation.

H. Cleaning and Protection:

1. Damage to signs or surrounding surfaces shall be repaired to the satisfaction of the Owner, at no additional cost to the Owner and disposed of off campus.

2. During the process of work, remove daily all discarded materials, rubbish, cans, rags, etc. from the Site. Contractor's use of client's dumpsters is prohibited.

3. Upon completion of painting, clean or repaint all paint splattered signs and adjacent surfaces. Remove splattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

4. At completion of installation, clean all sign surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by the Owner.

5. Sign Contractor shall:

   a. Check all items for correct placement.

   b. Clean, oil and/or polish per by manufacturer's instructions.

   c. Remove all crating debris from the Site and leave premises in clean condition.

   d. Take special precautions to protect finishes.

   e. Clean sign material using only cleaners and methods in accordance with the manufacturer's instructions.

   f. Repair and repaint building surfaces, which are damaged by Sign Contractor's workers as a result of installation of sign items.

END OF SECTION

SECTION 10520

FIRE EXTINGUISHERS AND CABINETS

1.0 GENERAL

A. Section includes following:

1. Portable fire extinguishers.

2. Fire protection cabinets.

3. Mounting brackets for fire extinguishers.

B. Product Data: For each type of product indicated.

1. Fire Extinguishers: Include rating and classification.

2. Fire-Protection Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.

C. Samples: For each exposed cabinet finish.

D. Maintenance data.

E. NFPA and DSA Compliance: Fabricate and label fire extinguishers to comply with CCR, Title 19 and UFC Standard 10-1.

F. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

G. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

H. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

I. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, failure of hydrostatic test according to UFC Standard 10-1.

2. Warranty Period: [Insert number] years from date of Substantial Completion.

2.0 PRODUCTS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.

2. Extruded Shapes: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

E. Portable Fire Extinguishers: Provide fire extinguishers of type, size, and capacity for each [fire-protection cabinet] [mounting bracket] [fire-protection cabinet and mounting bracket] indicated.

1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B [and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging].

2. Multipurpose Dry-Chemical Type in Steel Container: UL-rated [1-A:10-B:C, 2.5-lb] [2-A:10-B:C, 5-lb] [3-A:40-B:C, 5-lb] [3-A:40-B:C, 6-lb] [4-A:60-B:C, 10-lb] [20-A:120-B:C, 20-lb] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

F. Fire-Protection Cabinet:

1. Cabinet Type: Suitable for specified fire extinguisher.

2. Cabinet Construction: [Nonrated] [1-hour fire rated] [2-hour fire rated].

3. Cabinet Material: [Enameled-steel] [Aluminum] sheet.

4. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

5. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Rolled edge trim with 2-1/2-inch backbend depth.

6. Cabinet Trim Material: [Steel sheet] [Aluminum sheet].

7. Door Material: [Steel sheet] [Aluminum sheet].

8. Door Style: Fully glazed panel with frame.

9. Door Glazing: Tempered break glass.

10. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

G. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, with plated or baked-enamel finish.

2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.

3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

H. Finishes:

1. Manufacturer’s standard baked-enamel paint for the following: Exterior of cabinet [door] [trim] except for those surfaces indicated to receive another finish. Interior of cabinet [and door].

2. Aluminum: [Baked enamel]. Color and Texture: [As selected by Architect from manufacturer's full range].

3. Steel: [Baked enamel, with minimum dry film thickness of 2 mils]. Color and Texture: [Match Architect's samples] [As selected by Architect from manufacturer's full range].

I. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish. Color: Red.

J. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2. Orientation: [Vertical] [Horizontal].

K. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.

1. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

L. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Miter and weld perimeter door frames.

M. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

3.0 EXECUTION

A. Examine walls and partitions for suitable framing depth and blocking where [recessed] [semirecessed] [recessed and semirecessed] cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

C. Prepare recesses for [recessed] [semirecessed] [recessed and semirecessed] fire-protection cabinets as required by type and size of cabinet and trim style.

D. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

E. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets with maximum projection of 2-1/2 inches.

2. Provide inside latch for break-glass panels.

3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

F. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

G. Identification: Apply [decals] [vinyl lettering] at locations indicated.

H. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

I. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair.

END OF SECTION

SECTION 10801

TOILET ACCESSORIES

1.0 GENERAL

A. Section includes following:

1. Public-use washroom accessories.

2. Public-use shower room accessories.

3. Warm-air dryers.

4. Childcare accessories.

5. Underlavatory guards.

6. Custodial accessories.

B. Product Data: For each type of product indicated.

C. Product Schedule:

1. Identify locations using room designations indicated on Drawings.

2. Identify products using designations indicated on Drawings.

D. Accessibility: Comply with requirements of CBC Section 1118B for mounting heights.

2.0 PRODUCTS

A. Toilet Tissue (Roll) Dispenser.

B. Paper Towel (Folded) Dispenser.

C. Paper Towel (Roll) Dispenser.

D. Waste Receptacle.

E. Combination Towel (Folded) Dispenser/Waste Receptacle.

F. Liquid Soap Dispenser: Designed for dispensing soap in liquid form.

G. Grab Bar: Mounting flanges with concealed fasteners.

H. Sanitary Napkin Vendor.

I. Sanitary Napkin Disposal Unit: [Recessed] [Partition mounted, dual access].

J. Seat-Cover Dispenser.

K. Fold-Down Purse Shelf: Hinged unit with spring-loaded shelf that automatically returns to vertical position.

L. Mirror Unit:

1. Hangers: Rigid, tamper and theft resistant installation.

2. Integral Shelf: 5 inches deep.

M. Shower Curtain Rod.

N. Shower Curtain.

O. Folding Shower Seat:

1. Configuration: L-shaped seat, designed for wheelchair access of phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect with stainless steel mounting mechanism, No. 4 finish.

P. Soap Dish.

Q. Warm-Air Dryer:

1. Electrical Requirements: [Insert electrical requirements].

2. Maximum Projection: 4 inches.

R. Diaper Changing Station:

1. [Horizontal] [Vertical] unit that opens by folding down from stored position and with child-protection strap. Engineered to support a minimum of [250-lb] [Insert weight] static load when opened.

2. [Surface mounted, with unit projecting not more than 4 inches from wall when closed] [Semirecessed, with unit projecting not more than 1 inch from wall when closed].

S. Diaper Pack Vendor.

T. Child Protection Seat:

1. Unit that opens by folding down from stored position and with child-protection strap. Engineered to support a minimum of [80-lb] [150-lb] [Insert weight] static load when opened.

2. Surface mounted, with unit projecting not more than [4inches] from wall when opened.

U. Underlavatory Guard: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping, and allow service access without removing coverings. Antimicrobial, molded-plastic, white.

V. Utility Shelf.

W. Mop and Broom Holder.

X. Provide vandal resistant toilet accessories at toilet rooms opening to exterior.

Y. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [Insert number] keys to Owner's representative.

Z. Material and Finish: No. 4 Stainless steel, unless indicated otherwise.

3.0 EXECUTION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

END OF SECTION

SECTION 11130

AUDIOVISUAL EQUIPMENT – SPEAKERS

1.0 GENERAL

1.1 SUMMARY

A. Provide speakers and wiring as shown and specified as necessary for a complete installation.

B. Related Sections include the following:

1. Division 16 Sections for electrical wiring, connections, and installation of remote control switches.

2. Section 01350 – LEED Program Requirements.

3. Section 01351 – Supplemental Environmental Procedures.

4. Section 09510 – Acoustical Tile Ceilings.

5. Section 09260 – Gypsum Wall Board.

1.2 REQUIREMENTS

A. All conduit, wireways and permanently installed junction boxes and equipment in floors, walls, ceilings, power wiring and breaker panels, and wiring, will be installed per Section 16 of the Specifications.

1.3 SUBMITTALS

A. Product Data: Submit manufacture’s specifications and installation instructions.

B. Shop Drawings: Indicate layout, adjacent materials, electrical connections, and details of installation.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain all ceiling loudspeakers from one source and from a single manufacturer. Obtain each ceiling loudspeaker as a complete unit, including necessary mounting hardware, a rear enclosure (back can), baffle, grille, front-mounting clips, acoustic batting, and other accessories.

B. Coordination of Work: Coordinate layout and installation of ceiling loudspeakers with other construction supported by, or penetrated through, ceilings, including light fixtures, HVAC equipment, fire suppression system, and partitions.

2.0 PRODUCTS

2.1 LOUDSPEAKERS

A. Ceiling loudspeakers shall be provided where shown on the drawings.

B. Ceiling loudspeakers shall be high quality with 6” cone drivers.

C. Ceiling loudspeakers shall provide the following minimum performance.

1. Nominal frequency response (-10dB): 90 Hz – 20 kHz.

2. Nominal sensitivity level: 89dB SPL (RMS), 94dB SPL (peak), 1W @ 1m (3.3 ft).

3. Power handling: 16 Watts (RMS), 25 Watts (Peak).

4. Dispersion: 130° (2kHz, -6dB).

5. Nominal impedance: 8 Ohms.

D. Ceiling loudspeakers shall be fitted with a baffle plate for mounting in a suspended ceiling. The loudspeaker shall be supported from building structure above the finish ceiling. The Architect shall approve the grille and baffle finish.

E. Ceiling loudspeakers shall be provided with all assembly accessories necessary for installation in a suspended ceiling, including, but not limited to, a rear enclosure (back can), baffle, front-mounting clips, and grille.

F. Ceiling loudspeaker back cans shall have an internal volume of not less than 0.17 ft^3, and shall be lined with minimum 5/16" thick acoustic batting of minimum density 2 lbs./ft^3.

G. Ceiling loudspeakers shall also be provided with 70.7-volt line high quality audio transformers. These transformers shall have a minimum of 4 secondary tapings, with a ratio of at least 8:1 between the highest and the lowest tapings (9dB power factor). Tapings shall be clearly labeled with the wattages. Transformers shall have a maximum insertion loss of 1dB.

H. Ceiling loudspeakers shall be Atlassound FA116T72 or equal, with appropriate mounting hardware as indicated on the drawings with appropriate mounting accessories and transformer as described above.

3.0 EXECUTION

3.1 SYSTEM ASSEMBLY AND INSTALLATION REQUIREMENTS

A. Installation shall include the following:

1. Uncrating, setting in place, fastening to walls, ceilings, or other structures where required of all equipment except as otherwise noted.

2. Equipment alignment and adjustment.

3. All other work whether or not expressly required herein which is necessary to result in a completely tested and operating system.

B. The Contractor shall provide all required structural work, including but not limited to ceiling openings, platforms, safety devices, rough and finished trim, painting, plastering, patching and acoustical treatment.

C. The Contractor shall provide the speaker assembly. The Contractor will install the back cans only. The loudspeaker parts not installed shall be stored in a safe manner by the Contractor for completion by the specialty Audiovisual Integrator.

D. All conduit, wireways and permanently installed junction boxes and equipment in floors, walls, ceilings, power wiring and breaker panels, and wiring, will be installed per Section 16 of the Specifications.

E. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three (3) times.

F. All equipment shall be plumb and square.

G. Accessories will be incorporated with appropriate finishes to match ceiling finishes. See architectural details.

3.2 CONTRACTOR PERFORMANCE

A. All assembly and material cutting shall be limited to a working area specifically designated for this purpose.

B. The Contractor shall take measures to protect all cabinets, casework, finished flooring, wall coverings, equipment, etc. from damage resulting from its work. This shall include the installation of temporary protective coverings. Any such damage shall be corrected by the Contractor at no additional cost to the Owner.

C. The Contractor shall be responsible for the proper alignment, adjustment and calibration of all public address equipment including equipment specified as Owner furnished equipment, and shall provide all personnel and test equipment for the system test and adjust.

D. The Contractor shall be responsible for verifying the compatibility of all public address equipment and related hardware with related work performed by others. This includes electrical, mechanical, structural, and all finish work.

3.3 TESTING

A. Audiovisual interface devices shall be tested for proper operation in accordance with the manufacturer's written instructions.

B. All test procedures, equipment and results shall be documented and submitted to the Owner as record documentation.

END OF SECTION

SECTION 11132

PROJECTION SCREENS

1.0 SUMMARY

A. This Section includes permanently affixed audiovisual projection screens as required to complete the work of this project.

2.0 PRODUCTS

A. Unauthorized Materials

1. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB), or other hazardous materials identified by the Owner.

B. Acceptable Manufacturers

1. Stewart Filmscreen

2. Draper

3. Da-Lite

4. Harkness Hall

5. Substitutions

C. Screen Details

1. Projection screens shall be provided within individual areas of the project as specified within the Audiovisual Drawings. Specifications include the following information:

2. Location

3. Type of Screen (e.g., front projection, rear projection)

4. Operation (e.g., electrical, manual)

5. Projected Image Area

6. Borders (top, bottom, and sides)

7. Projection Surface Material

D. Front Projection Screens

1. Screen Material (Viewing Surface):

2. Mildew Resistance: Provide mildew resistant screen fabrics as determined by FS 191A/5760.

3. Fire Test Response Characteristics: Provide projection screen fabrics identical to materials that have been tested for flame resistance according to both small and large-scale tests for NFPA 701.

4. Seams: Projection screens shall be constructed such that there are no visible seams within the viewable image area.

5. Edge Treatment: Provide black masking borders as indicated for each screen. Side tensioning cables shall be provided where indicated to maintain a flat image-viewing surface.

6. Top Treatment: Provide black drop at top as indicated for each screen.

7. Bottom Treatment: Provide a black border at the bottom as indicated for each screen. A continuous rigid batten shall be integrated at the bottom of the screen.

3.0 EXECUTION

A. INSTALLATION

1. Install projection screens at locations indicated to comply with the manufacturers written instructions.

2. Install front projection screens with screen cases in position and in relationship to adjoining construction as indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when the screen is in the lowered position.

3 Test electrically operated units to verify that the screen, controls limit switches, closure, and other operating components are in optimum functioning condition and that the screens meet all manufacturer's published performance specifications.

B. CLEANING AND PROTECTION

1. Protect projection screens after installation from damage during ongoing construction activity. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION

SECTION 11150

PARKING CONTROL EQUIPMENT

1.0 GENERAL

A. Submittals:

1. Product Data.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

3. Wiring Diagrams: Power, signal and control wiring.

4. Operation and Maintenance Data: For parking control equipment to include in emergency, operation, and maintenance manuals.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

E. Electrical System Roughing-in: Coordinate layout and installation of parking control equipment with connections to power supplies [perimeter security system] [and] [security access control system].

2.0 PRODUCTS

A. Pay & Display Multi-Space Parking Equipment:

1. Automated Parking Pay Stations (Pay and Display Machines) are utilized by the campus to provide visitors and students with the ability to purchase daily parking permits for use in valid student lots.

2. Each system is to be set to accept $1 bills, nickels, dimes & quarters. The system dispenses change when required in increments of quarters, dimes, nickels and dollar coins. System provides for a paper audit trail, supported by an electronic record of all transactions. The system is able to function as a single unit or operate in a networked environment using either wired or digital cellular technology. System is supported by software applications allowing for user manipulation of rate structure, system configuration, monitoring and transaction recording from a local or remote site.

3. Each system shall be compatible with the existing campus-wide pay station implementation program.

4. Pay and Display Machine to have reinforced steel case, in-ground steel mounting pedestal, liquid crystal display panel, coin and bill operation with optional credit card and smart card support, thermal printer, transaction storage and processing, and terminal and management software.

5. Basis-of-Design Product: "Vanguard Series" Pay Station as manufactured by Pacific Parking Systems, Inc., Irvine, CA.

3.0 EXECUTION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.

B. Examine roughing-in for electrical systems to verify actual locations of connections before parking control equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. [Ticket Dispensers] [Central Pay Stations] [and] [Exit Terminals]: Attach cabinets to concrete bases with anchor bolts or expansion anchors. Ground all electrical equipment.

E. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust field-assembled components and equipment installation, including connections. Report results in writing.

F. Remove and replace parking control equipment where test results indicate that it does not comply with specified requirements. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Adjust parking control equipment to operate smoothly, easily, and properly.

H. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain parking control equipment.

END OF SECTION

SECTION 12494

ROLLER SHADES

1.0 GENERAL

A. Section includes roller shades [and motorized shade operators].

B. See Division 16 Sections for electrical service and connections for motorized shade operation.

C. Product Data: For each type of product indicated.

D. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, [wiring diagrams,] and relationship to adjoining Work.

1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

E. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.

F. Samples: For each exposed finish and for each color and texture required.

G. Maintenance Data.

H. Installer Qualifications: Fabricator of products.

I. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.

J. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

K. Comply with WCMA A 100.1.

L. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

2.0 PRODUCTS

A. Shade Band Material:

1. Colors: [Match Architect's samples] [As selected by Architect from manufacturer's full range].

2. Material Solar-Optical Properties: [Insert requirements].

3. Material Openness Factor: [Insert number] percent.

4. Material UV Blockage: [Insert number] percent.

5. Black out fabric where scheduled for spaces with A/V capability.

B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide capacity for [Insert number] roller shade band(s) per roller.

C. Direction of Roll: [Insert direction] [as indicated on Drawings for double-roller shades].

D. Mounting Brackets: [Galvanized or zinc-plated steel] [Fascia end caps, fabricated from steel finished to match fascia or headbox].

E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; removable design for access.

F. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

G. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

H. Pocket with Ceiling Slot Opening: Six-sided box units for recessed installation; fabricated from formed-steel sheet, extruded aluminum, or wood; with a bottom consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing rollers, brackets, and operating hardware and operators within.

1. Corner Section: Factory formed and welded.

I. Bottom Bar: Steel or extruded aluminum [, with plastic or metal capped ends]. Provide [exposed-to-view, external] [concealed, by pocket of shade material, internal]-type.

J. Mounting: [Inside] [Outside] [Ceiling] [Recessed in ceiling pocket] [Wall extension brackets] [Bottom-up brackets] [As indicated on Drawings].

K. Shade Operation: Manual; with [spring roller] [continuous-loop bead-chain, clutch, and cord tensioner and bracket] [gear and crank] [cordless system] lift operator.

L. Shade Operation: Motorized operator.

M. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed. Do not install shades between jambs if distance to face of glass will be less than 2 inches.

2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

N. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting [fascia,] [headbox], roller, and operating hardware and for hardware position and shade mounting method indicated.

O. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

P. Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

Q. Comply with NFPA 70.

R. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6[with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc].

S. Electric Motors: UL-approved totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor Characteristics: Single phase, [24] [110] [220] V, 60 Hz.
3. Motor Mounting: Within manufacturer's standard roller enclosure.

T. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for specified mounting and operations.

U. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

3.0 EXECUTION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

E. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION

SECTION 13710

ACCESS CONTROL AND ALARM MONITORING SYSTEM

1.0 GENERAL

A. The work shall consist of the provision, installation, testing, documentation, demonstration and handover of a complete and fully functional access control and alarm monitoring system.

B. The system shall be an integrated security management system which shall provide subsystems performing the following general services:

1. Access control
2. Alarm monitoring
3. Cardholder Management
4. Badge Creation
5. System Administration
6. Badge Layout Creation
7. Screen/Forms Creation
8. Graphical Map Creation
9. Data Import
10. Reporting functions
11. Closed circuit television surveillance and assessment
12. Operations and Security Intercommunications
13. Fiber optic data and communications transmission

2.0 PRODUCTS

A. Approved Manufacturers:

1. Access Control System: GE Interlogix – Infographics Secure Perfect

2. Proximity Cards and Readers: GE Interlogix – Casi

3. Panic Stations: Code Blue, Ring Communications, Talk-a-Phone

B. Access Control System: primary function shall be to regulate access through specific doors and gates to secured areas of the building and provide computer generated color direct card credentials for that use. The system shall utilize a single seamlessly integrated database for both its access control and badging functionality under one operating environment (Microsoft Windows operating system, current version). There shall not be separate source code bases for the Access Control and Badging modules of the system

C. Computer System Hardware: Shall comply with the ECC Information Technology Services standard computer workstation specification as a minimum standard.

D. System Printers: The system shall support the connection of impact, ink jet and laser printers connected to either operator terminals, to the system CPU directly or by network terminal server.

E. System Software: shall be designed to support advanced distributed network architecture, where Intelligent System Controllers do not need to be home-run wired back to the database server. Intelligent system Controllers shall be wired to any server that is licensed to run the system software and shall be connected to a Local Area Network / Wide Area Network via industry standard TCP/IP communication protocol.

F. User Generated Graphics: The system shall support the creation of user-generated graphics for the purpose of event annunciation. The user-generated graphics may contain straight line drawings, interpolated curves, circles, and graphic text of various sizes and at various orientations.

G. Multi User: The system shall accept multiple CRT terminal consoles.

H. Online System Diagnostics: shall be provided for the purpose of determining the source of a fault in the system hardware or tuning the performance of the system software.

I. Third Party Software: The system shall run third party software concurrently with the security system software. When such third party software is running, the security system processes shall have priority access to the resources of the system (CPU, disk, etc.).

J. Privilege Levels: The system shall support the creation of privilege levels that define the commands that a system operator may access, and the nature of that access.

K. Access Control Sub System:

1. Shall have an extensive time/calendar/schedule control subsystem allowing designation of holidays and daylight savings using an embedded calendar. Access shall be capable of being defined for card holders according to time of day or day of week either as individual card holders or groups of card holders.

2. The system shall include a robust database management facility for entering, storing, and manipulating information about individuals to whom access credentials have been issued.

3. The system shall support a set of cardholder record data fields that are maintained by or accorded special significance by the system.

4. The system shall provide five (5) area control features: Hard Anti-passback, Soft Anti-passback, Timed Anti-passback, Two Person Control, and Occupancy Limit.

5. The system shall support a database search and retrieval facility (query facility) which allows a qualified user to retrieve data from the cardholder database by selecting fields to match.

6. The system shall, by means of a single command, change a single data field or multiple data fields in a group of selected cardholder records.

7. The system shall generate external data files (data export) from a group of selected cardholder records. The data files created by the data export facility shall be in ASCII text, suitable for transfer to and subsequent modification by a computer system other than the security system.

8. The system shall provide the facility to add records to the cardholder database from an external source in real-time.

9. The system shall include an elevator access control feature.

L. Alarm Monitoring Sub System: shall have an alarm monitoring capability for an unlimited number of supervised alarm points. When an alarm activates, the system shall use English text and graphic floor plan maps to indicate the source of an alarm and describe the necessary actions to be taken by security personnel.

M. CCTV Interface: The system shall be capable of automated control via an interface with any Closed Circuit Television (CCTV) system installed that utilizes ASCII commands. When the system receives an alarm from any monitoring point connected to the system, the system shall allow a minimum of three (3) ASCII control commands of up to 32 characters each relating to that alarm point to be sent to the CCTV system. For example, the string may command a CCTV camera to activate to a programmed CCTV monitor.

N. Management Sub System: shall provide a historical journal, historical reports, access statistics, cardholder reports and user customized reports. The system shall act as part of a local area network or wide area network with other computer systems. When connected to a network, users on remote systems shall be able to log onto the security system and to transfer files to and from the security system over the network. It shall be possible to add additional user terminals by connecting them to a terminal server device connected to the network rather than to an I/O port on the security system.

O. Third Party Interfaces: shall support multiple seamlessly integrated third party interfaces with hardware and software vendors. These interfaces shall be integrated such that the interfaces utilize a single graphical user interface, single source code base, and a single database for configuration, alarm, and event storage. The interface shall allow data to be organized for optimum performance with one application accessing a single bank of data. Any changes to system hardware shall be instantly available across the entire system.

P. Access Control Panels (ACP): The ACP shall be a self-contained, microprocessor controlled field panel. The panel shall serve as the data collection and communications interface between the Host and the various field devices such as card readers, alarm inputs and control outputs. The panel shall operate in host controlled, local decision or dial-up mode. Configuration information (i.e. card records, time commands, door/monitor point/control point configuration, etc.) shall be downloaded from the host computer. Local programming at the ACP or the use of EPROMs shall not be required. The system shall provide a network based ACP that has the capability to reside on a local area network (LAN) or wide area network (WAN) without connectivity to a PC serial port. Communications between the host computer and the ACP shall be provided via Category 6 UTP copper cables. Each ACP shall support a minimum of thirty-two (32) card readers per panel.

Q. Proximity Cards Readers: shall read the encoded data from the access card and/or transponder and transmit the data back to the host panel, giving an audible and visual indication of a properly read card and with a typical read range of 4" to 5.5" (10 - 14 cm). The readers shall be fully weatherized.

R. Proximity Cards: shall be "Passive" (non-battery operated) proximity technology with a permanent ink jet or laser engraved identification number printed onto it. Cards shall be capable of having a photo or image printed directly onto the surface of the card with a direct print printer with multicolor custom graphics.

S. Door Contacts: High Security Biased Magnetic Contact Switch Sets shall be recessed reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finished to match the door jamb. Units shall have a minimum of two encapsulated reed switches which, when activated, open and cross or open and ground a circuit. Surface mounted switches shall not be used.

T. Passive Infra Red Sensors: shall detect intruder presence by monitoring the level of infrared energy emitted by the objects within a protected zone. The sensor shall initiate an alarm upon observing the increased or fluctuating infrared energy caused by the presence and motion of an intruder which changes the temperature as little as 5 degrees F. The sensors shall be passive in nature; no transmitted energy shall be required for detection. The sensor shall alarm if an intruder moves within the area of protection more than 5 feet at a velocity of 0.1 foot per second, and one step per second, assuming 6 inches per step. The sensor shall not alarm in response to general area thermal variations. All passive infrared units shall be provided with anti-blinding features and shall alarm in the event that an intruder attempts to blind or obstruct the sensor.

U. External Panic Stations: shall be an easily identifiable, vandal resistant communications device that is Americans with Disabilities Act (ADA) compliant, multi-functional, wall mounted, and constructed of heavy stainless steel. The unit shall be aesthetically pleasing and virtually impervious to damage, and shall include a high quality, vandal resistant, hands-free communications device, and a powerful combination blue beacon and strobe that serves to identify the unit from a great distance.

3.0 EXECUTION

A. The Contractor shall furnish and install, in accordance with the manufacturer's instructions, all interconnect wiring, and equipment necessary for the provision of a complete system as described herein. All wiring termination, except 120 VAC power inputs and above door finish hardware device inputs, shall be the responsibility of the Contractor.

B. Electric locking hardware: shall be furnished and installed by the door hardware supplier. The Contractor shall be responsible for coordination with the door hardware supplier and final wiring and interconnection and testing of all devices.

END OF SECTION

SECTION 13720

CLOSED CIRCUIT TELEVISION SURVEILLANCE SYSTEM

1.0 GENERAL

A. The work shall consist of the provision, installation, testing, documentation, demonstration and handover of a complete and fully functional closed circuit television (CCTV) system.

B. The primary functions of the CCTV system shall be for alarm assessment and access control verification purposes, general surveillance and playback of events.

2.0 PRODUCTS

A. Approved Manufacturers:

1. Cameras: Panasonic, Philips, Pelco or equal and approved.

2. Digital Video Recorders: Panasonic, Philips, Loronix or equal and approved.

3. Monitors: Panasonic, Philips, Sony or equal and approved.

B. CCTV Cameras: shall have the capability to superimpose a camera number and scene title either by the camera or by some external device to each video signal for camera location identification, shall operate on 24 volts AC at 60 Hz, shall have electronic circuits which use all solid state devices, shall utilize a standard “C” lens mount and shall provide the option of selecting a sync signal or alternative means to provide a video display without video display roll.

C. Pan/Tilt/Zoom (PTZ) Cameras: shall provide a choice of field or variable-speed drives and contain an integral high resolution ¼ in. format camera with auto-focus. Units shall include preset positioning electronics. Outdoor units shall be weatherproof and be equipped with heaters and blowers for temperature control.

D. Lenses: shall have an automated light level metering device and an auto-iris and utilize weighted average light adjustment. Each lens shall have coated optics. Provide lenses from one (1) manufacturer.

E. Digital Video Recording System (DVRS): shall be digitally recorded simultaneously at a recording rate of 7.5 frames per second NTSC per camera of no less than 320x240 resolution. Live CCTV viewing shall be no less than 648x480 resolution. DVRS shall communicate using an Ethernet 10/100 Base T and shall use the TCP/IP protocol. DVRS shall have the ability to mix high motion recording cameras at different frame rates and record color, black and white and audio signals to an internal hard drive for immediate playback.

F. Camera Inputs: shall record at a minimum resolution of 320 x 240 lines compressed.

G. Additional Recorded Information: shall include date and time, input sources and alarms. This information shall be available at any time regardless to the location of the recording long or short-term medium.

H. Workstation Computer: Shall comply with the ECC Information Technology Services standard computer workstation specification as a minimum standard.

I. Video Controller: shall be interfaced to the access control and alarm management system and call up the camera view(s) for display on the primary input alarm cue-up monitor in the event of an alarm.

J. Monitors: shall be designed for continuous operation, incorporate printed circuit modular construction and shall accept standard composite video signals.

3.0 EXECUTION

A. The Contractor shall furnish and install all CCTV System control wiring, fiber optic cabling and all associated hardware and system components in accordance with the manufacturer's instructions. All wiring termination, except 120 VAC power inputs, shall be the responsibility of the Contractor.

B. All wiring and cabling shall be installed by the Contractor in accordance with National and local codes and shall be installed in conduit where shown on the plans.

C. Video equipment located in consoles and distribution areas shall be powered 120 VAC power supplies, cameras shall be powered from 24 VAC power supplies.

END OF SECTION

SECTION 13730

SECURITY INTERCOMMUNICATION SYSTEM

1.0 GENERAL

A. The work shall consist of the provision, installation, testing, documentation, demonstration and handover of a complete and fully functional security intercommunication to provide two-way audio or audio and video communications between various locations throughout the campus.

2.0 PRODUCTS

A. Approved Manufacturers:

1. Zenitel, TOA, Philips.

B. System: shall provide fast "duplex," (hands-free at both ends) voice communication as required to provide instant intercommunications for employees and visitors using a microprocessor controlled, fully "digital", PC programmable, central switching exchange type using individual (2) pair cable from the exchange to each station.

C. Main Exchange: shall provide all control, logic, signaling, "duplex" switching amplification, power and all operating feature. Shall have capacity for simultaneous conversations equal to the number of speech channels installed. There shall be (1) speech channel for every (6) subscribers.

D. Master Console: shall include a lightweight handset, dialing buttons 0-9; button for speech control and other functions; cancel button; privacy slide switch and variable volume control, 10 direct access buttons and shall be suitable for either desk mounting with a six foot cord and plug or wall mounting.

E. Substation: Shall be a tamper resistant, electronic substation with one (1) stainless steel call request push button, speaker, microphone with preamplifier and indication LED mounted on a Stainless Steel face plate. The call button shall be programmed to call a specific master.

F. External Panic Station: shall be an easily identifiable, vandal resistant communications device that is Americans with Disabilities Act (ADA) compliant, multi-functional, wall mounted or free standing and constructed of heavy stainless steel. The unit shall be aesthetically pleasing and virtually impervious to damage, and shall include a high quality, vandal resistant, hands-free communications device, and a powerful combination blue beacon and strobe that serves to identify the unit from a great distance.

3.0 EXECUTION

A. The Contractor shall furnish and install all Security Intercommunications System wiring and all associated hardware and system components in accordance with the manufacturer's instructions. All wiring termination, except 120 VAC power inputs, shall be the responsibility of the Contractor.

B. All wiring and cabling shall be installed by the Contractor in accordance with National and local codes and shall be installed in conduit where shown on the plans.

END OF SECTION

SECTION 13740

SECURITY EQUIPMENT CONSOLES AND CABINETS

1.0 GENERAL

A. The work shall consist of the provision and installation of security equipment consoles and cabinets.

2.0 PRODUCTS

A. Metal Casework: shall be modular, low-profile type constructed in accordance with the requirements of NEMA ICS-6 and allowing interchange ability of doors, drawers, shelves and accessories and relocation of units in different arrangements.

B. Ventilation: shall be adequately provided to allow heat dissipation from consoles and cabinets. Silent fan assemblies shall be added if heat removal cannot be otherwise assured.

C. 120 VAC Outlet Strips: shall be provided with all associated cabling inside consoles and cabinets. Outlets shall be supplied in sufficient quantities to provide power to all console equipment requiring 120 VAC power.

D. Security Locks: shall be provided for all doors and access panels.

E. Architects approval shall be obtained for all styles trims and colors.

3.0 EXECUTION

A. The Contractor shall furnish and install all Security Intercommunications System wiring and all associated hardware and system components in accordance with the manufacturer's instructions. All wiring termination, except 120 VAC power inputs, shall be the responsibility of the Contractor.

B. All wiring and cabling shall be installed by the Contractor in accordance with National and local codes and shall be installed in conduit where shown on the plans.

END OF SECTION

SECTION 13846

NETWORKED LIGHTING CONTROL

1.0 SUMMARY

A. Section Includes:

1. Networked lighting control system and components.

1.1 REFERENCES

A. Federal Communications Commission:

1. Standard for Radio Frequency Equipment.

B. Government Electronics and Information Technology Association:

1. EIA 709.1 - Control Network Protocol Specification.

C. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

1. UL 50 - Enclosures for Electrical Equipment.
2. UL 67 - Panelboards.
3. UL 508 - Industrial Control Equipment.
4. UL 916 - Energy Management Equipment.

1.2 SYSTEM DESCRIPTION

A. Provide networked lighting control system consisting of components manufactured by single source.

B. Provide networked lighting control system consisting of:

1. Multiple relay panels linked over network wiring using open protocol for communications.

2. Multiple relay panels linked over network wiring using open protocol for communications, and be fully compliant with EIA 709.1.

3. Relay panels and programmable switches connected together by networked wiring system extending from panel locations with single communications bus to allow switches to communicate with panels.

4. System connected to single time clock mounted in interior of relay panel.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.

1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches, data line, and network time clock.

2. Drawings for each panel showing hardware configuration and numbering.

3. Panel wiring schedules.

4. Include typical wiring diagrams for each component.

B. Product Data: Submit manufacturer's standard product data for each system component.

C. Manufacturer's Installation Instructions: Submit for each system component.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements. Submit in writing system has been installed, adjusted, and tested in accordance with manufacturer's recommendations.

E. Manufacturer's Field Reports: Submit system startup report indicating date of completion and acknowledgment of programming completion. Indicate acceptance of component and equipment installation, interconnecting wiring, and start-up of system software.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record the following information:

1. Wiring diagrams reflecting field installed conditions with identified and numbered, system components and devices.

2. Drawings for each panel showing hardware configuration and numbering.

C. Operation and Maintenance Data:

1. Submit manufacturer's published installation instructions, operating instructions, programming instructions, and operator's guide.

2. System user's guide and programmer's guide.

3. Instruction books and manufacturer's printed materials.

4. Recommended renewal parts list.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70 as applicable to electrical wiring work.

B. Comply with NEMA 250 for type of electrical equipment enclosures.

C. Provide panelboards with UL listing in accordance with UL 50, UL 67, and UL 916.

D. Provide equipment complying with FCC emissions' standards in part 15 subpart J for Class A application.

E. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing lighting control system listed in this section, with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept system components on site in manufacturer's packaging. Inspect for damage.

B. Protect components by storing in manufacturer's containers indoor protected from weather.

1.8 WARRANTY

A. Furnish five year manufacturer's warranty for each system component.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of system for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including checkout and adjustments.

B. Furnish service during working hours on breakdowns and malfunctions for this maintenance period.

C. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, with maximum 4 hour response time.

D. Perform maintenance work using competent and qualified personnel under supervision of manufacturer or original installer.

E. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.10 EXTRA MATERIALS

A. Furnish 20 percent of total number of relays.

B. Furnish two of each switch type.

C. Furnish two of each occupancy sensor type.

D. Furnish two of each photocell type.

E. Furnish one replacement key for each locking panelboard.

2.0 PRODUCTS

2.1 NETWORKED LIGHTING CONTROL SYSTEM

A. Manufacturers:

B. Product Description: Networked lighting control system consisting of the following components: relay panels, network wiring, programmable network wired switches, programmable clock, software, and capability of integration into building automation system.

2.2 RELAY PANELS

A. UL listed, NEMA 250 Type 1 enclosure sized to accept up to 48 relays.

B. Power Supply: Transformer assembly with two 40 VA transformers with separate secondaries. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes.

C. Cover: Hinged, locking configuration with wiring schedule directory card.

D. Interior: Bracket and intelligence board backplane with factory mounted and tested relays.

E. Furnish with integral DIN rail mounting bar to allow for installation of system components. Furnish terminals to accept network wiring for connection of switches to system, or to allow network wiring to be run between multiple panels for network communications between panels.

F. Furnish with individual on-off switches for both panel and network wiring power.

G. Furnish 8 channels in each interior regardless of size, each with associated pushbutton to toggle channel on-off, and terminal block for separate dry contact input. Each relay in panel capable of being assigned to each channel, with overlapping allowed. Furnish each channel pushbutton with LED state indication.

H. Furnish each channel pushbutton with LED status indication.

I. Relays:

1. Type: Momentary-pulsed mechanically latching contactors rated at 20 amps, 120 to 277 VAC attached to interior by plug-in type connector.

2. Locate next to each relay individual override button and LED to indicate status - relay on, relay off, or relay failure.

3. Furnish screw terminations for each wiring connection.

4. Furnish each channel button's dry control contact input terminal with capability of accepting 2 or 3 wire, maintained or momentary inputs and 2 wire toggling input.

5. Furnish each channel with isolated contact for use with status feedback or pilot light control.

6. Relay Panel records channel wiring assignments and current status of each relay, in non-volatile memory to prevent data loss on power failure.

7. Furnish LED status indication of power supply status. Furnish access to 24 VAC and 24 V rectified power for accessory devices within panel.

8. Interior uses relays with pilot contact to provide individual relay feedback to other systems. Locate terminal blocks next to each relay to allow standard low voltage switching devices to control relay state. Devices can be either 2 or 3 wire, maintained or momentary inputs. Devices also accept 2 wire toggling input.

9. System to comply with EIA 709.1 lighting controller profile and furnish capability for network connecting to EIA 709.1 compliant building automation system components without use of dry contacts, gateways, protocol converters or additional devices.

2.3 NETWORK WIRING

A. Material: 18/4 twisted conductor with shield meeting Class 2P requirements. Data line can be run in loop, serial, or star configuration. Minimum 1 turn for each 3 inches; 50 picofarads/foot maximum.

B. Maximum length: 1,500 feet.

C. Maximum number of devices: 127.

2.4 PROGRAMMABLE NETWORK WIRED SWITCHES

A. Function: Allow individual overrides. Switches terminated to network wiring of each panel.

B. Switch module buttons capable of being individually programmed and assigned to each of the following four functions:

1. Control each individual relay in single panel.

2. Control each group of relays in single panel.

3. Control each of 8 channels in single panel.

4. Control similar channel letter in each chosen group of panels in system.

C. For applications requiring pattern switching, each button performs function using “on-off-not controlled” pattern of relays instead of normal “all on-all off.”

D. Features:

1. Equipped with bi-color LED pilot light for individual buttons to indicate status of controlled relay or group of relays.

2. Equipped with locator light.

3. Furnish individual buttons with removable clear cover for labeling controlled loads.

4. Furnish single dual quad and octal switches with single master button capable of overriding every relay controlled by individual buttons to off position or capable of restoring them to their original state. Each switch unit master button function is capable of being configured to perform desired function.

5. Furnish dip switches on back of module prevent switch from turning off lights accidentally.

6. Each module available locking version. When key is inserted, individual buttons function for five minutes.

2.5 PROGRAMMABLE CLOCK

A. From each plug-in point on network wiring, time clock can be used to:

1. Schedule each 8 channel groups in relay panel network.

2. Program network wired switches.

B. Includes user selectable functions to handle standard lighting control functions for each channel independently. Selectable functions include:

1. Scheduled on and scheduled off.

2. Manual on and scheduled off.

3. Astronomical on and astronomical off with optional offset.

4. Astronomical on and scheduled off with optional offset.

C. Each channel capable of being assigned the following:

1. Time delay from 1 to 256 minutes.

2. Automatic blinking of lights before turning off to allow occupants opportunity to enter override. Time interval configurable.

D. Features:

1. Furnish clock with display and user interface.

2. Capable of being adjusted for leap year, daylight savings dates, and holidays.

2.6 SOFTWARE

A. Furnish plug-in capability for use in system commissioning, programming, monitoring, and control. Software capable of functioning with EIA 709.1 compliant network tool.

B. After programming of system parameters is completed, system allows each user-definable feature such as schedules, relay groups, switch assignments to be field modified without need for configuration software or system integration expertise.

2.7 BAS INTEGRATION

A. In addition to hardwired channel inputs, furnish system with capability for integration into building automation and control system without use of dry contact, gateways or protocol converters. Integration accomplished via network connections of EIA 709.1 compliant devices.

3.0 EXECUTION

3.1 INSTALLATION

A. Mount switches occupancy sensors and photocells as indicated on Drawings.

B. Label each low voltage wire clearly indicating connecting relay panel.

C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings.

D. Mount relay panels as indicated on Drawings. Wire numbered relays in panel to control power to each load.

E. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to clearly indicate originating panel's designation.

F. Terminate communication conductors and associated conduits external to factory supplied equipment.

G. Test relays and switches after installation to confirm proper operation.

H. Label each low voltage wire with relay number at each switch or sensor.

I. Install wiring schedule directory card affixed to rear of panel cover to identify circuits, relays, and loads controlled.

3.2 FIELD QUALITY CONTROL

A. Test relays and switches after installation to confirm proper operation and confirm correct loads are recorded on directory card in each panel.

3.3 MANUFACTURER'S FIELD SERVICES

A. System Startup: Furnish manufacturer trained, factory authorized technician to confirm proper installation and operation of system components.

B. Furnish services of factory trained representative for minimum of one day days for factory check, test, and start-up supervision. Perform the following services:

1. Check installation of panelboards.

2. Test operation of remote controlled devices.

3. Test operation of telephone override phone lines.

4. Test operation of network connections.

5. Test operation of central operator's station and associated printer.

6. Repair or replace defective components.

C. Programming: Furnish services of factory trained representative to perform programming of system. Assist Owner's personnel in developing control scenario for each application. Program Owner furnished control scenario.

1. Explain operation of control programs to Owner and conduct demonstration of project.

2. Provide programs on 3.5 inch diskette CD Rom.

3. Maintain copy of programmed information at factory.

3.4 ADJUSTING

A. Furnish factory trained technicians to functionally test each system component after installation to verify proper operation.

3.5 DEMONSTRATION

A. Demonstrate operation of the following system components:

1. Index system to occupied cycle and unoccupied cycle.

2. Operation of switches. Demonstrate for zones.

3. Operation of each type of occupancy sensors. Demonstrate for zones.

4. Operation of each type of photocell. Demonstrate for zones.

B. Furnish services of manufacturer's technical representative for 48 hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least 7 days notice to Architect/Engineer of training date.

END OF SECTION

SECTION 14240

HYDRAULIC ELEVATORS

1.0 GENERAL

1.1 SUMMARY

A. This Section: This section covers and includes the furnishing and installing of hydraulic elevator equipment as described herein.

B. Related Sections Include the Following:

1. Division 15 Sections for related electrical and communications work.

C. Related Work By Others:

1. General Contractor shall provide the following requirements which shall be in accordance with the requirements of the ASME A17.1 Code plus applicable Model Building Code. For specific rules, refer to ASME A17.1, Section 300 for hydraulic elevators. State or local requirements must be used in more stringent.

a. Hoistway

b. Machine Room

c. Structural

d. Electrical

e. Life Safety

1.2 SUBMITTALS

A. Shop Drawings: Show plans, elevations, sections and large-scale details indicating service at each landing, signal fixtures, machine room layout, maximum and average power demands, static loads imposed on building structure at points of support and relationships with other construction disciplines.

B. Samples: Provide finish color selection brochures and samples of sheet materials.

C. Schematics: Provide wiring diagrams.

D. Maintenance Manuals: Provide Renewal Parts Catalogs and Maintenance Instructions.

E. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.3 QUALITY ASSURANCE

A. Qualifications: The Elevator Contractor shall be a company specializing in manufacturing and installing elevator equipment with not less than 5 years successful experience utilizing non-proprietary elevator controls.

B. Codes: The Contractor shall abide by all existing laws, codes, rules and regulations set forth by all governmental units and regulatory authorities having competent jurisdiction over Elevator Contractor. Work shall be performed in accordance with the latest edition, including amendments, revisions, and/or changes.

1. ASME A17.1 Safety Code for Elevators and Escalators Code

2. California Building Code

3. ANSI/NFPA70 – National Electrical Code

4. California Administrative Code: Title 8, Group 3 including adopted sections of ANSI A.17.1 and CCR Tile 24

5. All codes having legal jurisdiction include requirements or which conflict with the ASME code

6. Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)

1.4 WARRANTY

A. The elevator contractor shall guarantee the material and workmanship of the equipment installed under these specifications for one year after the completion of the installation.

1.5 MAINTENANCE

A. Warranty Maintenance Service: Beginning at completion, provide twelve-month full monthly maintenance service by skilled employees of the elevator Installer.

1.6 PROPRIETARY INFORMATION

A. Any proprietary material, information or data contained in the equipment, or any component or feature thereof, remains the property of the Owner.

2.0 PRODUCTS

2.1 ELEVATOR SYSTEM AND COMPONENTS

A. Elevators No. [ ]

1.	Type:	[Holeless] [Under Car, In Ground, Single Cylinder]
2.	Service:	Passenger
3.	Capacity:	3,500 lbs.
4.	Speed:	125 fpm
5.	Travel:	[ ]
6.	Landings:	[ ]
7.	Front Open:	[ ]
8.	Rear Open:	[ ]
9.	Control:	Hydraulic Pump and Control Valve
10.	Operation:	Microprocessor Selective Collective
11.	Machine Location:	[Remote] [Adjacent]
12.	Power Supply:	480 Volts 3 Phase 60 Hz

13. Car Doors:

    a. Type: Center Side Opening

    b. Size: 3'- 6" x 7'- 0"

14. Car Enclosure:

    a. Type: Passenger

    b. Hoistway Width: 8'- 8"

    c. Hoistway Depth: 7'- 0"

    d. Hoistway Overhead: 14'- 6"

    e. Pit Depth: 5'- 6"

    f. Car Inside Width: 6'- 8" (avoid custom platform sizes)

    g. Car Inside Depth: 5'- 5" (avoid custom platform sizes)

    h. Car Inside Height: 9'- 6" (under ceiling)

    i. Side Wall Panels: Removable with Plastic Laminate

    j. Rear Wall Panels: Removable with Plastic Laminate

    k. Door Faces: Stainless Steel, No. 4 Satin Finish

    l. Door Sills: Aluminum

    m. Ceiling: Aluminum Frame with Egg Crate Diffusers

    n. Handrails: 1-1/2 inch Diameter Stainless Steel, No. 4 Satin Finish

    o. Flooring: Rubber with Raised Dots

15. Hoistway Entrance:

    a. Type: Center Opening

    b. Size: 3′- 6 ″ x 7′- 0″

    c. Frame: Stainless Steel No. 4 Stain Finish

    d. Doors: Stainless Steel No. 4 Stain Finish

    e. Sills: Aluminum

16. Signals and Fixtures:

    a. Car Buttons: Stainless Steel Tamper Resistant

    b. Car Operation Panel: Applied Stainless Steel

    c. Car Position Indicator: Digital in Transom

    d. Communication: Integral with Car Operating Panel

    e. Hall Pushbuttons: Stainless Steel Tamper Resistant

17. Auxiliary Operation:

    a. Standby Power

    b. Fireman's Emergency Service

    c. Battery Lowering Device

    d. Independent Service

    e. Disabled Access Requirement

    f. Key Operated Hoistway Access

    g. Car Top Inspection

2.2 APPROVED FINISH MATERIALS

A. Provide the following materials and finishes for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated:

1. Satin Stainless Steel: ASTM A 666, Type 304 with No. 4 directional satin finish.

2. Plastic Laminate: High pressure type complying with NEMA LD 3, Type HGP for post formed applications and Type HGS for flat applications.

2.3 ELEVATOR PERFORMANCE REQUIREMENTS

A. Riding Qualities of the Elevator: Contractor shall make any necessary adjustments to maintain an acceptable elevator ride, as determined by the Owner.

B. Elevator Car Performance:

1. Rated Contract Speed: Regardless of load, the variance from rated contract speed shall not exceed 5 percent in either direction.

2. Leveling: The elevator shall level within 1/8-inch, regardless of load or direction of travel.

C. Elevator Door Performance:

1. Door Performance Times:

a. Door Open: Doors shall go from the fully CLOSED position to the fully OPEN position in 2.0 seconds.

b. Door Close: Doors shall go from the fully OPEN position to the fully CLOSED position in 2.5 seconds.

D. Acoustical Performance: 50 dBA maximum sound level in cab during any phase of elevator operation. Excluding corridors and lobbies, 25 dBA maximum sound level in occupied spaces near elevator machine room during any phase of elevator operation.

2.4 OPERATING SYSTEMS

A. General: The features specified are minimum requirements. It shall be the responsibility of the Elevator Contractor to provide descriptive information of their system describing the various enhancements and their operation.

B. Simplex Operation (Note: For one elevator only)

1. One or more car or hall calls shall dispatch the car to the designated floors in the order in which the floors are reached by the car, not in order in which the calls were registered. Car and hall calls shall be canceled when answered.

C. Duplex Operation (Note: For two elevators only)

1. The operation shall be duplex selective collection with the two cars arranged to operate from a single riser of hall buttons. Duplex control shall be implemented with use of a microprocessor.

2.5 AUXILIARY OPERATIONS

A. Independent Service: A key operated switch shall be provided for each car for selecting independent service operation.

B. Key Operated Hoistway Access: Key operated switches shall be furnished in the hoistway entrance jamb or adjacent to the jamb at top and bottom floor for hoistway access.

C. Firefighters Emergency Service Phase I and II: Standard firefighters service operation to meet the specific job location requirements.

D. Battery Powered Lowering Device: In the event of a loss of normal electrical service, the battery powered lowering device shall automatically activate and return the elevator to the lowest landing and open the doors.

E. Disabled Access Requirements: The elevator equipment being provided shall be designed to conform to applicable A.D.A. and accessibility regulations.

F. Car Top Inspection: An inspection station shall be provided on top of the car for operation of the car at low speed by authorized personnel.

2.6 HYDRAULIC MACHINE ROOM EQUIPMENT

A. General: Arrange equipment to fit in machine room space to comply with N.E.C. Article 110-16a – Working Clearances.

B. Pump Unit

1. Provide belt driven positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

2. Motor shall be rated and capable of providing a minimum of 120 starts per hour.

3. Valve shall be integral type.

C. Oil Reserve: Provide oil reservoir (tank) with capacity equal to plunger displacement plus an additional 25 percent. Tank heaters, oil level gauge, and strainers shall be provided.

D. Hydraulic Silencer: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof pump unit and cylinder.

E. Elevator Controller:

1. Non-proprietary microprocessor based controller in NEMA I cabinet.

2. The supervisory unit shall be programmable to allow for on-site modifications.

3. Provide Nordic Soft Start rated at a minimum 57 percent of motor horsepower rating.

F. Piping: All piping shall be a minimum of schedule 80 with 500 pound working pressure with sound couplings to be installed in the feedlines between the pumping unit and the jack assembly.

2.7 WIRING AND TRAVELING CABLES

A. Wiring: All wiring shall be in strict compliance with applicable codes and adequately enclosed in raceway, conduit, or gutters.

B. Traveling Cables: 10 percent spares shall be provided in all traveling cables.

2.8 SIGNAL EQUIPMENT

A. Car Control Station:

1. An applied car operating panel shall be provided, manufactured from 1/8-inch stainless steel, No. 4 satin finish. The panel shall contain stainless steel tamper resistant floor call buttons corresponding to the number of floors served plus the standard devices of door open, door close, alarm, and emergency stop buttons.

2. The standard required cluster of devices shall be located at a centerline height of 35 inches from cab floor to comply with handicap requirements. All standard required devices and floor call buttons shall have handicap indications adjacent to them.

3. Engrave car operating panel. Engraving shall be filled with epoxy of contrasting color and shall be sized per code.

4. Provide a hands-free telephone meeting all A.D.A. regulations mounted behind a pattern of holes in the control operating.

5. Appropriate firefighters service key switch, jewel, fire, and call cancel button shall be provided in car operating panel.

6. All emergency light units shall be provided above the car panel in the ceiling.

7. Appropriate key switches for operating functions of the operating system provided in the face of the control operating panel.

B. Car Position Indicator: An electronic readout type position indicator shall be provided to give a visual indication of the car position and will be located in the transom over the car door opening.

C. Hall Pushbutton Stations: One riser of stainless steel tamper-resistant corridor call buttons shall be provided. The button assembly shall consist of a single illuminated button for each terminal and two illuminated buttons at each intermediate landing. All fastenings shall be tamper resistant.

D. Car Directions Lanterns: Car direction fixture with UP-DOWN lanterns shall be provided in each car door jamb. Cover plates to be stainless steel, No. 4 satin finish with tamper resistant design fastening.

2.9 DOOR OPERATING EQUIPMENT

A. Door Operator: A passenger-type master door operator shall be furnished to open and close the car and hoistway doors simultaneously.

B. Car Door Protection Device: Provide infrared curtain to have a minimum of 120 infrared beams of invisible infrared light to protect passengers against closing of elevator doors.

2.10 PASSENGER HOISTWAY ENTRANCES

A. Hoistway Entrances: Frames shall be formed of not lighter than 14-gauge steel with head and jamb sections bolted together. Finish of frames, stainless steel, No. 4 satin finish. Sound insulate the backside of frames.

B. Hoistway Doors: Doors shall be formed of not lighter than 16-gauge steel, door panels shall bear 1 ½ hour U.L. rating. Finish of doors, stainless steel, No. 4 satin finish.

C. Hoistway Sills: Sills shall be extruded aluminum.

2.11 HYDRAULIC HOISTWAY EQUIPMENT

A. Hydraulic Cylinder Assembly:

1. Hydraulic Cylinder: Hydraulic Cylinder is to be made from electric resistance welded ASTM-A53 Grade B pipe and must meet requirements of ANSI A17.1 Elevator Code.

2. Cylinder Head: Cylinder head and flange shall be made from carbon (60,000 PSI tensile) steel. They shall be designed for 500 PSI oil service at 65 degrees centigrade.

3. Packing: Packing shall be "U" type packing. The oil line return shall consist of two sets of packing with a lantern ring between. A wiper ring shall be provided.

4. Plunger: Plunger is to be manufactured from steel pipe (A53, Grade B) or equivalent mechanical tubing. Plunger shall be straight within 1/16-inch and ground to 24-32 or better micro-inch finish.

B. Scavenger Pump: Provide a float activated scavenger pump to return hydraulic fluid from elevator pit to machine room hydraulic fluid reservoir.

C. Pit Valves:

1. A code compliant gate valve shall be installed between the hydraulic cylinder and hydraulic pumping unit.
2. Overspeed Shut-Off Valve: Provide an Overspeed Shut-Off valve designed to provide protection against supply line failure or overspeed in the down direction and shall comply with ASME A17.1-1993 rule 2410.6 requiring seismic safety valves.

D. Pit Stop Switch: A stop switch shall be provided in the elevator pit.

E. Pit Ladder: A ladder shall be located in the elevator pit as required by code.

F. Limit Switches:

1. Normal and final terminal stopping devices shall be provided for the elevator at each terminal.
2. Final terminal stopping devices shall be provided and arranged to stop the car automatically from the speed specified within the top clearance and bottom over travel.

G. Buffers – Spring: Provide suitable spring buffers, with necessary blocking and supports, under the elevator car.

H. Car Sling: A car frame to support the elevator platform and enclosure shall be provided of adequate strength to support the finished cab, capacity, and platform along with all associated equipment.

I. Platform: A steel frame platform shall be provided for specified capacity and flooring. Connection to the frame assembly shall be isolated.

J. Car Guide Rails: The rails shall be T-Type of proper size to comply with specified loads and per codes. All guide rails shall be erected parallel to a maximum deviation of 1/8-inch, +/- 1/16-inch.

K. Rail Backing: Provide rail backing where the distance between support framing is greater than required by code.

L. Rail Brackets: The brackets shall be security mounted and designed to allow for proper rail alignment and shall be of sufficient strength for the rail forces based upon calculation per codes.

M. Guide Shoes: 3-inch rollers, adjustable spring-loaded guide shoes shall be furnished.

2.12 CAR ENCLOSURES

A. General: Provide metal cab as specified below by drawings and specifications attached.

B. Enclosure: Shall be manufactured from 14 gauge sheet steel and be 120-inches high. The canopy shall be manufactured from 12-gauge steel. Cab walls are to be insulated with sufficient sound deadening material.

C. Car Doors: The door panels shall be formed of not lighter than 16-guage steel. The bottom of the doors shall be provided with removable laminated phenolic guides, minimum 2, which run in the sill slots. Provide full-length neoprene astragals. Finish car sides with stainless steel, No. 4 satin finish.

D. Sills: Provide extruded aluminum. Grooves for the door guides shall have a minimum clearance for the guides. The sill shall be supported on steel brackets securely fastened to the structural supports.

E. Front Return Panels/Jambs: Provide fixed returns, fabricated from 14-guage stainless steel, No. 4 satin finish.

F. Interior Panels/Walls: Furnish ¾-inch thick removable stand off panels covered with plastic laminate (Finish to be as selected by Owner).

G. Handrail: Provide handrail on rear of cab as minimum. Handrail shall be manufactured from 1-½ inch diameter stainless steel, No. 4 satin finish.

H. Base and Reveals: Provide base below removable panels, vertical joints between panels, and other metal fabricated from stainless steel, No. 4 satin finish.

I. Ceiling and Lighting:

1. [Standard Ceiling and Lighting: Aluminum frame and tee bar ceiling grid with fluorescent light fixtures, 25-foot candles and egg crate diffusers.

2. [Custom Ceiling and Lighting: Furnish contractor's custom suspended ceiling fabricated from [No. 4] [No. 8] stainless steel applied to particle board and incorporate six low voltage down lights in ceiling.

J. Emergency Lighting: Furnish a self-rechargeable, battery driven, emergency car lighting sufficient to provide 5-foot candles at car threshold with doors closed.

K. Ventilation: Furnish two-speed, heavy-duty exhaust fan.

L. Emergency Exit: An emergency exit, meeting current code requirements, shall be located in the canopy.

3.0 EXECUTION

3.1 EXAMINATION

A. Examination of Site: Prior to commencing elevator installation, inspect hoistways, hoistway openings, pits, and machine rooms as constructed. Notify General Contractor, in writing, of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work.

B. Examination of Specifications: Contractors shall thoroughly examine the requirements of the specification. Should any discrepancies arise between the contract documents and the work to be performed or equipment to be provided, Contractor shall notify the Owner in writing of such discrepancies.

3.2 INSTALLATION

A. Manufacturer's Instructions: Comply with manufacturer's written instructions.

B. Codes and Regulations: Comply with applicable codes and regulations.

C. Equipment Installation: Install equipment to allow for ease of access for maintenance and repair and to promote a safe operating condition.

D. Welded Construction: Provide AWS standard welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation.

E. Sound Isolation: Mount rotating and vibrating equipment to vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

1. Acoustical Performance: Locate and install power units and hydraulic piping with the appropriate noise and vibration control treatments, as necessary, to conform with the maximum sound level limits specified elsewhere the contract documents.

F. Lubrication: Lubricate operating parts of systems as recommended by manufacturers.

G. Alignment: Installation of hoistway entrances shall be such that the alignment of the cars is accurate with the entrances.

H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with non-shrink, non-metallic grout.

I. Contract Speed: Speed variation under any loading condition in either direction shall be no more than 5 percent.

J. Leveling Tolerance: Leveling tolerance shall be 1/8-inch, up or down, regardless of load and direction of travel.

K. Manufacturer's Name: Manufacturer's nameplates, trademarks, or logos not permitted on surfaces that are visible to the public.

L. Final Clean-Up: At completion of installation, finishing touching shall include the following:

1. Clean machine room floor of dirt, oil and grease and brush-paint the floor with one coat of oil resistant paint.

3.3 FIELD QUALITY CONTROL

A. Permits: Contractor shall obtain and pay for all necessary municipal and state permits.

1. Acceptance Testing: Upon completion of elevator installation and prior to permitting use of elevators, at the Contractor's expense, conduct test

recommended by ASME A17.1 and governing regulations and agencies.

2. Operating Tests: Load elevators to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next.

B. Final Acceptance: Final acceptance will not be granted until all required testing has been performed and satisfied, discrepancies of the Contract Documents are satisfied, all Project Completion submittals provided to the Owner, permits and certificates received by the Owner.

3.4 DEMONSTRATION

A. Instruct Owner's personnel in proper use and operation of the elevator and demonstrate that operation systems and devices are functioning properly.

3.5 PROJECT COMPLETION SUBMITTALS

A. After completion of work and prior to final acceptance, submit the following documents. Final payment will not be made until received.

1. Maintenance Manuals, Parts Catalogs, and Operating Manuals.

2. As-Built Wiring and Straight Line Diagrams.

3. Maintenance/Diagnostic Tool (if required).

4. Inspection and Acceptance Certifications and Operating Permits: All required inspection certifications and operating permits as required per code.

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIAL AND METHODS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section supplements all Sections of this Division and shall apply to all phases of Work specified, shown on the Drawings, or required to provide for complete installation of mechanical systems for this Project. The Work required under this Division is not limited to the "mechanical" Drawings. Refer to site, architectural, structural, and electrical Drawings which may also designate Work to be accomplished. The intent of this Specification is to provide a complete mechanical system which includes all documents which are a part of the Contract.

B. Related Work Specified Elsewhere:

1. Refer to all Sections in Division 0, CONTRACT REQUIREMENTS, and Division 1, GENERAL REQUIREMENTS.

C. Work Installed but Furnished by Others:

1. Where the Drawings indicate points of connections to piping which are to be furnished and installed by others, the final connection are deem as part of this contract. Locations shall be determined from the drawings and/or from the site conditions.

1.2 QUALITY ASSURANCE

A. General Requirements.

1. All electrical Work performed under this Division shall be installed by competent craftsmen, skilled in the trade involved, and shall be installed in conformance with the National Electrical Code and applicable local codes.

2. Installation of all items shall be performed in strict accordance with all codes and regulations set forth by State, Local, and Federal authorities.

B. Requirements of Regulatory Agencies:

1. Codes and Ordinances.
   a. All Work shall meet the requirements of local codes, ordinances, and utility companies except adhere to the Contract Documents when more strict requirements are specified.

   b. Codes which govern mechanical Work in this Project are as follows:

      (1) California Building Code

      (2) California Mechanical Code

      (3) California Plumbing Code

      (4) California Electric Code

      (5) ANSI B3l.l - Code for Power Piping

      (6) ASME Boiler Code

      (7) NFPA Life Safety Code l0l

      (8) NFPA 90A

      (9) NFPA l3

      (10) Factory Mutual Standards

      (11) American Gas Association

      (12) California State Fire Marshal Regulations

C. Source Quality Control:

1. Manufacturer's Tests. All materials shall, so far as possible, be subjected to standard tests by the manufacturer before shipment.

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. Requirements for all shop drawings are specified in GENERAL CONDITIONS and 01600, PRODUCT REQUIREMENTS.

B. Operation and Maintenance Data:

1. Maintenance Manuals.

a. Furnish two sets of maintenance manuals, each containing items specified below. Furnish manuals to the Architect for review prior to giving them to the Owner during the time of the Contract and before final acceptance of the mechanical Work.

b. Definitions Applicable to the Maintenance Manuals.

(1) Literature. Any page (either whole or in part), sheet, drawing, or booklet describing the maintenance, operation, and parts of mechanical equipment, which is furnished either in the shipping carton, attached to the equipment, or otherwise prepared and distributed by the manufacturer for the user, not limited to papers submitted as shop drawings.

(2) Mechanical Equipment. All major items shown in the Mechanical Division Drawings and Work for which shop drawings are requested except the following: thermometers, expansion tanks, air separating tanks, insulation materials, vibration isolation equipment, plumbing drains and fixture carriers, boiler stack, and Work in Section 15810, DUCTS.

(3) Instructions. An outline written by the Contractor with information necessary to help the Owner apply the maintenance manual and simplify verbal instructions.

c. Collection of "Literature." Collect "literature" in like new condition, of all pieces of "mechanical equipment" until two copies of each are obtained. Copies soiled during construction will not be accepted.

d. Assembly of "Literature."

(1) Assemble "literature" in separate, multiples of two, 3-ring loose leaf binders, 2 inches (50 mm) size, with chrome-plated piano hinges and black hard coated covers.

(2) Small or large "literature" not easily inserted in binders shall each be put in heavy manila envelopes.

(3) Furnish each binder with plastic enclosed tabs on reinforced paper neatly arranged. Type each of the following on a separate tab.

(a) Instructions

(b) Valve Charts

(c) Accessories

(d) Lubrication

(e) Testing and Balancing Reports

(f) Each Specification and Title in the Project Specification for which "Literature" has been collected.

(4) File "instructions" envelopes and "literature" under correct tabs. Clearly identify each piece of "literature" and envelope with equipment name and numbers.

e. Valve Charts.

(1) Format. Arrange format of valve charts by rooms and sequence all valve numbers starting with mechanical equipment rooms and finishing with "occupied spaces."

(2) Information. Furnish the following information typed on valve charts for each valve furnished throughout the Project in the Mechanical Division, except check valves and automatic valves.

(a) Room numbers and name where valve is located, i.e. "ZG boiler room."

(b) Valve number assigned by Contractor and stamped on brass plate, i.e. "l47."

(c) Service medium using designation assigned to Drawings on mechanical symbols, i.e. "heating hot water supply" or "plumbing cold water."

(d) Valve types as specified in Section 15110, VALVES, i.e. ECCENTRIC PLUG VALVE or GATE VALVE.

(e) Function valve serves, i.e. "strainer shut-off" or "balancing valve."

(f) Zone identification, i.e. "AHU-2" or "auxiliary heating."

(3) Insert Charts in Manuals.

f. Lubrication Charts. Furnish a chart listing each lubricated piece of equipment, the proper type of oil or grease required, and recommended frequency of lubrication. Insert charts in manuals.

g. Accessories.

(1) Furnish the Owner with a complete equipment accessory schedule listing each piece of equipment and the related size, type,number required, and manufacturer of the following items.

(a) Filters

(b) Fan Belts

(c) Refrigerant Dryers

(2) Insert Schedules in Manuals.

h. Insert 2 copies each of correct testing and balancing reports in manuals.

2. Instructions in Operation.

   a. After all tests and adjustments have been made and the maintenance manual has been completed and given to the Owner, furnish one or more full-time qualified personnel as necessary to put the mechanical Work in continuous operation for a period of not less than 3 days, during which time the designated personnel's only purpose shall be to give complete operating and maintenance instructions to the operating personnel selected by the Owner, and furnish all service necessary for the proper operation and protection of the mechanical Work. Fuel, power, and other supplies required during this period will be furnished by the Owner.

1.4 JOB CONDITIONS

A. Existing Conditions:

1. Existing Pipe Lines.

   a. If any existing water, gas, or other pipes and appurtenances are encountered which interfere with the proper installation of new Work and which will not be used in connection with new Work, or existing systems, close such pipe in a proper manner, and if necessary, move or remove the pipes as directed by the Architect.

   b. Where existing Work is to be modified, it shall be done in conformance with the Specifications. Materials used shall be same as existing unless otherwise specified.

B. Sequencing, Scheduling:

1. Coordination of Work.

   a. Plan all Work so that it proceeds with a minimum of interference with other trades. Inform the general Contractor of all openings required in the building construction for the installation of mechanical Work. Provisions shall be made for all special frames, openings, and pipe sleeves as required.

   b. Verify local utility company's inspection requirements and abide by their rights of inspection before covering or otherwise concealing any piping, wiring, or equipment.

2.0 PRODUCTS

2.1 MATERIALS

A. Electrical.

1. All motors, starters, or any other electrical components furnished or installed under the mechanical Division shall be in complete compliance with Division 16, ELECTRICAL.
2. Unless otherwise specified, all electric motors, provided under this Division shall be 60 hertz.

   a. All fan and pump motors (except fire pumps, smoke exhaust fans and two-speed motors) (5) HP and larger shall be of the high efficiency type. Guaranteed minimum full load efficiencies shall be certified in accordance with IEEE Standard 112 Test Method B, NEMA MG-1-12.53a and shall meet or exceed the following minimum criteria:

GUARANTEED MINIMUM FULL LOAD EFFICIENCY		
Rated HP	Nominal 1180 RPM	Nominal 1770 RPM
5	86.5	86.5
7.5	86.5	88.5
10	88.5	88.5
15	88.5	90.2
20	89.5	90.2
25	91.7	90.2
30	90.2	91.7
40	91.7	91.7
50	91.7	93.0
60	91.7	93.0
75	93.0	93.0
100	93.0	93.6
125	93.0	94.1
150	93.6	94.1
200	93.6	94.1

3. Wiring Diagrams. Furnish a composite control and interlock wiring diagram of Work not in the mechanical Division but necessary to put equipment shown in the mechanical Division in operation.

B. Electrical.

1. Provide for each motor driven piece of equipment and all two-speed starters a "Dymo tape" identification tag, or 3M Tape shall be l/2 inch (l3 mm) wide with color and location as directed. Use same identification as shown on Drawings.

C. Access to Equipment

1. All motors, valves, control devices, equipment, specialties, etc. shall be located for easy access for operation, repair and maintenance. If items are concealed, provide access doors of size required for easy access to the items. Provide access doors of the types specified in Division 8, DOORS AND WINDOWS.

3.0 EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation

1. General

a. Cooperate with all other Contractors in furnishing material and information for correct location, in proper sequence, of all sleeves, bucks, inserts, foundations, wiring, etc.

b. All piping connections to equipment shall be made with unions or flanges to permit dismantling. Flanges and unions shall also be installed in the piping systems to permit disassembly consistent with good installation practice and as required for removal of connected equipment from place of installation.

2. All belt drives, flexible couplings, and other exposed rotating or reciprocating parts shall be covered with OSHA approved safety covers. Covers shall be permanent type and easily removable.

3. All motors and bearings shall be covered with watertight and dust-proof covers during construction period.

4. Sleeves, frames, and wall pipes shall be furnished and installed for all pipes and ducts, passing through concrete floors and walls and shall be coordinated with other trades. Special sleeves through floors and walls shall be installed in accordance with manufacturers printed instructions and as detailed.

a. All sleeves and frames through exterior floors and walls above ground and all interior floors and walls shall be black iron pipe unless otherwise noted. Sleeves and frames shall be of a size to accommodate the pipe or duct and insulation. Sleeves and frames shall be grouted in place with installation left smooth and finished to match surrounding surfaces.

b. Pipes passing through exterior floors and walls below ground, 3 inch (75 mm) and larger, shall utilize cast iron wall pipes unless noted or detailed otherwise. The wall pipe shall be used to convey the liquid or gas through the floor or wall without the use of sleeves. Wall pipes shall be furnished complete with end connections and adapters required to connect to the piping material. Size of wall pipe shall equal or exceed the maximum pipe size connected thereto. Wall pipes shall be integrally cast into floor or wall construction and provide the best possible seal at the exterior exposure. Wall pipes shall be manufactured by Clow.

c. Pipes passing through exterior floors and walls below ground, 2-1/2 inch (63 mm) and smaller, shall utilize black iron pipe sleeves as specified for aboveground in conjunction with a modular mechanical type seal as hereinafter specified.

(1) The modular mechanical type seal shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. Tightening of the bolts shall cause the rubber sealing elements to expand providing a watertight seal between the pipe and wall sleeve.

(2) The required inside diameter of the sleeve and the installation of the seal shall be coordinated with the seal manufacturer to provide a watertight joint. Seals shall be "Link Seal" manufactured by Thunderline Corporation. A seal consisting of a combination of a sleeve and a pressure clamping system manufactured by O. Z. Manufacturing is acceptable.

d. Cutting of openings and installation of sleeves and frames through exterior floors and walls above grade, and interior floors and walls shall be done in a neat, workmanlike manner. Openings shall be cut only as large as required for the installation.

(1) At fire-rated floor and wall penetrations, provide penetration sealant as specified in Division 7, THERMAL AND MOISTURE PROTECTION.

e. Sleeves and frames at floors and walls in concealed locations and in unfinished spaces such as mechanical rooms, etc. shall extend 1 inch (25 mm) from the finished surface. All other sleeves at floors shall extend 1/4 inch (6 mm) from finished floor surface, but shall allow placement of escutcheons. All other sleeves at walls shall be installed flush with finished surface.

f. Escutcheons for exposed pipe through floors and walls where exposed to view shall be provided and shall be chromium plated except where special escutcheons are required under plumbing fixtures. Escutcheons shall be sized sufficiently to conceal the floor or wall opening and sleeve.

5. Interference

a. Wherever piping runs on ceilings, arrange the run of the piping in such a manner that it does not interfere with grilles, light outlets or light fixtures.

6. Valves

a. Valves shall be provided on all piping wherever shown or specified using adapters where required. All removable or replaceable equipment shall be valved. All valves shall have a securely fastened stamped brass metal plate each bearing a different number identified in the maintenance manual.

7. Openings in Pipes

a. All openings in pipes shall be kept closed during the progress of the Work.

8. Lubrication

   a. Provide all lubrication for the operation of all equipment until substantial completion of the Project. Run in all bearings, and after they are run in, drain and flush bearings and refill with a new oil change. Refer to maintenance manual specification for lubrication chart.

9. Freeze Protection

   a. It shall be the responsibility of the Contractor during the warranty period to perform, in cooperation with the Owner's personnel, all operations necessary to protect the cooling system for winter protection, including but not limited to, draining water coils and cooling tower.

3.2 ADJUSTMENT AND CLEANING

A. Safety Devices. Thoroughly check all safety devices to assure proper operation and protection.

B. Service

1. Perform service on all mechanical Work until the date of substantial completion including oiling and greasing, adjustments, cleaning, packing of seals, and other items as recommended by equipment manufacturer in the maintenance manual hereinbefore specified.

2. Air filters.

   a. Do not operate air moving equipment having air filters unless temporary filters are in place to protect the mechanical Work.

   b. Clean or replace these temporary filters before final test and balance Work is begun as necessary for accurate readings. After completing the testing and balancing Work, replace temporary filters with new filter media as specified.

3. Strainers

   a. Remove, clean and reinstall each strainer screen as specified below after systems have been flushed as specified in other sections of

Division 15.

(1) Clean each strainer after all adjustments have been made and system has operated a minimum of 24 hours, but before final test and balancing operation is started.

(2) Clean each strainer again, after final test and balancing operation and before substantial completion of the Project.

b. Certain screens may remain out of the strainer body after removal during the final cleaning only as directed by the Architect.

4. Purge all air from water systems after each servicing.

a. Protect all furnishings and finishes during each servicing operation, and repair or replace to original condition, those damaged as a result of servicing.

5. Replace insulation removed or damaged after each operation. Leave insulation as specified in Section 15080, MECHANICAL INSULATION.

6. Contractor may coordinate servicing operations with Owner's operating personnel so as to coincide with time interval specified for instruction in operation.

7. Put system in full operating condition before substantial completion of the Project.

C. Alarms. Test and adjust alarms for satisfactory operation.

D. Tests and Adjustments. Upon completion of the installation and before substantial completion of the Project, the Contractor shall make all necessary tests and adjustments to place the system in a working condition. Systems shall be balanced as specified in Section 15950, TESTING, ADJUSTING AND BALANCING. The general operating tests shall cover a period of not less than 12 hours after completion of final testing and balancing, and shall demonstrate that the entire equipment is functioning in accordance with the Specifications. Furnish all instruments, test equipment, and competent personnel that are required for the tests.

END OF SECTION

SECTION 15060

HANGERS AND SUPPORTS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes piping supports complete.

B. All hangers, supports, anchors, and guides shall be in accordance with the following:

1. American Standard Code for Pressure Piping ANSI B-31.

2. SMACNA guidelines (latest edition) including all addenda.

C. Dielectric Protection. Furnish acceptable protection or copper plated hangers between ferrous and nonferrous metal pipe and hangers on all water piping.

2.0 PRODUCTS

2.1 MATERIALS

A. Horizontal Piping Hangers:

1. Provide one of the following types of hangers for horizontal piping manufactured by Grinnell, MW Sausse, or Elcen.

2. All Pipe Except Copper:

   a. Except as otherwise specified hereinafter, provide Clevis type, Grinnell Figure 260 or Figure 300 as required to keep the Clevis nut outside the insulation.

   b. At Contractor's option, provide adjustable swivel ring steel band hangers for piping 3 inches and below in lieu of Clevis hangers, Elcen Figure 89.

c. Where pipe exceeds maximum loading recommended for Clevis type hangers, furnish steel pipe clamp, Grinnell Figure 216.

d. For pipes 8 inches and larger, and where provision for expansion and contraction is required, provide single pipe-roll support with two rods and adjustable sockets, Grinnell Figure 171, or for pipe 12 inches and smaller, adjustable swivel pipe-roll with one rod, Grinnell Figure 174.

e. Provide trapeze hangers where several pipes can be installed parallel and at the same level, and fabricate from structural steel shapes. Use roller chairs Elcen Figure 17 or pipe-roll stands Elcen Figure 19 where provision for expansion is required.

(1) Spacing shall not be farther than the closest interval required for any size pipe supported thereby, or as necessary to prevent damage or failure to the structure.

(2) When trapeze hangers are not shown, furnish shop Drawings of installation where there is doubt of the structural capacity for concentrated loads.

3. Copper Tubing Support.

a. Hangers Touching Pipe. Provide copper plated hangers, split-ring extension hanger, Elcen Figure 398.

b. Hangers on Outside of Insulation. Furnish same as specified for steel pipe.

4. Floor Supports. Provide one of the following means of supporting horizontal piping from floor.

a. Where bottom of piping is less than 1 foot-6 inches (460 mm) above finish floor, furnish cast-iron pipe rests, Elcen Figure 48, with pipe nipples to suit. Fasten to floor.

b. Where bottom of pipe is higher than 1 foot-6 inches (460 mm) above finish floor and/or where provision for expansion is required, furnish pipe-roll stands, Elcen FIgure 19, without vertical adjustment, or Elcen Figure 20 with vertical adjustment as required. Provide concrete piers or unistrut rack and fasten stands to piers or racks.

5. Wall Supports. Provide one of the following means of supporting horizontal piping from wall.

    a. Furnish steel J-hook for pipe located close to wall, up to 3 inch pipe, Elcen Figure 46.

    b. For hanger suspension with 750 pound (280 kg) maximum loading, furnish light welded-steel bracket with hole for one rod, 3/4 inch (19 mm) diameter, Elcen Figure 56.

    c. For pipe-roll stand support, furnish welded-steel bracket, light for 700 pound (260 kg) maximum loading, Elcen Figure 56, medium for 1500 pound (560 kg) maximum loading Figure 57, heavy for 3000 pound (1120 kg) maximum loading Figure 58.

B. Vertical Piping Supports:

1. All Pipe Except Copper:

    a. Vertical pipe supports shall be steel extension pipe-clamps, Elcen Figure 39, refer to manufacturer's rated maximum loading for each size pipe. Bolt clamp securely to pipe, reset clamp-end extension on building structure.

2. Copper Tubing Support.

    a. For uninsulated vertical lines, provide copper finished steel riser clamp, Elcen Figure 339 or plastic coated steel riser clamp, Grinnell CT 121 C.

C. Beam clamps shall be malleable iron, Grinnell Figure 229 for 3/8 inch (9.5 mm) hanger rods, forged-steel beam clamp, Grinnell Figure 228 for hanger rod up to 1-1/2 inch (38 mm).

D. Inserts:

1. Furnish and set inserts in concrete forms. Provide reinforcing rods for pipe sizes over 3 inch or equivalent.

2. Concrete inserts shall be as follows. Black malleable iron universal type for threaded connections with lateral adjustment, Grinnell Figure 282 for pipe sizes up to 8 inch.

3. For pipes 8 inch and over or equivalent group of pipes on trapeze, use two or more inserts to prevent exceeding maximum loading.

E. Saddles and Shields:

1. Saddles

a. Heating piping and on all domestic hot water piping where water temperature exceeds 140 degrees F. (60 degrees C.).

(1) For all piping 2-1/2 inches and larger installed on clevis or ring supports provide Elcen Figures 251 thru 256, Carpenter and Patterson Figures 351 thru 356, Grinnell Figures 160 thru 166A, or Pipe Shields Model CS.

(2) For all piping installed on roller supports use the same saddles as listed above except use Pipe Shields Model CSX.

b. Cooling Piping

(1) For all piping installed on clevis or ring supports provide Elcen Figures 241 or 242, or Pipe Shields Model CS-CW.

(2) For all piping installed on roller supports provide Pipe Shields Model CSX-CW.

2. Shields

a. Provide shields to protect insulation in all areas where saddles are not specified to protect insulation at areas of contact with hangers and supports.

b. Provide Elcen Figures 219 or 240 or Grinnell Figure 167.

END OF SECTION

SECTION 15070

MECHANICAL SOUND, VIBRATION & SEISMIC CONTROL

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes all vibration isolators for mechanical equipment to prevent the transmission of vibration and mechanically transmitted sound to the building structure. It also includes adjusting each mounting system, and measurement of isolator system performance when so requested by the Architect. Specific mounting arrangements for each item of mechanical equipment shall be as described herein, and as indicated by schedules and details on the Drawings.

2.0 PRODUCTS

2.1 MATERIALS

A. Vibration Isolators

1. General Properties:

a. All vibration isolators shall have either known undeflected heights or other markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.

b. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range 50% above the design deflection.

c. The ratio of lateral to vertical stiffness shall not be less than 0.5 or greater than 1.0.

d. The vertical natural frequency for each support point, based upon the load per isolator and isolator stiffness, shall not differ by more than + or - 10%.

e. Wave motion through the isolator shall be reduced to the following extent: isolation above the resonant frequency shall follow the theoretical prediction based upon an undamped single degree of freedom system, with a minimum isolation of 50 decibels above 150 cycles per second.

f. All neoprene mountings shall have a shore hardness of 50 to 60 after minimum aging of 20 days or corresponding oven aging.

g. All vibration isolation equipment, including but not limited to, isolators, mountings, brackets, frames, etc., that are exposed to moisture or an outdoor environment shall be coated as follows:

(1) All steel parts to be hot-dipped galvanized.

(2) All bolts to be cadmium plated.

(3) All springs to be cadmium plated and neoprene coated.

h. Design deflections for vibration isolators shall be as listed in the Vibration Isolation Schedule, except in the event of unacceptable levels of vibration when the equipment is in operation, due to any of the resonances of the isolated systems coupling, by coincidence, with any of the resonances of the building structure. In this event, the contractor shall bear the cost of changing the isolators to alter the natural frequencies of the isolated systems so that the amplitude of structural vibrations is reduced to acceptable levels.

2. Type and Description

3. Type HN is a suspension hanger with a steel box frame and a molded neoprene in shear element. A neoprene grommet shall be provided at the location where the hanger rod passes through the hanger box so that no metal-to-metal contact occurs.

a. Type MS is a bare, steel spring isolator, free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4 inch neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Bolt holes shall be provided in the baseplate to permit attachment to the building structure where required.

b. Type MSL is a bare, stable, steel spring isolator, free standing and laterally stable with a 1/4 inch thick ribbed neoprene pad between the base plate and the support. Bolt holes shall be provided in the baseplate to permit attachment to the building structure. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Limit stops shall be provided to prohibit spring extension if the load is removed. These stops may also serve as rigid blocking during erection so that the installed and operating heights shall be the same. Clearance shall be maintained around restraining bolts and between the limit stops and the housing so as not to interfere with the spring action.

c. Type HS is a suspension hanger with a steel box frame and a steel spring resting on a neoprene cup. The cup shall contain a steel washer designed to distribute the load evenly to the neoprene and prevent its overload or extrusion. The spring diameter and hanger box lower hole size shall be large enough to permit the hanger rod to swing through a 30-degree arc before contacting the hole and short circuiting the spring. A neoprene grommet shall be provided at the location where the hanger rod passes through the hanger box so that no metal-to-metal contact occurs. Hangers shall be provided with an eye bolt, eye socket or hanger rod on the spring end as required.

d. Type CMS is a prefabricated spring isolation curb for rooftop equipment. The lower member shall consist of a rectangular steel tube containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All-directional neoprene snubber bushings shall be a minimum of 1/4 inch thick. Steel springs shall rest on 1/4 inch thick neoprene acoustical pads and be available with 1 inch, 2 inch, or 3 inch static deflection. Hardware must be cadmium plated or galvanized and the springs plated or provided with an approved rust-resistant finish. Weatherproofing shall be provided by a continuous flexible aluminum seal joined at the corners by a flexible frictionless neoprene bellows. The aluminum seal must be nailed over and provide counterflashing to the curb's waterproofing. Provision shall be made for access ports with waterproof covers at the spring location and 2-inch thermal insulation on the sides of the lower curb.

e. Type SF - Flexible Pipe Connectors: Flexible neoprene pipe connectors shall be used at pump connections. They shall be manufactured of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Straight connectors shall have two spheres. Neoprene elbows shall be manufactured with a single sphere forming the corner of the joint itself. Connectors up to and including 2 inch diameter may have threaded ends. Connectors 2-1/2 inches and larger shall be manufactured with floating steel flanges recessed to lock the connector's raised face neoprene flanges. All connectors shall be rated a minimum of 150 psi at 220 degrees F. All straight through connections shall be made with either flanged or screwed twin spheres properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure. Connectors shall be provided with control units, in accordance with the manufacturer's recommendations, to limit expansion.

f. Type HMN is a neoprene isolator incorporating a steel housing capable of resisting a seismic load of 1.0G in all directions. The mount shall consist of a captive steel insert embedded into a neoprene element which is enclosed by a steel housing which also includes floor mounting holes. The isolator shall have a rated deflection of 0.20 inches compression, 0.175 inches in tension and 0.125 inches in shear.

		Manufacturer's Code - Isolator Type			
Type	Description	M.W. Sausse (Vibrex)	Amber/ Booth	California Dynamics	Mason Industries
HN	Neoprene Hanger	HSS, HSSJ	Br	RH	HD
MS	Spring Mount	RMS	SW	SS	SLFH
MSL	Spring Mount with Limit Stop	RMLS	CT	OS	SKLR
HS	Spring Hanger	RMXA	BSA	CH30	30
CMS	Roof Top Isolation Curb	Vibrocurb II	RTIR	--	RSC
HMN	Housed Neoprene Mount	FUP-EQ	BRD	RQ	BR
SF	Flex Connector	CFLEX	2600	--	SFDEJ

Notes:
1. Availability - contact manufacturer
2. Notwithstanding this table, the manufacturer's isolator must meet all the requirements of this specification.

B. EQUIPMENT FRAMES

1. General. Mounting frames and/or brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.

2. Frame Types

a. Type A frame is a wide flange structural steel base rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases which may be "T" or "L" shaped. Pump bases for split case pumps shall include supports for suction and discharge base elbows. Pump bases for end suction pumps shall include supports for suction elbow or suction diffuser.

(1) All perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.05 inch. Height savings brackets shall be provided in all mounting locations to provide a base operating clearance of one inch.

b. Type B frame is a channel structural steel base with rectangular in shape for all equipment other than pump bases which may be “T” or “L” shaped. Pump bases for split case pumps shall include supports for suction and discharge base elbows. Pump bases for end suction pumps shall include supports for suction elbow or suction diffuser.

(1) All perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.05 inch. Height saving brackets shall be provided in all mounting locations to provide a base operating clearance of one inch.

c. Type C frame is a steel bracket or gusset welded or bolted directly to the machine frame in order to accommodate the isolator.

d. Type D frame is similar to Type B, except that the frame shall be filled to its depth with reinforced concrete. Perimeter steel members shall not be less than 6 inches deep. Air relief holes shall be provided as indicated in the details.

C. SEISMIC RESTRAINTS

1. Type I, Equipment Not Vibration Isolated:

a. Attach to the structure with attachments capable of resisting the forces resulting from the loading specified in Paragraph 1.04 above.

2. Type II, Vibration Isolated Equipment:

a. Mount all vibration isolated equipment on rigid steel frames as described in the vibration control specifications unless the equipment manufacturer certifies direct attachment capability.

b. Each vibration isolated frame shall have a minimum of four all directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment to the base and the structure.

c. The snubber shall consist of interlocking steel members restrained by snubbing material made of bridge bearing neoprene.

d. The snubbers shall contain an elastomeric one-piece bushing that is replaceable and a minimum of 1/4 inch thick. Snubber shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch or more than 1/4 inch. Shim snubbers as required to maintain clearances.

e. The snubber end cap shall be removable for inspection of snubber internal clearance.

f. The neoprene bushing shall be capable of rotation to verify that no short circuiting of the vibration isolator exists.

3. Type III, Seismic Restraint of Vibration Isolated Suspended Piping:

a. Use a slack cable system of a minimum diameter of 1/8 inch of steel at a minimum of 40 feet on center.

b. The cable size and attachment to the pipe and structure shall be designed and signed by a structural engineer licensed in the State of California.

c. Provide restraints for all trapeze mounted piping where the total supported weight is greater than or equal to a 1-1/2 inch pipe, except in equipment rooms where all trapeze mounted piping weight is greater or equal to 1-1/4 inch pipe.

d. Provide restrains for all piping 1-1/4 inch and larger located in boiler rooms, mechanical equipment rooms and refrigeration machinery rooms.

e. Provide restraints for all fuel gas and oil piping, medical gas piping and compressed air piping 1 inch and larger.

f. Submittal drawing shall indicate proposed method of vertical restraint.

g. Cable shall be installed with sufficient slack to avoid short circuiting the vibration isolation.

4. Type IV, Piping and Ductwork - Rigidly Supported:

a. Support all piping and ductwork systems per SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", 1991: NFPA Pamphlet 13 and State Building Code.

b. Provide restraints for all trapeze mounted piping where the total supported weight is greater than or equal to a 2-1/2 inch pipe, except in equipment rooms where all trapeze mounted piping weight is greater or equal to 1-1/4 inch pipe.

c. Provide restraints for all piping 1-1/4 inch and larger located in boiler rooms, mechanical equipment rooms and refrigeration machinery rooms.

5. Type V, Suspended Vibration Isolation Equipment:

a. Utilize a slack cable restraint system.

b. The cable size and attachment shall be designed and signed by a structural engineer licensed in the State of California.

c. Submittal drawing shall indicate proposed method of vertical restraint.

d. Cables shall be installed with sufficient slack to avoid short circuiting the vibration isolation.

D. AUXILIARY STEEL

1. General: provide auxiliary structural steel member for supports, anchors, guides, seismic restraints and vibration isolation for piping systems, where required for structural support.

2. All Structural steel systems to be designed in accordance with AISC Steel Handbook.

3. All systems to be secured to building structure in a method acceptable to and approved by the project Structural Engineer.

4. Steel Work: Fabricate neatly. Grind off excess burrs and welding spatter. Paint with rust inhibitive primer.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes the installing of nameplates, tags, stencils, pipe markers, ceiling tacks, labels and lockout devices.

2.0 PRODUCTS

2.1 MATERIALS

A. Nameplates

1. Manufacturers:

a. Craftmark Identification Systems.

b. Safety Sign Co.

c. Seton Identification Products

d. Substitutions: Section 01630 - Product Requirements.

2. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

B. Tags

1. Plastic Tags:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches (38 mm) diameter.

2. Metal Tags:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Brass with stamped letters; tag size minimum 1-1/2 inches (38 mm) diameter with finished edges.

3. Information Tags:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches (83 x 143 mm) with grommet and self-locking nylon ties.

4. Tag Chart: Typewritten letter size list of applied tags and location plastic laminated.

C. Stencils

1. Manufacturers:

a. Craftmark Identification Systems.

b. Safety Sign Co.

c. Seton Identification Products] Model

d. Substitutions: Section 01630 - Product Requirements.

2. Stencils: With clean cut symbols and letters of following size:

a. Up to 2 inches (51 mm) Outside Diameter of Insulation or Pipe: 1/2 inch (13 mm) high letters.

b. 2-1/2 to 6 inches (64-150 mm) Outside Diameter of Insulation or Pipe: 1-inch (25-mm) high letters.

c. Over 6 inches (150 mm) Outside Diameter of Insulation or Pipe: 1-3/4 inches (44 mm) high letters.

d. Ductwork and Equipment: 1-3/4 inches (44 mm) high letters.

3. Stencil Paint: As specified in Section 09900, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

D. Pipe Markers

1. Color and Lettering: Conform to ASME A13.1.

2. Plastic Pipe Markers:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

3. Plastic Tape Pipe Markers:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

4. Plastic Underground Pipe Markers:

a. Manufacturers:

(1) Craftmark Identification Systems.

(2) Safety Sign Co.

(3) Seton Identification Products] Model

(4) Substitutions: Section 01630 - Product Requirements.

b. Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

E. Ceiling Tacks

1. Manufacturers:

   a. Craftmark Identification Systems.

   b. Safety Sign Co.

   c. Seton Identification Products] Model

   d. Substitutions: Section 01630 - Product Requirements.

2. Description: Steel with 3/4 inch (19 mm) diameter color-coded head.

3. Color code as follows:

   a. HVAC equipment: Yellow.

   b. Fire dampers/smoke dampers: Red.

   c. Plumbing valves: Green.

   d. Heating/cooling valves: Blue.

F. Labels

1. Manufacturers:

   a. Craftmark Identification Systems.

   b. Safety Sign Co.

   c. Seton Identification Products] Model

   d. Substitutions: Section 01630 - Product Requirements.

2. Description: Laminated Mylar, size 1.9 x 0.75 inches (48 x 19 mm), adhesive backed with printed identification.

3.0 EXECUTION

3.1 Preparation

A. De-grease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

3.2 Installation

A. Apply stencil painting in accordance with Division 9.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

E. Install tags using corrosion resistant chain. Number tags consecutively by location.

F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with [plastic nameplates] [stencil painting]. Identify in-line pumps and other small devices with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify valves in main and branch piping with tags.

J. Identify air terminal units with numbered tags.

K. Tag automatic controls, instruments, and relays. Key to control schematic.

L. Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

M. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

N. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 Schedules

A. Piping Identification.

1. Pipe coding shall consist of stenciled legend, upon coded color bands on long straight runs. See Division 9, for color coding schedule. Apply the stencil at 20 foot (6 m) intervals. On short runs and complicated piping, apply as often as necessary for proper identification but not exceeding 10 feet (3 m) apart. Coding shall be applied to all piping in mechanical rooms, accessible chases and other accessible areas. They need not be coded in spaces that are not accessible.

2. Stencil legend shall be placed on the bottom half of the pipe, facing about 30 degrees downward toward either side. Where the view from this angle on the floor is obscured by other pipe or objects, place the stencil in the most visible position. All stencil lettering shall be with black paint.

3. System of pipe marking labels manufactured by Seaton Name Plate Corp., Brady Signmark Division, or Wilmington Plastics, can be substituted for stencils. If used, labels for each piping system must be reviewed by the Architect.

B. Size of Stencil for Various Pipe Sizes.

OUTSIDE DIAMETER OFPIPE OR COVERING	HEIGHT OF STENCILLETTER IN INCHES
3/4 (20 mm) to 2 inches (50 mm) incl.	1/2 inch (l3 mm)
2-1/2 (64 mm) to 6 inches (l50 mm)	1 inch (25 mm)
8 (200 mm) and over	3 inches (75 mm)

C. Pipe Coding Schedule.

1. Plumbing. See table 15075-1

2. Fire Protection. See table 15075-2

3. Heating. See table 15075-3

4. Air Conditioning. See table 15075-4

TABLE 15075-1

PIPING	STENCIL LEGEND
PLUMBING	
Cold Water	CW
Hot Water (105 °F)	HW 105
Hot Water Circulating	HWC
Drinking Water	DW
Non Potable water	CW - DO NOT DRINK
Gas	G
Soil and Waste	W
Vents	V
Storm Drains	S

TABLE 15075-2

PIPING	STENCIL LEGEND
FIRE PROTECTION	
Fire Lines	F
Fire Sprinkler Lines	FS

TABLE 15075-3

PIPING	STENCIL LEGEND
HEATING	
Hot Water Supply	HWS
Hot Water Return	HWR

TABLE 15075-4

PIPING	STENCIL LEGEND
AIR CONDITIONING	
Refrigeration Suction	RS
Refrigeration Liquid	RL
Refrigeration Discharge	RD

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes the installing of material, and type of material required for the insulation of all mechanical equipment. Locations of insulation and acoustical duct liner are specified in this Section.

2.0 PRODUCTS

2.1 MECHANICAL INSULATION

A. Manufacturers. Owens Corning, Certain Teed, or equal.

B. Tape. Wherever tape is used for sealing purposes, it shall be of type and applied as recommended by the nonconductive covering manufacturer. Where recommendation is lacking, the tape used shall be sealed with 3M adhesive EC-1329.

C. Insulating Cement. Insulating cement shall be Owens-Corning 110 mineral wool, all purpose cement. Where insulating cement is applied to pipe fittings in concealed locations, it shall be "one coat" cement.

D. Pipe Insulation. Pipe insulation shall be multi service type suitable for all lines operating from -0 to 850 degrees F. (-18 to 454 degrees C.). Insulation shall be one piece consisting of glass fibers bonded with phenolic resin and molded into a hollow cylinder covered with a factory applied vapor barrier jacket. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system. It shall be of a type suitable for installation on piping systems. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

1. Thermal conductivity (Btu/hr square foot degrees F./inch) (Watt/Meter-Kelvin) shall not exceed the following:

a. At 75 degrees F. (25 degrees C.) mean temperature 0.23 (0.033)

b. At 100 degrees F. (40 degrees C.) mean temperature 0.25 (0.036)

c. At 200 degrees F. (90 degrees C.) mean temperature 0.30 (0.039)

2. Pipe Insulation with factory applied all-service jacket (ASJ) and two-

component adhesive closure system, rated for a maximum service temperature of 850°F (454°C). For large pipe sizes where SSL-II is not available, the single adhesive SSL closure may be substituted.

Circumferential joints shall be sealed by butt strips having a two-component sealing system. Stapling is not required to complete the closure. When self sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F (65°C). Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed.

3. When multiple layers are required, all inner layer(s) shall be No Wrap.

4. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. If humidity’s in excess of 90% are expected, the ASJ shall be protected with either a mastic coating or a suitable vapor retarding outer jacket. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

5. Vapor barrier jacket shall be heavy duty all service jacket (ASJ) consisting of laminated aluminum foil, glass reinforcing and kraft paper. Perm rating shall be 0.01.

E. Duct Insulation. All duct insulation shall be fiber glass blanket with a vapor barrier facing suitable for either heating or cooling service. Thermal conductivity (Btu/hr square foot degrees F./in) (Watt/Meter-Kelvin) shall not exceed 0.25 (0.036) at 75 degrees F. (25 degrees C.). Density shall be .75 lbs. cubic foot (12 kilogram/cubic meter).

1. The finished duct system shall meet the requirements of NFPA 90A and 90B.

2. Duct wrap insulation shall meet the requirements of ASTM C 1290, Type III, to maximum service temperature of 250°F (121°C). Facing material shall meet the requirements of ASTM C 1136, Type II, when surface burning characteristics are determined in accordance with ASTM E 84 with the foil surface of the material exposed to the flame as it is in the final composite.

3. All supply ducts, return ducts and related fittings shall be insulated with one of the following as designated on project plans and specifications.

a. Owens Corning Fiberglas All-Service Duct Wrap.

1) Type 75, 0.75 lb./cu.ft. (12 kg/m3) density: 1.5", 2", 2.2" or 3" (38mm, 51mm, 56mm or 76mm) thick

b. The duct wrap insulation shall consist of a blanket of glass fibers factory-laminated to a reinforced foil/ kraft (FRK) vapor retarder facing with a 2" (50mm) (min.) stapling and taping flange on one edge. Vapor barrier jacket shall be heavy-duty vapor barrier (FRK) consisting of laminated aluminum foil, glass reinforcing and kraft paper. Perm rating shall be 0.01.

F. Flexible Duct Insulation.

1. Flexible duct insulation shall be factory applied or field applied as follows.

a. Insulation shall be adhered to the duct with Benjamin Foster 85-15, adhesive applied in 6 inch (150 mm) strips around the duct on 12 inch (300 mm) centers. Tying cord or twine shall be used to secure the insulation. Vapor barrier at butted joints shall be sealed with 3M vapor barrier tape. Where insulation is furnished with vapor barrier flange, flanged joint shall be sealed with vapor barrier mastic.

G. Acoustical Duct Liner.

1. Acoustical duct liner shall be flexible type using long fiberglass with a smooth firmly bonded fire-resistant surface to prevent erosion of the insulation. Thermal conductivity shall not exceed .24 Btu/hr square foot degrees F./in (.03 Watt/Meter-Kelvin) at 50 degrees F. (10 degrees C.) mean temperature. Noise reduction coefficient (NRC) shall not be less than 0.70 based on acoustical materials test, mounting No. 6. Liner shall be adhered to interior of ducts with Benjamin Foster 85-15 adhesive, completely coating all duct surfaces. Mechanical fasteners shall be used on top and sides for ducts exceeding 24 inches (600 mm) in height or width and shall be spaced 18 inches (450 mm) on centers. Lining shall meet the NFPA requirements for internal duct application and shall have a minimum density of 1.5 pounds per cubic foot (24 kilogram/cubic meter). All duct liner shall be marked with the density located so as to be visible on the exposed surface of the liner. Air friction correction factor shall not exceed 1.05 at 2000 fpm (10 meter/second) and 1.2 at 4000 fpm (20 meter/second).

2. All supply ducts, return ducts and related fittings shall be insulated with one of the following as designated on project plans and specifications.

a. Owens Corning AeroflexPLUS Acoustical Duct Liner, for service at internal air velocities not to exceed 6,000 fpm (30.5 m/s):

1) Type 150, 1", 1.5" or 2" (25mm, 38mm or 51mm) thick.

2) The duct liner shall have a black pigmented coating on the air stream side to resist damage during installation and in service. Edges shall be factory coated with the same black pigmented coating to comply with SMACNA HVAC DCS.

H. Glass Fiber Semi-Rigid Board Insulation.

1. Glass fiber semi-rigid board insulation shall be 3 pounds per cubic foot semi-rigid board material of long fiberglass with resin binder. Thermal conductivity shall not exceed 0.24 Btu/hr square foot degrees F./in (0.035 Watt/Meter-Kelvin) at 50 degrees F. (10 degrees C.) mean temperature. Insulation shall be applied to the inside of housing with 50 percent coverage of adhesive. Benjamin Foster 85-15 and suitable mechanical fasteners spaced 12 inches (300 mm) on centers.

2. Insulation shall be coated on one side with a neoprene compound to securely bond fibers against erosion in air stream.

3. Owens Corning Fiberglas Duct Liner Board, for service at internal air velocities not to exceed 4,000 fpm (20.3 m/s):

a. 3.0 pcf (48 kg/m3) density, 1", 1.5" or 2" (25mm, 38mm or 51mm) thick.

b. The duct liner shall have a black pigmented coating on the air stream side to resist damage during installation and in service. Edges shall be factory coated with the same black pigmented coating to comply with SMACNA HVAC DCS requirements.

I. Exterior Pipe Insulation Jackets.

1. Aluminum. Aluminum jacket shall be 0.016 inches (0.406 mm) thick, Type 3003 or 5005 alloys, with 3/16 inch (4.76 mm) longitudinal or circumferential corrugations. Jacket shall have an acceptable factory-applied vapor barrier on the inside and shall be applied using aluminum straps over transverse joints. Corrugations shall match from one section of cover to the other. On vertical runs the upper cover shall lap over the lower cover and the seams shall be

toward walls, horizontal seams shall be on the bottom of the run. Fitting and valve jackets shall be factory fabricated and of the same material as the pipe jacket.

2. Plastic. Provide plastic jacketing and fitting covers by Ceel-Co. Jacket thickness shall be 0.028 inches (0.71 mm) and shall be suitable for temperatures from minus 40 to 180 degrees F (40 to 83 degrees C.). Jacketing shall be provided with a minimum 1 inch overlap. All longitudinal and circumferential seams shall be welded together as recommended by the manufacturer. Provide Ceel-Co. Series 330 UVR (Ultraviolet Ray Resistant) PVC plastic jacketing.

J. Equipment Exteriors Requiring Vapor Barrier.

1. Glass fiber semi-rigid board insulation. Use 3 pounds per cubic foot (48 kilogram/cubic meter) material of long fiberglass with resin binder. Thermal conductivity shall not exceed. 4 Btu/hr square foot degrees F./in (0.035 Watt/Meter-Kelvin) at 100 degrees F. (40 degrees C.) mean temperature. Impale grooved and shaped boards on pins spaced 12 inches (300 mm) on center and securely fasten with self-locking metal caps swabbed with vapor barrier mastic, Owens Corning, Type C.

2. All insulation edges and butt joints are to be sealed with Owens Corning Type C pressure sealing tape. Insulation shall be faced with a vapor barrier jacket consisting of laminate of 0.001 inch (0.025 mm) aluminum foil and pre-sized glass cloth.

K. Heated Duct and Equipment (above 250 degrees F.) (120 degrees C.).

1. Provide glass fiber semi-rigid board insulation suitable for temperatures up to 450 degrees F. (230 degrees C.). Use 6 pounds per cubic foot material of long fiberglass with resin binder. Thermal conductivity shall not exceed .24 Btu/hr square feet degrees F./IN (0.035 Watt/Meter-Kelvin) at 100 degrees F. (38 degrees C.) mean temperature. Impale grooved and shaped boards on pins spaced 12 inches (300 mm) on center and securely fasten with self-locking metal caps. All insulation edges and butt joints are to be sealed with Owens Corning Type H pressure sealing tape. Insulation shall be faced with pre-sized glass cloth.

L. Refrigerant Pipe Insulation.

1. All refrigerant suction piping along with all attached fittings and valves shall be insulated with flexible plastic cellular type insulation, intended by the manufacturer for refrigerant service. The insulation shall be factory molded to fit the pipe snugly. The insulation shall be applied and sealed vapor tight in accordance with the manufacturer's Specifications. The wall thickness of the insulation shall be 3/4 inch (20 mm) for low temperature piping and ½ inch (13 mm) for all other temperature systems. The insulation shall meet the requirements of the MIL-P-15280 and MIL-P-24.

M. Pre-molded Pipe Fitting Covers.

1. Covers shall be factory pre-molded one-piece polyvinyl chloride (PVC.). Covers shall have a snow-white finish and shall withstand surface operating temperatures from 35 to 150 degrees F. (2 to 65 degrees C.) continuous usage. All covers shall conform to Federal Specification L-P-535, Composition A, Type II, and shall be Ceel-Co Series 100, Certainteed "snap-form" or Zeston.

TABLE 15080 - 1

INSULATION THICKNESS FOR NOMINAL PIPE SIZES (INCHES)								
SYSTEM	TEMP RANGE	Runouts upto 2	1 AND LESS	1 ¼ TO 2	2 ½ TO 4	5 AND 6	8 AND UP	JACKET
Cold Domestic Water	Any		0.5	0.5	0.5	0.5	0.5	All Service (ASJ)
Storm Drainage and Condensate Drain	Any		0.5	0.5	0.5	0.5	0.5	All Service (ASJ)
Space Heating Systems (steam, steam condensate and hot water)	> 350 ° F (>152 ° C)	1.5	2.5	2.5	3.0	3.5	3.5	All Service (ASJ)
	251 - 300 ° F (122 - 149 ° C)	1.5	2.0	2.5	2.5	3.5	3.5	All Service (ASJ)
	201 - 250 ° F (94 - 121 ° C)	1.0	1.5	1.5	2.0	2.0	3.5	All Service (ASJ)
	141 - 200° F (61 - 93 ° C)	0.5	1.5	1.5	1.5	1.5	1.5	All Service (ASJ)
	105 - 140° F (41 - 61° C)	0.5	1.0	1.0	1.0	1.5	1.5	All Service (ASJ)
Chilled Water or Brine	40 - 60 ° F (4.5 - 16 ° C)	0.5	0.5	0.5	1.0	1.0	1.0	All Service (ASJ)
	<40° F(4.5° C)	1.0	1.0	1.5	1.5	1.5	1.5	All Service (ASJ)
Service water heating systems	>105° F (41° C)	0.5	1.5	1.5	1.5	1.5	1.5	

TABLE 15080 - 2

INSULATION FOR ENGINE EXHAUST			
SYSTEM	LOCATION	INSULATION	JACKET
Engine Exhaust 1,200 F (650 C) and Silencer	All Piping including Silencers	4 inch (100 mm) thick Calcium Silicate	Aluminum or Insulating Cement and Glass Cloth

TABLE 15080 - 3

VALVE AND FITTING JACKETS		
SYSTEM	LOCATION	JACKET
Hot Water Domestic	All Concealed	Glass Cloth and Adhesive or Pre-molded Cover
Hot Water Domestic	All Exposed	Pre-molded Cover
Hot Water Heating	All Concealed	Glass Cloth and Adhesive or Pre-molded Cover
Hot Water Heating	All Exposed	Pre-molded Cover
Cold Water Domestic	All Concealed	Glass Cloth and Vapor Barrier or Pre-molded Cover
Cold Water Domestic	All Exposed	Pre-molded Cover
Chilled Water Piping	All Concealed	Glass Cloth and Vapor Barrier or Pre-molded Cover
Chilled Water Piping	All Exposed	Pre-molded Cover
Steam	All	Glass Cloth and Adhesive
Condensate Return and Pumped Condensate	All	Glass Cloth and Adhesive
Storm Drainage Piping	All Concealed	Glass Cloth and Vapor Barrier or Pre-molded Cover
Storm Drainage Piping	All Exposed	Pre-molded Cover
Air Handling Unit, and Fan-coil Unit Condensate Drain Piping	All	Pre-molded Cover
Engine Exhaust (1200 degrees F.) (650 degrees C.)	All	Aluminum or Insulating Cement and Glass Cloth

END OF SECTION

SECTION 15105

PIPES AND TUBES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes all pipes that apply to mechanical systems. Separate sections for each system identify the actual pipe materials to be used.

2.0 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel and Black Steel Pipe and Fittings for Steel Pipe.

1. Steel Pipe.

a. Standard Weight.

SIZE DIAMETER INCHES (MILLIMETRES)	MANUFACTURING METHODS	WALL THICKNESS	ASTM SPEC	GRADE
1/8 thru 4 (6 thru 100)	Welded	Schedule 40	A-120	_____
5 thru l0 (125 thru 250)	Welded or Seamless	Schedule 40	A-53	A or B
12 and over (300 and over)	Welded or Seamless	0.375 inch	A-53	A or B

2. Provide steel pipe for underground use (in direct contact with soil) with a factory applied polyethylene plastic coating in minimum thicknesses depending on pipe diameter as follows:

Pipe Diameter (inches)	3/4 - 1-1/2	2	3 - 4	5 and up
Plastic Thickness (inches)	0.025	0.030	0.035	0.045
Pipe Diameter (millimeters)	20 - 40	50	80-100	125 and up
Plastic Thickness (millimeters)	0.635	0.762	0.889	1.143

Or provide mill dipped and wrapped pipe protected per AWWA Spec C 203.

3. Fittings for Steel Pipe.

   a. General: When threaded fittings made of grey cast iron, malleable iron, and ductile iron are specified to be galvanized, hot dip galvanize each fitting before cutting threads.

   b. Grey Cast Iron Fittings: Furnish standard weight fittings free of sand holes and imperfections, with clean American Standard taper pipe threads, complying with Fed. Spec. SS-P-501, ANSI Standard B 16.4. Material shall conform to ASTM A 126, Class B. Furnish 126 lb. class.

   c. Malleable Iron Fittings: Furnish l50 lb. class with clean American Standard taper pipe threads complying with Fed. Spec. WW-P-521 and ANSI Standard B 16.3. Materials shall conform to ASTM A 197.

   d. Ductile Iron Fittings: Furnish 300 lb. S.W.P. class with clean American Standard taper pipe threads and comply with ASTM Specification A 395 Grade 60-45-15.

   e. Welding Fittings: Furnish factory made fittings as set forth in and dimensioned in ANSI B 16.9. Match wall thickness of fittings to steel pipe wall thickness specified, hereinbefore. Fittings shall conform to ASTM Specification A 106, Grade B. Short radius elbows and other fittings not meeting ANSI B 16.9, shall not be used. Weldolets shall be manufactured and installed in accordance with ANSI B16.9 and ANSI B31.1. Thredolets shall be in accordance with ANSI B16.11.

f. Black Cast Iron Drainage Fittings: Furnish fittings manufactured according to the ANSI Standard B 16.12. Fittings shall be tapped so as to give a 1/4 inch per foot (2 percent) pitch.

g. Cast Iron Flanged Fittings:

1) Standard Weight: Furnish 125 lb. class conforming to ANSI Standard B 16.1 meeting or exceeding the chemical and physical requirements of ASTM A 126, Class B.

h. Victaulic Couplings and Fittings:

1) Couplings shall be Victaulic Style 77 and/or Style 75, with housing fabricated in two or more parts of malleable iron castings, in accordance with Fed. Spec. QQ-I-666, Grade II. Coupling gasket shall be Victaulic Grade "H" molded synthetic rubber, per ASTM D 2000, Grade No. R6115BZ. Coupling bolts shall be oval neck trace head type with hexagonal heavy nuts, per ASTM A 183.

2) Fittings: All pipe fittings used with Victaulic pipe couplings shall be fabricated of malleable iron castings in accordance with Fed. Spec. QQ-I-666, Grade II.

B. Cast Iron Pipe and Fittings for Cast Iron Pipe.

1. Ductile Iron Water Supply Pipe and Fittings.

a. Schedule:

DIAMETER INCHES (MILLIMETERS)	STANDARDS	THICKNESS CLASS	DEPTH OF BURY FT. (METERS)
3 TO 12 (80 to 300)	ANSI A21-51 and AWWA C151	2	2-1/2 to 24 (0.762 to 7.3)

b. Cement line and seal coat pipe in accordance with ANSI A21.4 Specification. Outside of pipe shall be bituminous coated. Iron strength shall be 60-42-0 as approved by ANSI.

c. At the foundry, stamp or cast on each pipe length the manufacturer's mark, and the letters "DI" or "ductile."

d. Joints shall be made up with fittings and ends to conform to the requirements of Fed. Spec. WW-P-421 for Type III Mechanical Joint.

2. Cast Iron Water Supply Pipe and Fittings.

a. Conform to the requirements of Fed. Spec. WW-P-421, ANSI Specification A21.6 or ANSI Specification A21.8 Cement line pipe and fittings at factory in accordance with ANSI Specification A21.4.

b. Specials and fittings shall be Class D, tar coated, conforming to AWWA Specification C100. Joints shall conform to the requirements of Fed. Spec. WW-P-421 for Type III Mechanical Joint.

3. Cast Iron Drainage Pipe and Fittings.

a. Comply with ANSI Standard A-40.1, ASTM Specification A-74, and Fed. Spec. WW-P-401. Joints shall be made with hubless pipe and fittings, using an acceptable elastomeric sealing sleeve and stainless steel clamp, clamping screw and housing or with mechanical joint fittings:

1) Minimum weight in pounds for single hub 5 foot (1.5 metres) lengths shall be as follows.

SIZE		SERVICE WEIGHT		EXTRA HEAVY WEIGHT	
INCHES	(MILLIMETERS)	POUNDS	(KILOGRAMS)	POUNDS	(KILOGRAMS)
2	50	20	9	25	11
3	80	30	14	45	20
4	100	40	18	60	27
5	125	55	25	75	34
6	150	65	29	95	43
8	200	100	45	150	68
10	250	145	65	215	97
12	300	190	86	270	122
15	380	255	115	375	170

2) Furnish fittings, specials, and miscellaneous lengths in the same thickness class as herein specified for 5 foot (1.5 m) lengths.

C. Copper Tube and Fittings for Copper Tube.

1. Copper Water Tube and Fittings.

a. Furnish seamless copper water tube conforming to the requirements of ASTM Specification B88 in weight K, L, or M and temper annealed or drawn as specified. Comply with Fed. Spec. WW-T-799, for refrigeration service.

b. Fittings for Copper Water Tube.

1) Wrought copper fittings. Furnish wrought copper solder joint, pressure fittings conforming in all respects to ANSI B16.22 and same weight as pipe.

2) Cast Bronze Fittings. Furnish cast bronze solder joint pressure fittings conforming in all respects to ANSI B16.18 and same weight as pipe.

3) Brazolets shall be high silicon bronze conforming to ASTM B 283 in sizes 2-inch and smaller, and conforming to MIL-B-16541 in sizes 2-1/2-inch and larger.

2. Potable Water

a. Pipe and Fittings

1) Above grade water piping shall be type "L" hard drawn copper water tube with wrought copper lead-free solder joint fittings.

2) Below grade water piping shall be type "K" hard drawn copper water tube with wrought copper lead-free solder joint fittings.

3) All exposed finish piping shall be I.P.S. brass pipe and fittings, polished chrome plated.

b. Joints

1) Above Grade: All joints shall be made with a tin based, lead free solder, alloyed with antimony, copper, silver, and nickel, equal to J.W. Harris "Bridgit" and a paste flux that meets Copper Development Association Standard Test Method 1.0, and ASTM B813.

2) Below Grade: All joints shall be made with BCuP-5 or BAgl brazing alloy and a suitable paste flux.

3) Below Floor- To Trap Primers: Type L, annealed soft copper, continuous without joints.

3. Copper Drainage Tube and Fittings.

a. Furnish copper drainage tube (DWV) conforming to the requirements of ASTM Specification B 306 in drawn temper.
b. Fittings for Copper Drainage Tube.

1) Cast bronze drainage fittings. Comply with ANSI B16.23, with solder joints.

2) Wrought Copper Drainage Fittings. Comply with ANSI B16.29 with solder joints for wrought copper and wrought copper alloy drainage fittings.

D. Plastic Piping:

1. Pressure Pipe and Fittings:

a. Polyvinyl chloride pipe (PVC) shall conform to ASTM D 2241, 160 psi (1103 kPa) SDR 26. Pipe shall have solvent-welded joints.

b. Polyethylene (PE) water service line tubing shall conform to ASTM D 2737, SDR 9 with PE 2305 material and 160 psi (1103 kPa) working pressure. Pipe shall have socket fusion joints.

c. High molecular weight polyethylene pipe for gas service underground. Pipe shall conform to ASTM designation PE 3406-3408, Driscopipe 8000, manufactured by Driscopipe.

2. Non-pressure Pipe and Fittings.

a. Polyvinyl Chloride (PVC). Pipe and fittings shall conform to ASTM D 2665 with factory-attached joints, solvent cemented coupling.

b. Acrylonitrile-Butadiene-Styrene (ABS) composite sewer pipe. Pipe fittings shall conform to ASTM D 2661 with factory-attached joints, solvent cemented coupling.

c. Polypropylene (PP). Pipe shall be Type 1 conforming to ASTM D 4101. Pipe and drainage fittings shall be joined by an approved method: thermo-seal fusion process, sowent cement or mechanical joints.

d. Perforated PVC. Pipe shall conform to ASTM 2729.

e. Polyethylene Tubing. Pipe shall conform to ASTM F-405 in sizes 3 to 6 inch.

E. Reinforced Thermosetting Resin Pipe (RTRP).

1. Pressure Pipe and Fittings.

a. Pipe and fittings shall conform to ASTM D 2992 and ASTM D 2996, Type I - Filament Wound, Grade l - Epoxy Resin, Class H - Thermoplastic Resin Liner (PVC), with a working pressure of 150 psi (1034 kPa).

2. Non-pressure Pipe and Fittings.

a. Pipe and fittings shall conform to ASTM D 2992 and ASTM D 2996; Type I - Filament Wound; Grade 2 - Polyester Resin: Class C - Non-Reinforced Epoxy Resin (isothalic) liner, 60 mils (1524 microns) thick.

F. "Duriron" Pipe and Fittings.

1. Furnish high silica iron allop-corrosion-resistant cast iron pipe and fittings. Conforming to ASTM A518 and A861, as manufactured by Durion.

2. Joints.

a. Joints for hubless acid-resisting cast iron soil pipe and fittings shall be made by using a mechanical joint compression-type consisting of a type 304 stainless steel clamp, Neoprene outer sleeve, non-porous TFE inner sleeve.

G. "Yoloy" Pipe and Fittings for "Yoloy" Pipe.

1. Furnish "Yoloy" pipe manufactured by the Youngstown Sheet and Tube Company, consisting of a low-carbon open hearth steel alloyed with nickel and copper with minimum tensile strength of 55,000 psi (380 MPa) and a yield point of 40,000 psi (276 MPa).
2. Fittings for "Yoloy" pipe.
   a. Grey Cast Iron Fittings. Furnish 125 lbs. class as specified hereinbefore under Paragraph, "Fittings for Steel Pipe."
   b. Malleable Iron Fittings. Furnish 150 lb. class as specified hereinbefore under Paragraph, "Fittings for Steel Pipe."
   c. Welding Fittings. Furnish factory made fittings as set fourth in and dimensioned in ANSI B16.9. Furnish fittings manufactured from "Yoloy" pipe specified above. Short radius elbows and other fittings not meeting ANSI B16.9 shall not be used.

H. Glass Pipe:

1. Pipe shall be regular schedule low expansion borosilicate glass.

2. Joints shall be made by stainless steel couplings with teflon gaskets.

I. Stainless Steel Tubing:

1. Tubing shall be welded stainless steel tubing conforming to the requirements of ASTM Specification A 554.

2. Fittings shall be as-welded wrought austenitic stainless steel conforming to the requirements of ASTM Specification A 774.

J. Perforated Concrete Pipe

1. Pipe shall conform to ASTM C 443, Type 2, and ASTM C 14, Class 3 in sizes 4 to 36 inch.

K. Porous Concrete Drain Pipe.

1. Pipe shall conform to ASTM C-654 in sizes 4 to 24 inch.

END OF SECTION

SECTION 15110

VALVES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes all valves within the Building.

1.2 QUALITY ASSURANCE

A. General.

1. All gate, globe, and angle valves shall be designed for repacking under pressure when fully opened, and shall be equipped with packing suitable for intended service. When valve is fully opened, back seat shall protect the packing and stem threads from fluid.

2. Bronze Valves.

a. Valves with steam pressure rating of 125 psig (860 kPa) or 150 psig (1029 kPa) shall have pressure containing parts of a material conforming to ASTM B 62.

b. Metallic seated valves with a steam rating of 200 or 300 psig (1380 or 2058 kPa) shall have pressure containing parts of material conforming to ASTM B 61.

c. Bronze gate, globe, angle, and check valves shall conform to Manufacturer's Standardization Society (MSS) of the valve and fittings industry SP-80.

3. Iron Body Valves.

a. Pressure containing parts of valves shall be of material conforming to ASTM A 126, Grade B.

b. Face-to-face and end-to-end dimensions shall conform to ANSI B16.10.

c. Gate valves shall conform to MSS SP-70.

4. Valve stems shall be copper silicon alloy conforming to ASTM B 371 or ASTM B 584.

5. Wheel handles shall be non-heating style cast from malleable iron or commercial aluminum.

6. Butterfly valves shall conform to the requirements of MSS SP-67.

7. Check valves shall operate equally well in horizontal or vertical positions.

2.0 PRODUCTS

2.1 VALVES

A. General.

1. Insofar as possible, all valves of the same type shall be of the same manufacturer. All gate, globe, angle, and swing check valves as a group shall be of the same manufacturer.

2. All valves 2 inches (50 mm) and smaller shall be threaded and have bronze bodies.

3. All valves 2-1/2 inches (65 mm) and larger shall be iron body bronze mounted (IBBM) type and shall be flanged.

4. All valves 4 inches (100 mm) and larger mounted in excess of 7 feet (2 m) above the floor in boiler and mechanical rooms shall be equipped with chain operators. Extend chains to within 6 feet - 6 inches (2 m) of floor.

5. Mark each valve at the factory with the following minimum information, engraved, stamped, or cast on each valve or metal tag, permanently attached to the valve.

a. Manufacturer's Name.

b. Catalog or Figure No.

c. Size and Pressure Class.

d. Arrows to indicate direction of flow on check, globe, angle, non-return, and eccentric plug valves.

e. Underwriters' approved valves shall bear the Underwriter's label.

B. Gate Valves. Do not use.

C. Globe and Angle Valves.

1. Size 2 inches (50 mm) and Smaller.

a. Water Valves.

1) Furnish valves designed for 150 psig (1029 kPa) steam and 300 psig (2058 kPa) nonshock water, oil, and gas working pressures. Valves shall have union bonnets, integral seats, and renewable teflon discs. Valves shall permit disc and bonnet replacement without removing valves from piping.

2) Manufacturers and Figure Numbers.

a) Globe Pattern

(1) Nibco T-235Y

(2) Hammond IB413T

(3) Kitz 09

b) Angle Pattern

(1) Nibco T-335Y

(2) Hammond IB454

(3) Stockham B-222

b. Steam Valves

1) Furnish valves designed for 200 psig (1380 kPa) steam and 400 psig (2760 kPa) non-shock water, oil, and gas working pressure. Valves shall have union bonnets, regrindable 500 Brinnell stainless steel plug seats and discs, and screwed ends. Valves shall permit seat, disc, and bonnet replacement without removing valves from piping.

2) Manufacturers and Figure Numbers.

a) Globe Pattern

(1) Nibco T-276-AP

(2) Hammond IB434

(3) Kitz 17S

b) Angle Pattern

(1) Nibco T-376-AP

(2) Hammond IB468

(3) Powell 2610

2. Size 2-1/2 inches (65 mm) and Larger.

a. Furnish valves designed for 125 psig (860 kPa) steam and 200 psig (1380 kPa) water, oil, and gas working pressure. Valves shall have bolted bonnets, guided bronze or bronze faced disc, outside screw and yoke, (O S and Y) and flanged ends. Discs and seats shall be renewable without removing valves from line.

1) Globe Pattern

a) Nibco F-718-B

b) Hammond IR116

c) Kitz 76

2) Angle Pattern

a) Nibco F-818-B

b) Hammond IR118

c) Powell 243

D. Check Valves

1. Steam Vacuum Breaker, size 2 inch (50 mm) and smaller.

   a. Furnish swing check valves designed for 150 psig (1029 kPa) steam and 300 psig (2058 kPa) water, oil, and gas working pressures. Valves shall have renewable Teflon discs, renewable side plugs, and integral seats.

   b. Manufacturers and Figure Numbers.

      1) Nibco T433-Y

      2) Hammond IB946

      3) Powell 596

2. Water, Oil, and Steam, size 2 Inches (50 mm) and Smaller.

   a. Furnish swing valves designed for 200 psig (1380 kPa) steam and 400 psig (2760 kPa) non-shock water, oil, and gas working pressures. Valves shall have renewable discs and side plugs and regrindable, integral seats. Discs shall be renewable and seats reground without removing valves from the line.

   b. Manufacturers and Figure Numbers.

      1) Nibco T-476-B

      2) Hammond IB-949

      3) Powell 560Y

3. Size 2-1/2 inches (65 mm) and Larger.

   a. Steam Check Valves.

      1) Furnish iron body bronze mounted (IBBM) horizontal pattern swing check valves designed for 125 psig (860 kPa) steam working pressure. Valves shall have bolted caps, removable and renewable seat ring, and side plugs.

      2) Manufacturers and Figure Numbers.

a) Nibco F-918-B

b) Hammond IR-1124

c) Powell 559

b. Water Check Valves.

1) Valves shall be silent type spring loaded of the double door or wafer style. Valves shall be designed for 125 psig (860 kPa) non-shock water working pressure at 250 degrees F. (120 degrees C).

2) Double door valves shall have cast iron body, aluminum bronze or stainless steel disc, stainless steel spring and hinge pin, and Buna-N seat. Wafer style valves shall have cast iron or semi-steel body, bronze disc, stainless steel spring, and Buna-N seat.

3) Manufacturers and Model Numbers.

a) Double Door Style

(1) Marlin style A, L, or T

(2) APCO series 9000 or 9000L

(3) Mission style K Duo—Chek

b) Wafer Style

(1) APCO series 300

(2) Williams-Hager 375

(3) Nibco W-910

E. Steam Boiler Non-Return Valves.

1. Furnish angle type non-return stop and boiler check valves designed for 250 psig (1725 kPa) steam working pressure. (OS and Y) valves shall have bolted flanged yoke bonnet, outside screw stem, removable and renewable seat ring

and disc, designed to automatically prevent reverse flow of steam and allow tight manual shut-off.

2. Manufacturers and Model Numbers.

   a. Nibco F-869-B

   b. Powell 368

   c. Stockham F-541

F. Eccentric Plug Valves.

1. Valves shall be non-lubricated eccentric or rounded-port plug type designed for minimum pressure loss in the wide open position. Valves shall be designed for 150 psig (1029 kPa) non-shock water working pressure at 250 degrees F. (120 degrees C). Resilient plug facing shall be capable of continuous bubble tight service in water at 250 degrees F (120 degrees C). Valves shall be equipped with adjustable opening stops for balancing. Valves shall have permanently lubricated, corrosion resistant bearings in upper and lower plug journals.

2. Actuators.

   a. Valves 3 inches (80 mm) and smaller shall have permanently attached levers.

   b. Valves 4 inches (100 mm) and larger shall have enclosed worm gear actuators with hand wheels.

3. Provide DeZurik eccentric plug valves or Keystone Ballcentric round-port plug valve. Eccentric plug valves shall be provided with a 1/8-inch or 1/4-inch gage (3.2 or 6.35 mm thick) tap on seat end of valve. Round-port valves shall be provided with two hand-operated pet cocks with quick disconnect couplings, check valves, and sealing caps for connecting differential meters.

4. Manufacturers Model Numbers.

   a. Sizes 2 inches (50 mm) and Smaller.

      1) DeZurik 499S

2) Keystone 1512

b. Sizes 2-1/2 inches (65 mm) and 3 inches (80 mm).

1) DeZurik 499F

2) Keystone 1522

c. Sizes 4 inches (100 mm) and 5 inches (127 mm).

1) DeZurik 118F

2) Keystone 1522-EWG

d. Sizes 6 inches (150 mm) and Larger.

1) DeZurik 118F

2) Keystone 1532-EWG

G. Gas Cocks.

1. Furnish lubricated or non-lubricated plug valves which comply with prevailing requirements of gas codes, ordinances, laws or local utility rules and regulations. Where prevailing requirements are less stringent than those requirements met by the valves specified herein, the valves specified below shall establish the minimum requirements for gas cocks.

2. Equip valves which convey in excess of 500 cubic feet (14 cubic metres) of gas per hour (as computed from connected appliance input ratings) with a permanently attached handle or operator. Furnish smaller valves with at least one handle for each size valve in the Project.

a. Open and closed positions shall be clearly marked with dial indicators on all valves having the words "open- shut," "on-off," etc.

3. Manufacturers and Model Numbers.

a. Lubricated Plug Valves.

1) Furnish valves designed for 200 psig (l380 kPa) water, oil, and gas working pressures with teflon-coated tapered plug.

2) Sizes 2 inches (50 mm) and Smaller.

a) Nordstrom 114

b) Powell 2202

c) Walworth 1700

3) Sizes 2-1/2 inches (65 mm) through 8-inch (200 mm).

a) Nordstrom 115 or 165

b) Powell 2203 or 2207

c) Walworth 1700F

b. Non-lubricated eccentric valves.

1) Sizes 4 Inches (l00 mm) and Below. Furnish DeZurik Figure No. 425 specifically designed for gas applications with plastic coated interior and compressible resilient seal permanently bonded to face of plug. Furnish screwed ends in sizes 2 inches (50 mm) and smaller, flanged ends 2-1/2 inches (65 mm) and larger.

H. Radiator Valves.

1. Valves shall be of packless (diaphragm-type) construction, suitable for steam and water pressures to 125 psig (860 kpa). Valves shall have indicating dial and non-rising stem.

a. Manufacturers and Model Numbers:

1) Dunham - Bush 1240

2) Hoffman 184

3) Trane 44

2. Valves shall be of spring-packed construction with the packing held in place by a heavy coil spring to assure tight seal around valve stem. Valves shall be suitable for steam and water pressures to 150 psig. Valves shall have non-rising stem and divisions or pointer on dial for adjusting. Degrees of opening shall be cast on bonnet.

   a. Manufacturers and Model Numbers:

      1) Dunham - Bush 740A

      2) Hoffman 185

3. Valves shall be of the regular packed type with adjustable packing nut to tighten the stem packing. Valve shall be repackable under pressure. Valve shall be suitable for steam and water pressures to 150 psig (1029 kPa).

   a. Manufacturers and Model Numbers:

      1) Dunham - Bush 600A

      2) Hoffman 187

      3) Spirax Sarco Type R.

I. Underwriters Approved Valves.

1. Valves shall be UL listed and designed for a minimum of 175 psig (1200 kPa) non-shock, cold water working pressure.

2. Gate Valves.

   a. Furnish OS and Y pattern, guided wedge disc, with stem repackable under full operating pressure.

   b. Size 2 Inches (50 mm) and Smaller.

      1) Material. Bronze body and disc.

      2) Manufacturers and Model Numbers.

         a) Nibco T-104-0

         b) Stockham B-133

c. Size 2-1/2 Inches (65 mm) and Larger.

1) Furnish iron body bronze mounted with solid wedge disc.

2) Manufacturers and Model Numbers.

a) Nibco F-607-0

b) Hammond IR-1154

c) Stockham G-634

3. Check Valves.

a. Swing

1) Furnish iron body, bronze mounted.

2) Manufacturers and Model Numbers.

a) Mueller A2122-6

b) Nibco F908-W

c) Stockham G-940

b. Double Door.

1) Furnish iron body, aluminum bronze discs, and Buna-N seat.

2) Manufacturers and Model Numbers:

a) APCO 9000

b) Nibco W-900-W

c) Mission U12 HMP

4. Butterfly Valves.

a. Furnish wafer or lug style cast or ductile iron body with ductile iron or aluminum bronze disc.

b. Manufacturers and Model Numbers.

1) Wafer style

a) Keystone 239

b) Powell 3010

c) Nibco FP20E-W

2) Lug Style

a) Keystone 129

b) Powell 3140

c) Nibco FP20E-L

J. Butterfly Valves.

1. Furnish valves designed for 150 psig (1029 kPa) and 250 degrees F (120 degrees C.) water service. Valves shall have extended necks. Operator shall be 10-position lever lock for sizes 2 through 5 inches (50 - 125 mm) and totally enclosed and sealed worm gear actuators with 4-arm or wheel handle for sizes 6-inch (150 mm) and larger. (Infinite adjustment and memory stop options shall be provided where specified or shown on the Drawings). Valves shall be bi-directional suitable for drop-tight shut-off at full rated pressure with flow in either direction.

2. Materials.

a. Body: Cast or ductile iron.

b. Disc: Bronze, aluminum bronze, or stainless steel.

c. Stem - Type 416 stainless steel.

d. Seat - Ethylene Propylene Diene Terpolymer (EPDM).

3. Manufacturers and Model Numbers.

a. Lug Type. Valves shall be full lug type drills and tapped, designed for dead end service.

1) Sizes 2 through 12 inches (50 - 300 mm)

a) Nibco LD2000

b) Milwaukee ML-233-E

c) Kitz 6122E

2) Sizes 14 inch (350 mm) and Larger.

a) Nibco LD1000

b) Milwaukee

c) Kitz

b. Wafer Type

1) Sizes 2 through 12 inches (50 - 300 mm).

a) Nibco WD2000

b) Milwaukee MW-233-E

c) Kitz 5122E

2) Sizes 14 inch (350 mm) and Larger.

a) Nibco WD1000

b) Milwaukee

c) Kitz

K. Differential Pressure Regulating Valves:

1. Valve shall consist of body with top mounted actuator.

2. Body shall be single-port, globe style with cage guiding, balanced valve plug, and push-down-to-open valve action. Body shall be cast iron or steel. Bonnet shall be steel. Stem, valve plug, and cage shall be stainless steel. Seat ring shall be stainless steel or cast alloy. Cage shall be removable for quick change of trim.

3. Actuator body shall be cast iron or cast steel with steel alloy spring, cast iron or steel diaphragm plate and neoprene diaphragm. Actuator shall contain an adjusting screw for simple field adjustment.

4. Pressure settings shall be determined after review of pump curves of the associated circulating pumps.

5. Manufacturer and Model Number.

   a. Valve - Fisher EDR

   b. Actuator - Fisher 647

L. Pressure Reducing Valves.

1. Water:

   a. Domestic Water Lines.

      1) Zurn-Wilkins 500YSB series: 180° F. max. temp. adjustable spring range all bronze body and bell housing. Built-in bypass, in-line “Y” strainer w/20 mesh stainless steel screen-sizes and settings per specific application.

   b. Domestic Water Fill Lines (Low Pressure).

      1) Pressure reducing valves with 8-25 pound (55-172 kPa) range. Provide Zurn-Wilkins 500 YSBR series.

   c. Combination Fill and Relief Valve. Setting shall be 30 pounds (200 kPa) relief and 8-25-pound (55-172 kPa) adjustable reducing. Provide Bell and Gossett 3.

2. Steam.

   a. Pressure reducing valve shall be Fisher Controls Co., Type 92, Leslie or Spence, pilot operated with stainless steel inner valve, flanged ends, steel main valve spring, stainless steel guide bushings and 304 stainless steel diaphragms. Pressure reducing valve shall be installed as shown on the Drawings, complete with isolating valves, bypass, strainer, gages, and relief valve. Valve seat and plug shall be induction hardened 416 or 17-4 PH stainless steel. Valves shall be of capacities and pressure ranges indicated in the schedule on the Drawings.

M. Relief Valves.

1. Water.

   a. Domestic Water Temperature and Pressure Relief Valve.

      1) On hot water storage tanks provide an ASME rated McDonald Miller or Watts Regulator Co., thermostatic, self-closing temperature and pressure relief valve, located in the relief valve openings of tanks. Valve shall have a minimum thermal discharge capacity equal to the input capacity of the heater, standard pressure setting of 125 psig (860 kPa) and standard temperature setting of 210 degrees F. (100 degrees C.) pipe discharge to floor drain.

   b. Hydronic Heating and Cooling Systems.

      1) Low Pressure. Provide 30-pound (200 kPa) setting. Provide Bell and Gossett A3 or Taco 333.

      2) High Pressure. Provide Bell and Gossett

2. Steam.

   a. Safety valves shall conform to the requirements of the appropriate section of the ASME Boiler Construction Code. Valves shall be set to relieve steam at 5 psig (35 kPa) or 10 percent in excess of operating pressure, whichever is greater. Capacity shall be equal to maximum capacity of the controlling item.

b. Manufacturers:

1) Keckley

2) Kunkle

3) Spirax Sarco

N. Ball Valves.

1. General. Valves shall be non-blowout stem design. Quarter turn of handle shall fully open or close valve. Handle position shall indicate whether valve is open or closed. Handle stops shall be a permanent, integral part of the body. Packing nut shall be adjustable.

2. Size 2 Inches (50 mm) and Smaller.

a. Valves shall be full port, 2-piece construction with screwed ends. Valves shall be designed for 400 psig (2760 kPa) WOG working pressure at 150 degrees F. (65 degrees C.).

b. Valves shall have bronze or brass body, hard chrome plated forged brass, or stainless steel ball, steel handle with vinyl grip, and replaceable teflon seats. Ball shall be vented.

1) Manufacturers and Figure Numbers.

2) Nibco T-585-70

3) Kitz 68

3. Size 2-1/2-Inches (65 mm) and Larger.

a. Valves shall be full port, ANSI Class 150 with flanged ends. Valves shall be designed for 250 psig (1725 kPa) working pressure at 150 degrees F. (65 degrees C.).

b. Valves shall have steel body, chrome or nickel plated steel or stainless steel vented ball, replaceable teflon seats, and steel stem and handle.

c. Manufacturers and Figure Numbers.

1) Apollo 88-100/200

2) Nibco F-510

3) Watts CF

END OF SECTION

SECTION 15120

PIPING SPECIALTIES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes piping specialties and miscellaneous materials.

2.0 PRODUCTS

2.1 PIPING SPECIALTIES

A. METERS

1. Condensate Meters. Condensate meters shall have all necessary accessories and capacities as indicated on the Drawings. Meters shall be Cadillac.

2. Domestic Water Meter. Provide a new water meter at location shown. Meter shall be manufacture, size and type as approved by the local utilities company. Meter shall be valved on each side and have 3/4 inch (20 mm) valved drain.

B. Flow Indication and Control Systems (Hydronic Piping).

1. The water flow indication and control system shall be one of the following types. Furnish flow elements (and meters) of the same manufacturer throughout the Project. Element locations shall be as shown on the Drawings.

2. Variable Orifice Systems.

a. The flow control mechanism shall consist of a spring loaded orifice cup which shall move in response to changes in differential pressure across the cup to automatically maintain flow rate through the cup to within 5 percent accuracy over an operating pressure differential of at least 10 times the minimum required for full flow conditions. Cup shall be stainless steel. Element exterior shall contain dual temperature pressure test ports and shall be permanently marked to show model number, direction of flow, and flow rate in GPM.

b. Piping Elements.

(1) Sizes 1-1/4 inch (31 mm) and Smaller. Provide combination flow control mechanism and ball valve. Element shall have threaded ends.

(2) Size 1-1/2 Inch (40 mm) through 3 Inches (80 mm). Element shall have threaded ends and may be provided with integral or separate ball valve.

(3) Test Kit. Provide to the Owner a pressure and temperature test kit consisting of pressure gage, thermometer, gage adapters, flow charts, and a carrying case.

c. Flow control system shall be manufactured by Autoflow or Griswold.

3. Fixed Venturi System.

a. Provide a complete flow-set system manufactured by Olympic Valve, Inc. Each flow element shall be provided with two pressure/temperature test ports with safety caps.

b. Piping Elements.

(1) Size 2 Inches (50 mm) and smaller. The flow measuring supply valve shall consist of a 300 psig (2070 kPa) ball valve, flow measuring venturi, test ports and a ground joint union. Return valve shall consist of a butterfly valve, test port, and a ground joint union.

(2) Sizes 2-1/2 Inches (65 mm) through 8 Inches (200 mm). Flow elements shall be cast iron venturis, same size as the pipe, rated at 250 psig (1720 kPa) at 250 degrees F. (121 degrees C). The ends shall be full in accordance with ANSI B16.1 or of the wafer style precisely machined to fit between a pair of 150 lb. ANSI flanges.

(3) Sizes 10-Inch (250 mm) through 24-Inch (600 mm). Flow elements shall be carbon steel venturis, same diameter as the pipe line and meeting standard pipe specifications in accordance with ASTM A 120. The end configuration shall be

full flanged with dimensions meeting ANSI B16.5 - 150 lb.

c. Flow Meter(s). Provide portable Olympic Model 300.5 flow meter(s) for use by the testing and balancing Contractor. Meter(s) shall become property of the Owner. Meter shall contain a differential pressure meter with 6-inch (150 mm) dial face equipped with transparent meter faces reading flow directly in gpm for all valve sizes. Meter shall also include a dial thermometer 0 to 220 degrees F. (-18 to 104 degrees C.), pressure gage 0 to 100 psig (0 to 690 kPa), two quick coupling hoses, bleed hoses, and instruction book all enclosed in a carrying case. Scale range(s) shall be _____ (and _____). Meter(s) shall be designed for a working pressure of 600 psig (4140 kPa) at 210 degrees F. (99 degrees C.). Accuracy of the meter shall be no less than 1/2 percent full scale.

d. Accuracy of this valve and meter system shall be <+>3 percent over the ASHRAE recommended flow range of the valves.

4. Fixed Orifice Systems.

a. The systems shall be of fixed orifice type, complete with piping elements and differential pressure kit(s). Each element shall contain two pressure test ports for connection to the test kit. Systems shall be designed for a minimum working pressure of 175 psig (1200 kPa) at 250 degrees F. (120 degrees C.).

b. Piping Elements.

(1) Size 2-Inch (50 mm) and Smaller.

(a) Element shall be a combination flow element and balancing valve.

(b) Manufacturers and Model No. Bell and Gossett Circuit Setter, Illinois Series 6000, TACO Circuit Setter.

(2) Size 2-1/2 Inches (65 mm) and Larger.

(a) Element shall be a cast iron wafer-type body with stainless steel orifice designed for use between ANSI 125 lbs flanges.

(b) Manufacturers and Model No. Bell and Gossett Circuit Sensor, Illinois Series 6000.

c. Differential Pressure Kit(s).

(1) Provide portable differential pressure read-out kit(s) for use by the testing and balancing Contractor. Kit(s) shall become property of the Owner. Kit shall contain differential pressure gage, necessary, hoses, shut-off and vent valves, instructions and charts, all enclosed in a carrying case. Scale range(s) shall be _____ (and _____ respectively). Gage accuracy shall be <+> 1.0 percent full scale. Kits shall be manufactured by Bell and Gossett, Illinois, or TACO.

5. Pitot Tube System.

a. The system shall consist of Annubar pitot tube flow sensors and Eagle Eye differential pressure meters manufactured by the Dieterich Standard Corp.

b. Elements shall be pitot tubes with safety shut-off valves rated at 300 psig (2070 kPa) at 250 degrees F. (120 degrees C.). Furnish quick couplings unless elements are shown connected to permanent meters. Attach a metal tag to each element showing designed flow rates, metre readings, line size and station or location. Furnish "Annubar" No. AWR 71 in pipes 2 inches (50 mm) and smaller made of brass and stainless steel, No. AWR 73 in pipes 2-1/2 inches (50 mm) through 4 inches (100 mm) made of stainless steel, No. AWR 74 in pipes 5 inches (125 mm) through 10 inches (250 mm), and No. AWR 75 in pipes 12 inches (300 mm) and larger made of stainless steel.

c. Provide portable Eagle Eye EDP meter(s) for use by testing and balancing Contractor. Meter(s) shall then become property of the Owner. Meter shall contain a 6-inch (150 mm) scale indicating differential pressure in inches of water, two quick coupling hoses, bleed valves, and instructions, all enclosed in a carrying case. Scale range(s) shall be _____ (and _____). Meter(s) shall be designed for a working pressure of 225 psig (1550 kPa) at 210 degrees F. (99 degrees C.). Accuracy shall be <+> 2 percent of full scale.

2.2 ADDITIONAL MATERIALS

A. Air vents shall be installed on all coils, radiation and other points required for efficient operation of system.

1. Automatic Vents.

a. Vents on radiation and unit heaters shall be Dole No. 20SR or Sarco No. l5 disc type air vent. For operating pressures to 20 psig (138 kPa), Sarco 13W or Armstrong l-AV for operating pressures to 100 psig (690 kPa), Sarco 13 WH or Armstrong 32 AV for operating pressures to 200 psig (1380 kPa), Armstrong 32 AV only for operating pressures to 320 psig (2200 kPa).

b. On high points in piping and where exposed to view install automatic vents specified above for radiation.

2. Manual Vents. For vents on radiation, unit heaters, coils, and other mechanical equipment, furnish Dole No. 9 coin valves.

a. Furnish air chambers at all high points in piping with air vent cocks fully accessible. Furnish air chambers with diameters same size as pipe and a minimum of 2 inches (50 mm) long except furnish same length as diameter for pipes larger than 2 inches (50 mm). When air vent cocks on air chambers are not fully accessible, extend cocks with 1/4 inch (6 mm) copper water tube Type K or L as directed.

B. Expansion tank

1. Provide pre-charged vertical steel tank with a heavy duty butyl rubber diaphragm.

2. Tank shall have NPT system connections and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet the system requirements.

3. Tanks shall be steel, and constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code, and stamped 125 psig working pressure.

4. Tank fittings. Provide Bell and Gossett Type ATF or TACO No. 439.

5. Manufacturer. Bell & Gossett Series D, Wessels NLA or Amtrol.

C. Air separators

1. Provide a centrifugal type air separator.

2. The unit shall have inlet and outlet connections tangential to the vessel shell.

3. The unit shall have an internal stainless steel air collector tube with 5/32 inch (4 mm) diameter perforations and 63% open area designed to direct accumulated air to the compression tank (air control system) or air vent (air elimination system) via an NPT vent connection at the top of the unit.

4. The unit shall have a removable galvanized steel strainer with 3/16 inch (4.8 mm) diameter perforations and a free area of not less than five times the cross-sectional area of the connecting pipe. The strainer shall be located at the bottom of the vessel to reduce floor space required for strainer removal.

5. Vessel shell diameter shall be three times the nominal inlet/outlet pipe diameter, with a minimum vessel volume for sufficient velocity reduction.

6. A blowdown connection shall be provided to facilitate routine cleaning of the strainer and the separator. Provide a bronze full port ball valve with PTFE packing to connect to the blowdown connection.

7. The air separator shall be designed, constructed and stamped for 125 psig at 350°F (862 kPA at 177°C) in accordance with Section VIII Division I of the ASME Boiler and Pressure Vessel Code.

8. The air separator shall be painted with one shop coat of light grey air dry enamel.

9. Manufacturer. Bell & Gossett Rolairtrol R Series or Taco.

D. High Capacity Air Vent

1. Provide a float actuated high capacity air vent designed to purge free air from the system and provide shut-off at pressures up to 150 psig at a maximum temperature of 250°F.

2. The design of the high capacity air vent shall prevent air from entering the system if system pressure drops below atmospheric pressure.

3. The high capacity air vent shall be constructed of cast iron and fitted with components of stainless steel, brass and EPDM.

4. Manufacturer. Bell & Gossett Model 107A.

E. Strainers

1. Furnish "Y" type strainers throughout the job unless specifically noted otherwise. Furnish hot dip galvanized strainers in galvanized iron pipe.

2. "Y" strainers. Furnish one manufacturer throughout the Project.

a. Strainers shall be designed for 125 psig (860 kPa) minimum steam working pressure equipped with blowoff plugs and manufactured by Crane, Armstrong or Sarco.

Service	Size (inches)	Straining	(Inches)	
		Coarse	Medium	Fine
Water	1/4 to 2	1/10	1/16	30 mesh
	2-1/2 to 4	1/8	1/16	3/64
	5 up	1/4	1/8	1/10

F. Unions:

1. All unions shall be 150 psig (1034 kPa) malleable, iron screwed, with brass to iron ground joints.

G. Pressure Gages:

1. General. Provide pressure gages manufactured by U.S. Gage, Trerice or Ashcroft, with white dial and black scale, size 6 inch (150 mm) dial. Locate gages for easy reading. Install gages as shown and on all pumps. Equip each gage with an integral or separate siphon and connect by means of a brass pipe and fittings containing a shut-off cock.

2. Steam system pressure gages ranges shall be as follows:

	Psig Graduation	(kPa)
High Pressure Gage	0-200	(0-1400)
Low Pressure gage	0-30	(0-200)
Condensate Pump Discharge gage	0-60	(0-400)

3. Water system pressure gages shall have a range to cover pumping head as well as static head.

H. Thermometers:

1. Thermometers in Water Systems. Furnish thermometers of the separable socket type, 9 inch (230 mm) scale, adjustable angle, red reading mercury manufactured by US Gauge, Trerice, or Weiss. Thermometers shall have ranges (as shown) and shall be mounted for convenient reading. Install stems longer than pipe diameters in pipe tee.

I. Expansion Joints.

1. Guides and anchors shall be provided for the joints as recommended by the joint manufacturer and as shown.

2. Expansion compensators size 2 inches (50 mm) and smaller. Furnish Metraflex, Adsco, or Flexonics flexible metal expansion compensators suitable for installation in copper or steel piping lines as shown.

3. Expansion Joints Size 2-1/2 Inches (64 mm) and Larger.

   a. Heating piping expansion joints shall be Adsco, Corruflex, or Solar, self-equalizing, packless expansion joints, stainless steel element with monel metal sleeve, 150 psig (1034 kPa) steam pressure rating at 500 degrees F. (260 degrees C.). Install at locations shown on the plans.

J. Seismic Connector

1. Manufacturers:

   a. Delafield Fluid Technologies.

   b. Flex Hose

   c. Metraflex

2. Guides and anchors shall be provided for the connector as recommended by the connector manufacturer and as shown.

3. Seismic connector shall be as manufactured for the following services sewer, water and natural gas.

4. The seismic connectors shall provide a seismic deflection of twenty-four (24) inch in any direction.

K. Insulating Couplings

1. Provide at all interconnections between piping systems of dissimilar material and at all connections of piping systems to equipment where piping and equipment are of dissimilar materials the appropriate sizes of insulating couplings. Couplings shall be manufactured by Epco, specifically designed for the purpose of electrically isolating pipe lines from other piping systems or equipment.

L. Test Plugs

1. Provide 1/4- or 1/2-inch NPT test plugs of solid brass at the locations shown on the Drawings. Plugs shall be capable of receiving either a temperature probe or pressure probe 1/8-inch O.D. Fittings shall have a valve core of neoprene suitable for temperatures to 200 degrees F., and shall be rated for zero leakage for pressure from 0 to 1000 psig.

2. Provide test plugs manufactured by Peterson Engineering Company "Pete's Plug," or Sisco.

3. Provide two (2) test kits each consisting of a minimum 2-1/2 inch dial face pressure gage, 0 to 200 psig; 1 inch dial thermometer, 25 to 125 degrees F.; 1 inch dial thermometer, 0 to 220 degrees F.; and a standard gage adapter all contained within a carrying case. The pressure gage and thermometers shall be capable of easy re-calibration. Air vents shall be installed on all coils, radiation and other points required for efficient operation of system.

END OF SECTION

SECTION 15130

PUMPS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes pumps for hydronic applications.

2.0 PRODUCTS

2.1 MATERIALS

A. Pumps shall be from the following manufacturers:

1. Bell & Gossett

2. Aurora

3. Paco

B. Condensate Return Pump.

1. Furnish duplex condensate return unit with capacity and characteristics shown on the Drawings. Pump shall be driven by open dripproof ball bearing motors with the electrical characteristics indicated. Pump shall be capable of indicated operation while handling condensate at 200 degrees F. (93 degrees C.). The equipment shall include one (cast iron) (steel) receiver tank, two pumping units with bronze impellers, inlets, vent, drain and pump discharge connections, strainer and a mechanical alternator to allow alternate pump operation and simultaneous pump operation. A gate valve and check valve shall be installed in each pump discharge and a gate valve on the inlet to the receiver. Provide a pressure gage in the common discharge line. The receiver vent shall be galvanized steel pipe installed full size as shown (through the roof and properly flashed). Vent may be connected to a coramon vent if so shown. Provide duplex pump control panel complete with magnetic starters, alternator, fused disconnect switches, hand-off-auto switches, and pilot lights. Panel to be NEMA Type 1 with all components prewired for single point electrical service connection.

C. Condensate Return Pump.

1. Furnish a condensate return pump, vertical shaft type, with open dripproof motor(s). Unit shall have capacity rating indicated on the Drawings while handling condensate at 200 degrees F. (93 degrees c). Duplex units shall be provided with a mechanical alternator to cause alternate pump operation or both, if required. Ball thrust bearing shall be located above floor level. Impeller shall be bronze and shaft of stainless steel, Inlet basin shall be as shown on the Drawings. A gate valve and check valve shall be installed in each pump discharge and a gate valve and strainer shall be installed on the inlet to the basin. The basin shall be (cast iron) (steel) vented with a galvanized steel pipe installed full size through the roof and properly flashed. A common vent may be used if so shown on the Drawings. Provide duplex pump control panel complete with magnetic starters, alternator, fused disconnect switches, hand-off-auto switches and pilot lites. Panel to be NEMA Type 1 with all components prewired for single point electrical service connection.

D. Centrifugal Circulating Pumps.

1. Pumps shall be of the size, capacity, and model as indicated on the Drawings. Pumps shall be selected for nonoverloading characteristics, and the Contractor shall submit performance curves on pumps proposed for installation. Impeller diameters shall not exceed 85 percent of the maximum size impeller cataloged by the manufacturer.

2. Split Case Pumps, Pumps shall be double suction, single stage, centrifugal type, either horizontal or vertical as shown on the Drawings. Pumps shall have ball bearings, either grease or oil lubricated, bronze trim, and cast iron or steel base plate, Casing shall be cast iron, designed for (150) (250) psig (1034) (1720 kPa) working pressure. Impeller shall be bronze and shall be dynamically balanced and securely keyed to the shaft. Impeller wearing rings shall be bronze and casing wearing rings shall be bronze or cast iron. Pumps shall have [(balanced) (unbalanced) mechanical seals] [packed stuffing box with lantern ringi, (steel) (stainless steel) shaft, and (bronze) (stainless steel) shaft sleeves. Pump shall be connected to motor through a (Wood's "sure-flex") (flexible) coupling.

3. End-Suction Pumps. Pumps shall be single-stage, single end suction design, cast iron bronze trim, flexible or close-coupled as shown on the Drawings. Pumps shall have ball bearings, either grease or oil lubricated. Flexible coupled pumps shall be mounted on a steel or cast iron base plate. Casing shall be cast iron, designed for (125) (250) psig [(860) (1720) kps] working pressure. Impeller shall be bronze and shall be dynamically balanced and securely keyed to the shaft. Impeller wearing rings shall be bronze and casing wearing rings shall be bronze or cast iron. Pumps shall have (mechanical seals) (packed stuffing box with lantern ring), (steel) (stainless steel) shaft, and (bronze) (stainless steel) shaft sleeves. Flexible-coupled pumps shall be connected to motor through a (Wood's "sure-flex")(flexible) coupling.

4. In-Line Pumps. Pumps shall be vertical close coupled inline type with suction and discharge flanges the same size located on a -common centerline 180 degrees apart for mounting in the pipe line. The motor and shaft assembly shall be easily rerrioved fron the casing without disturbing the piping. Pumps shall be cast iron, bronze fitted, with casing designed for (100) (173) (250) psi (690) (1200) (1720) kPa) working pressure. Impeller shall be bronze, dynamically balanced, and keylocked to the shaft. Pumps shall have removable bronze wearing rings, (mechanical seals) (packed stuffing box with Latern ring), (steel) (stainless steel) shaft, and (bronze) (stainless steel) shaft sleeves.

E. Condenser Water Pumps (Vertical Turbine).

1. Furnish and install vertical multi-stage, centrifugal short coupled pumps for cooling tower service as shown Furnish sizes, characteristics, and capacities as scheduled.

   a. Motors. Vertical hollow shaft motor, shielded weatherproof drip-proof construction with a 1.15 service factor and a split-type top shaft and threaded coupling to facilitate motor removal. Top shaft to be 416 stainless steel.

   b. Discharge Assemblies. Minimum size as scheduled. Above base cast-iron construction with an ASA 125 lb. flanged discharge suitable for a minimum of 175 psi working pressure.

c. Column and Shafting. Required length schedule 30 steel column pipe with 416 stainless steel high tensile shafting and 303 stainless steel threaded lineshaft couplings and bowl shaft to lineshaft coupling. Column and shafting to be of the water lube construction, using water being pumped.

d. Bowl Assembly. The bowl assembly shall be of close grained enameled cast iron, 30,000 psi (206.8 MPa) minimum tensile strength.

(1) Neoprene rubber copper cored impeller seal ring mounted between the bowl and impeller.

(2) 416 stainless steel high tensile bowl shaft.

(3) SAE 40 bronze impeller.

(4) 303 stainless steel taper lock bushing to secure impeller to the shaft.

(5) Impeller shall be supported by a combination water lubricated, fluted rubber, and bronze bearing located above impeller and a permanently sealed grease lubricated tail bearing located below the impeller.

(6) The bowl shall have a cast-iron bell type inlet.

e. Furnish stuffing box and packing gland designed for cooling tower service.

f. Furnish Nonreversing Ratchet.

g. Furnish a (basket) (cone) type suction strainer of galvanized steel. The net open area of the strainer shall be at least twice the area at the suction bell lip.

F. Variable Speed Pumping Systems.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

1.0 GENERAL

1.1 DOMESTIC WATER PIPING

A. Domestic Water system shall include the following:

1. Pipe and pipe fittings, valves.

2. Domestic water and reclaim water piping system.

3. Electric heat tracing for piping systems.

4. Complete domestic water system from point of connection as shown on the drawings to all fixtures and items of equipment requiring domestic water. Make all final connections.

5. Complete non-potable (industrial) water piping system from point of connection to domestic water system to all fixtures and items of equipment requiring industrial water. Provide backflow preventers and final connection to all equipment.

1.2 PIPING

A. Domestic Water And Reclaim Water Piping, Buried

1. Copper:

2. Tubing: ASTM B88, Type K, annealed, 2 1/2" and smaller.

(1) Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze.

(2) Joints: AWS A5.8, BCuP silver braze.

3. Cast Iron:

   (1) Pipe: AWWA C151. 3" and larger

   (2) Fittings: Ductile iron, standard thickness.

   (3) Joints: AWWA C111, rubber basket with 3/4 inch diameter rods.

4. All exposed finish piping shall be I.P.S. brass pipe and fittings, polished chrome plated.

1.3 FITTINGS

A. Flanges, Unions, and Couplings

1. Pipe Size 2 Inches and Under:

   a. Ferrous pipe: 150 psig

2. Pipe Size Over 2 Inches:

   a. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

   b. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

3. Grooved and Shouldered Pipe End Couplings:

   a. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

   b. Sealing gasket: "C" shape composition sealing gasket.

   c. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. VALVES. See prior sections.

C. PIPING SPECIALTIES. See prior sections.

D. Water Hammer Arrestors. Water hammer arrestors shall be PPP or Siouz Chief, pipe type. Provide access panels.

E. Backflow Preventers. Backflow preventers shall be of the type required for each application.

F. Flow Regulators. All hot water risers and circulating loops shall have the circulating flow rate automatically regulated using a Griswold flow control valve Model 3771 with 0.5 gpm flow rate or greater as noted on the drawings at 1 to 14 psi pressure differential.

G. Warning Signs. Permanent warning signs with 2" high block letter shall be provided at each location as follows:

1. Each outlet of non-potable water. Sign shall read "DANGER-UNSAFE WATER."

2. Each outlet where hot water source is 140°F system. Sign shall read "DANGER - HOT WATER."

1.4 PIPE WRAPPING

A. Polyethylene: IAPMO approved; 10 mil minimum thickness; wrapped with minimum ½ overlap.

B. Polyvinyl Chloride (PVC) Sleeve: Minimum 27 mil thickness; flexible.

1.5 ELECTRIC HEAT TRACING

A. Manufacturer:

1. Thermon Econotrace Systems.

2. Raychem XL-Trace or equal.

B. Design conditions are 30 degrees F ambient air temperature, 70 degrees F fluid temperature, 30 mph wind velocity.

C. Provide parallel resistance type heating cable, 4 watts per foot at 120V, stranded copper buss wire, PVC inner insulation, resistance heating wire, PVC sheath, UL listed.

D. Provide outside air sensing thermostat with adjustable set point. Initial thermostat setting 40 degrees F.

E. Manufacturer:

1. Thermon; Model NIE.

2. Raychem XL-Trace or equal.

F. Provide necessary components for complete system, including connectors, splice kits, fastening tape.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

1.0 GENERAL

1.1 SANITARY WASTE AND VENT PIPING

A. This System includes the sanitary drainage piping and includes:

1. Pipe and pipe fittings.

2. Sanitary sewer piping system.

3. Floor Drains

4. Floor Sinks

5. Shower Drains

6. Cleanouts

7. Grease Interceptor

2.0 PRODUCTS

2.1 PIPING

A. Sanitary Sewer Piping, Buried

1. Cast Iron Pipe: ASTM A74 service weight.

a. Fittings: Cast iron.

b. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Sanitary Sewer Piping, Above Grade

1. Cast Iron Pipe: ASTM A74, service weight.

a. Fittings: Cast iron.

b. Joints: ASTM C564, neoprene gasket system or lead and oakum.

c. Aerators and De-aerators for Solvent Drainage Systems: ASME/ANSI B16.45-1987; grey cast iron.

2. Cast Iron Pipe: CISPI 301, hubless, service weight.

a. Fittings: Cast iron.

b. Joints: Neoprene gaskets and Type 304 stainless steel, heavy duty wide clamp-and-shield assemblies with 80 psi torque strength.

3. Steel Pipe: ASTM A53, Schedule 40, galvanized. (Exposed in kitchen areas only.)

a. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.

b. Malleable Iron Fittings: ASME B16.3, screwed type. ASTM A47.

c. Mechanical Grooved Couplings: Malleable iron, galvanized.

d. Condensate Drain Piping

4. Copper Tubing: ASTM B88, Type M, hard drawn.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under:

1. Ferrous pipe: 150 psig malleable iron threaded unions.

2. Copper tube and pipe: 150 psig bronze unions with soldered joints.

3. Pipe Size Over 2 Inches:

a. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

b. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

c. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 FLOOR DRAINS

A. Floor Drains, Floor Sinks

1. Manufacturers

a. Zurn

b. Wade

c. J.R. Smith

d. Josam.

B. Shower Drains

1. Manufacturers

a. Zurn

b. Wade

c. J.R. Smith

d. Josam.

2.5 CLEANOUTS

A. Manufacturers:

1. Zurn, Model 1400.

2. Smith, Model 4020.

3. Josam, Model 58010.

4. COTG

a. (Exterior Surfaced Areas): Round cast nickel bronze access frame and non-skid cover.

b. (Exterior Unsurfaced Areas): Line type with lacquered cast iron body and round epoxy coated gasketed cover.

c. FCO (Interior Finished Floor Areas): Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze strainer, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.

5. WCO

a. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

b. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.6 GREASE INTERCEPTORS

A. Manufacturers:

1. Zurn

2. Jay R. Smith

3. Construction: Acid resistant coated interior and exterior fabricated steel grease interceptor PDI rated in GPM and lbs. grease capacity as indicated on the drawings, with internal air relief by-pass, bronze, cleanout plug and visible double wall trap seal with removable combination pressure equalizing/flow diffusing baffle and sediment tray. Gasketed non-skid secured cover with enzyme port opening having bronze plug, complete with flow control fitting.

END OF SECTION

SECTION 15160

STORM DRAINAGE PIPING

1.0 GENERAL

1.1 STORM DRAINAGE PIPING

A. This System includes the storm drainage piping and includes:

1. Pipe and pipe fittings.

2. Storm water piping system.

3. Roof and Overflow Drains

4. Cleanouts

2.0 PRODUCTS

2.1 PIPING

A. Storm Water Piping, Buried

1. Cast Iron Pipe:

a. Fittings: Cast iron.

b. Joints: ASTM C564, neoprene gasket system or lead and oakum.

B. Storm Water Piping, Above Grade

1. Cast Iron Pipe: CISPI 30, hubless, service weight.

a. Fittings: Cast iron.

b. Joints: ASTM C564, neoprene gasket system or lead and oakum.

2. Cast Iron Pipe: CISPI 301, hubless, service weight.

a. Fittings: Cast iron.

b. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.2 DRAINS

A. Roof Drains, Roof Sinks

1. Manufacturers:

a. Zurn.

b. Wade.

c. J.R. Smith

d. Josam

2. Roof and Overflow Drains: ANSI A112.21.2.

a. Body: Lacquered cast iron with sump.

b. Strainer: Removable, cast iron dome with vandal proof screws.

c. Accessories: Membrane flange and membrane clamp with integral gravel stop, under deck clamp, roof sump receiver. Provide flashing, Nobleflex chlorinated polyethylene roof drain flashing or equal extending 8" out in all directions from roof.

d. Overflow roof drain shall be typical to roof drain except it shall have a 2-inch high water dam.

2.3 CLEANOUTS

A. Manufacturers:

1. Zurn, Model 1400.

2. Smith, Model 4020.

3. Josam, Model 58010.

B. COTG

1. (Exterior Surfaced Areas): Round cast nickel bronze access frame and non-skid cover; Model 4261 manufactured by J.R. Smith.

2. (Exterior Unsurfaced Areas): Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. FCO (Interior Finished Floor Areas): Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze strainer, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.

D. WCO

1. (Interior Finished Wall Areas): Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2. (Interior Unfinished Accessible Areas): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

END OF SECTION

SECTION 15180

HEATING AND COOLING PIPING

1.0 GENERAL

1.1 HEATING AND COOLING PIPING

A. This includes chilled, condenser and hot water heating piping for the hydronic systems.

B. Products

1. Chilled Water Piping.

a. Pipe shall be Type L drawn copper for pipe sizes 2 inches (50 mm) and smaller. Pipe 2-1/2 inches (65 mm) and larger shall be black steel.

b. Fittings for copper piping shall be wrought copper, same weight as pipe, sweat type or cast bronze (tinned when brazed).

c. Furnish welding fittings for steel pipe.

C. Condenser Water Piping.

1. Interior and Aboveground.

a. Pipe shall be standard weight black steel pipe. Pipe 2 inches (50 mm) and smaller shall be threaded. Pipe 2-1/2 inches (64 mm) and larger shall be welded.

b. Fittings on pipe 2 inches (50 mm) and smaller shall be *malleable iron.

c. Fittings on pipe 2-1/2 inches (65 mm) and larger shall be steel welding fittings.

D. Hot Water Heating Piping.

1. Pipe shall be Type L, drawn copper for pipe sizes 2 inches (50 mm) and smaller. Pipe 2-1/2 inches (65 mm) and larger shall be black steel pipe standard weight.

2. Fittings for copper piping shall be wrought copper or cast bronze (tinned when brazed), same weight as pipe sweat type. Furnish welding fittings for steel pipe.

E. Refrigerant Piping.

1. Sizes shown on plans are outside diameter.

a. Field Fabricated Pipe. Furnish copper water tube Type L, drawn temper with wrought copper or cast bronze (tinned when brazed) fittings.

b. Pre-charged Piping. Furnish copper tube Type L, annealed, with "Quick Connect" fittings matched to units.

F. Steam and Condensate Piping.

1. All steam supply piping shall be standard weight, black steel pipe.

2. All condensate return piping shall be (stainless steel type _____). (Schedule 80 black steel pipe). ("Yoloy" pipe).

3. All pumped condensate piping shall be (Schedule 80 black steel) (stainless steel type _____).

4. Threaded fittings shall be Malleable iron.

5. Welding fittings shall be steel.

G. Traps

1. Thermostatic traps shall be provided for all convectors and finned type radiation, Hoffman 8C, 9C, 17C, Trane No. B-1, Sarco Type H, rough brass body, size as indicated on the radiation schedule.

2. Thermostatic traps for medium pressure steam shall be Hoffman No. 8, 9, Trane Type B-1, or Sarco Type S-65. Traps connected to chrome-plated equipment installed in open area shall be chrome or cadmium plated. Size as indicated on the schedules.

3. Low pressure float and thermostatic traps with bodies rated at 15 psi (100 kPa) working pressure shall be Armstrong Series B, Sarco FTP, Hoffman, Series 50 or Trane 55AL, 66CL, 77HL, with capacities as shown.

4. Bucket traps shall be Sarco Type B, or Armstrong, Series 200, Illinois Engineering Company, Series 61, capacity as shown.

5. Low pressure float and thermostatic traps with bodies rated at 125 PSI 860 kPa) steam working pressure shall be Armstrong, Series A, with capacities as shown.

H. Drip Pan Elbows.

1. Drip pan elbows shall be installed on each relief valve discharge and shall be Crane. Discharge from elbow shall be carried to point 12 inches (300 mm) above roof and flashed. Discharge pipe shall be minimum of one pipe size larger than the discharge of the drip pan elbow. Drain from pan shall be extended to nearest floor drain with ½ inch (15 mm) pipe.

I. Steam Vacuum Breaker. Vacuum breakers shall be provided on closed vessels and piping systems to control induced vacuum within safe limits. They shall be factory set to open at 2-inch H.G. vacuum, be adjustable from 1/4 to 20 inches H.G. and be suitable for maximum operating pressure of 150 psi. Provide Hoffman No. 62.

END OF SECTION

SECTION 15181

SITE CHILLED WATER AND HEATING WATER PIPE

1.0 GENERAL

1.1 SITE CHILLED WATER AND HEATING WATER PIPE

A. Provide and install chilled water and heating water piping - direct buried of every kind for the water piping systems complete with all necessary bedding, fittings, thrust blocks, trenching, backfilling and hardware as necessary for fully functional piping systems.

2.0 PRODUCTS

A. PVC Direct Burial Pipe

1. Manufacturers: Rovanco, Permapipe/Ricwil, Thermal Pipe Systems.

2. Carrier Pipe: Polyvinyl chloride (PVC) SDR 26 (160 psi) at 73°F conforming to ASTM D2241 and commercial standard C5-256, in nominal 20-foot lengths.

3. Insulation: Polyurethane foam with the following minimum characteristics: K factor, 13 density 2 pcf, closed cell content 90-95% in conformance with MIL-I-24172, and ASTM C-S91 completely filling the annular space between the carrier pipe and jacketing.

4. Jacketing Material: High impact, seamless PVC, Class 12454-B compound conforming to ASTM-1784, Type 1, Grade 1, Minimum jacket thickness shall be as follows:

Pipe Size (in)	Jacket Size (in)	Insul. Thick (in)	Jacket Thick (mils)
8	12	1.68	120
6	10	1.68	100
4	8	1.75	80
2	6	1.81	70

5. Joining Method: Pipe is joined with rubber O-ring gasket seals conforming to ASTM D1869 and ASTM D3139 on each 20 foot length to allow for expansion and contraction. Joints are to be uninsulated.

6. Fittings: PVC, made of the same type and grade material as the piping to which they are attached and rated at the same pressure and temperature as the pipe, integral bell and spigot, fitted with rubber ring gaskets.

7. End Seals: all lengths of pipe will have factory installed watertight end seals. Any lengths cut in the field will be sealed with field-applied, watertight end seals.

8. Thrust Blocks: All underground changes of direction, i.e., 90° elbows 45° elbows, tees, etc., shall be uninsulated, as they are poured in concrete thrust blocks to form anchor points and direct the expansion and contraction to take place at the gasketed joints.

9. PVC Pipe Primer: IPS Weld-on P-70 primer or equal.

10. PVC Pipe Solvent Cement: IPS Weld-on 719 or equal.

B. Pre-insulated Steel Pipe for Direct Burial - Heating Water

1. Manufacturers: Ravanco, Permapipe/Ricwil, Thermal Pipe Systems.

2. Carrier Pipe: Black Steel conforming to ASTM A-53 Grade B Schedule 40. All exposed pipe ends shall be corrosion resistant at the factory.

3. Insulation: Polyurethane foam with following minimum characteristics: K factor, 13 density 2 PCF, closed cell content 90-95% in conformance with MIL-I-24172 and ASTM C-591 completely filling the annular space between Carrier pipe and jacketing.

4. Jacketing Material: High impact, seamless PVC Class 12454-B compound conforming to ASTM 1784, Type 1, Grade 1. Minimum jacket thickness shall be as follows:

Pipe Size (in)	Jacket Size (in)	Insul. Thick (in)	Jacket Thick (mils)
8	12	1.68	120
6	10	1.68	100
4	8	1.75	80
2	6	1.81	70

5. Joining Method: Coupling; each end of the pre-insulated pipe section shall be furnished with a coupling containing one (1) O-Ring seal at one end and factory welded to the Carrier pipe at the other end. When two lengths are joined the O-Ring shall compress to form a watertight connection and also provide separation of pipe ends for expansion and contraction. Loops or expansion joints shall not be required as each coupling shall evenly distribute expansion and contraction along the entire length of piping. O-Ring seals shall be constructed of a material which withstands 250°F Hot Water at 150 PSIG continuous working pressure with no leaking.

6. Fittings: PVC, made of the same type and grade material as the piping to which they are attached and rated at the same pressure and temperature as the pipe, integral bell and spigot, fitted with rubber ring gaskets.

7. End Seals: All lengths of pipe will have factory installed watertight end seals. Any lengths cut in the field will be sealed with field-applied, watertight and seals.

8. Thrust Blocks: All underground changes of direction, i.e., 90°elbows, 45°elbows, tees, etc., shall be uninsulated, as they are poured in concrete thrust blocks to form anchor points and direct the expansion and contraction to take place at the gasketed joints.

END OF SECTION

SECTION 15190

FUEL PIPING

1.0 GENERAL

1.1 FUEL PIPING

A. This includes all Work for the complete installation of fuel piping systems.

2.0 PRODUCTS

2.1 GAS PIPING

A. Gas piping shall be standard weight, black steel pipe. All fittings, except cocks, shall be standard weight, beaded, malleable iron. Furnish gas cocks as required for proper isolation of all equipment.

2.2 FUEL OIL SYSTEM

A. Provide as shown on the Drawings a complete system of fuel oil storage and piping. The system shall be complete with underground tank(s), day tank(s), piping, valves, filters, and pumps. The system shall be for No. 2 fuel oil. Tanks shall be installed as detailed on the Drawings. The system shall conform to the standards of NFPA (30) (31) (37).

B. Underground tank(s) shall be all welded steel, designed for underground service and shall bear the underwriter's label. Tank(s) shall be furnished with required reinforced threaded tappings, and fill line shall extend to within 6 inches (150 mm) of bottom of tank. Tank(s) shall be provided with a remote reading oil level gage(s) mounted on wall of mechanical room as directed. Gage shall be Hersey "Large" Model Pneumatic Hand Pump Type Level Gage, Liquidometer Corporation or Simmonds Precision. Tanks shall have a calibrated rod for measuring oil level in tank and an opening carried to grade with a watertight cover for measuring oil level. Tank(s) shall be delivered with one coat of red lead already applied and shall be painted with two additional coats during installation. Tank(s) shall have capacity as indicated on the Drawings.

C. Underground tank shall be fiberglass-reinforced polyester construction. The tank shall have a safety factor of 3:1 against general buckling from external hydrostatic pressure and shall withstand a 5 psi internal air pressure test with a 5:1 safety factor. Tank shall be capable of storing liquids with specific gravity up to 1.1 and up to a maintained temperature of 10 degrees F. (65 degrees C.) at the tank interior surface. Tank shall be chemically inert to petroleum products. Tank shall be UL labeled and tested and installed according to the manufacturer's instructions. Tank(s) shall be provided with a remote reading oil level gage(s) mounted on the mechanical room wall as directed. Gage shall be Hersey "Large" Model Pneumatic Hand Pump Type Level Gage, Liquidometer Corporation or Simmonds Precision.

D. The day tank shall be all welded steel, designed for above ground service and shall bear the underwriter's label. Tank shall be provided with a remote reading oil level gage mounted on wall of mechanical room as directed. Gage shall be Liquidometer Corporation "Midget" Model Pneumatic Indicator or Simmonds Precision. Tank shall have capacity as indicated on the Drawings. Provide high level switch to stop pumps and low level switch to start pump. (Provide high and low level alarm contacts on gage).

E. Piping.

1. Piping shall conform to one of the following:

   a. Piping shall be standard weight black steel with cast iron fittings.

   b. Underground piping shall be Type K copper annealed with flared fittings. Exposed piping in mechanical room shall be Type K hard drawn copper with solder joint fittings.

2. Aboveground vent and fill lines shall be galvanized steel with malleable iron fittings.

3. Suction lines shall be provided with an anti-siphon device. Basket type filter shall be placed in line ahead of (burner) (generator). Gate valves shall be installed in line ahead of filters and a check or foot valve installed in the suction as required to maintain prime. No valves shall be installed in return lines, unless a relief valve is placed ahead of the valve and piped to discharge into the oil suction lie.

F. Fuel oil transfer pumps shall be of the horizontal positive displacement (turbine) (or) (rotary) type, size, and capacity as shown on the Drawings. Pump and motor shall be (close-) (flexible-) coupled and shall be installed on a common base, (pumps shall be furnished with built-in relief valves).

END OF SECTION

SECTION 15120

PROCESS AIR AND GAS PIPING

1.0 GENERAL

1.1 PROCESS AIR AND GAS PIPING

A. This includes all Work for the complete installation of special gas piping systems.

2.0 PRODUCTS

2.1 GAS PIPING

A. Gas piping shall be standard weight, black steel pipe. All fittings, except cocks, shall be standard weight, beaded, malleable iron. Furnish gas cocks where shown.

B. Central Bottled Gas System

1. General. The bottled gas system shall be installed from and including the manifold to the outlets shown.

2. Manifold shall consist of eight cylinders divided into even units of service and reserve. Provide a dual-bank switching manifold with a regulator for each bank and a common discharge line. The regulators shall be set at slightly different delivery pressures and shall automatically discharge the service bank, then switch to discharge the reserve bank. Provide a final line pressure regulator to insure an even, precise delivery pressure. Regulators shall be easily repaired without interruption of service. Provide automatic indication when the switch-over from the service bank to the reserve bank takes place. Indicating lights at the control unit itself and at a remote status panel, location as shown on the Drawings, shall show that the system is on reserve. Provide check valves and flash arrestors at pigtail connections to cylinders and all accessories required for a complete system.

3. Gas piping shall be standard weight, black steel pipe. All fittings, except cocks, shall be standard weight, beaded, malleable iron. Furnish gas cocks as required for proper isolation of all equipment.

4. Compressed Air Piping. Compressed air piping shall be standard weight, black steel pipe. Fittings shall be malleable iron for size 2 inches (50 mm) and smaller, and welding fittings for 2-l/2 inches (65 mm) and larger piping.

C. Central Vacuum System

1. General. The vacuum system shall be installed from and including the vacuum pump to the station outlets. The equipment specified and indicated on the Drawings is based on equipment manufactured by Chemetron Corporation. Other acceptable manufacturers are Ohio Medical Products, Puritan-Bennett or Nash Engineering Company.

D. Vacuum Pump

1. Provide duplex vacuum pumps mounted to the receiver, factory wired for single point electrical connection. Provide two suction pressure operating switches with the following control:

2. The first pressure switch will start one pump at 19 inches (480 mm) of mercury and stop at 25 inches (635 mm) of mercury. The second pressure switch starting the second pump at 18 inches (457 mm) of mercury and stopping at 25 inches (635 mm) of mercury to supplement the system.

3. Unit shall be complete with alternator, factory wired and mounted NEMA 12 control panel with magnetic starters, fusible disconnect switches, time delay shutdown switch and all other controls as specified for a complete system.

4. Pumps shall be composed of a rotary oil sealed pump, automatic pump lubricator, a vacuum line filter, drive motor, and a vacuum gage.

5. Provide flexible pipe connectors, vibration isolation pads and all other accessories required for a complete system.

6. Station Outlets. Provide vacuum outlets as specified for central oxygen system station outlets.

E. Piping and Fittings.

1. Piping shall be Type L copper tubing with wrought copper fittings.

2. Pumps shall be connected to the system with flexible piping.

F. Engine Generator Exhaust Piping.

1. General. Provide, as shown on the Drawings, a complete system for the removal of exhaust products of combustion from the engine-generators. System shall conform to the requirements and recommendations of NFPA 37 and the specific requirements of the engine-generator manufacturer.

2. Provide all pipe, fittings, flexible connectors, insulated roof thimble, tall cone flashing, anchors and guides, flapper caps and insulation.

3. Piping shall be standard weight Schedule 20 black steel pipe with welded fittings.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all Work as necessary for the complete installation of the plumbing fixtures and trim.

2.0 MATERIALS

A. General

1. Fixtures specified hereinafter shall be the standard product of one of the manufacturers listed below comparable to models listed for each fixture. Crane, Wade, Haws, Kohler, Bradley, T/S Brass, American Standard, Elkay, Halsey Taylor, Josam, Symmons, Brass Craft, Zurn, Speakman, Eljer, Powers, Williams, MIFAB, SLOAN.

2. Flush valves shall be Sloan, Zurn, or Delaney, comparable to models listed.

3. All plumbing fixtures shall be provided complete with all necessary trim and accessories to insure the proper installation and operation of each fixture. Trim and accessories shall include but not limited to supply pipes, stops, drains, strainers, tailpieces, P-traps and bolt caps.

B. Water Closets.

1. General.

a. Furnish white vitreous china water closets with elongated bowl type, with bolt caps, 1.6 G.P.F.

b. Seats. Unless otherwise specified, seats shall be manufactured by Olsonite, Church or Beneke. Furnish white or black seats with concealed hinge, open front elongated seat, solid plastic, less cover and with concealed check.

2. Flush Valve Closets.

   a. Furnish siphon jet, quiet action closets with l-l/2 inch (40 mm) top spud.

   b. Wall-hung closets: Provide Floor-Anchored fixture carrier as manufactured by J.R. Smith, Zurn or MIFAB.

   c. Floor mounted closets. Provide Kohler or American Standard.

   d. Flush Valves. Furnish valves manufactured by Sloan, IR sensors, battery operated.

C. Urinals.

1. Shall be vitreous china, wall hung, washout type with valve operated integral flush spreader, strainer for 2 inch drain connection, 3/4 inch (20 mm) top spud, 1.0 G.P.F.

2. Provide Kohler or American Standard.

3. Furnish valves manufactured by Sloan, IR sensors, battery operated.

4. Provide floor anchored fixture carrier, as manufactured by J.R. Smith, Zurn or MIFAB.

D. Lavatories.

1. Provide Kohler or American Standard.

2. Wall Hung - General Purpose: Furnish vitreous china, high back, rectangular basin, and splash lip front overflow. 4" centers with floor anchored carrier J.R. Smith, Zurn or MIFAB.

3. Wall-Hung/Disabled Access: Same as above with protective covering below fixture.

4. Counter Top. Round basin with cast-in soap dish, vitreous china.

5. Counter top disabled access: same as above with vitreous china, round basin. Protective covering below fixture.

6. Kitchen. Vitreous china lavatory with foot control on concealed wall hanger and fittings. Size 20 x 18 inches (508 x 457 mm) wall mounted.

E. Service Sinks.

1. Provide Kohler or American Standard.

2. Service Sinks. Acid-resisting, enameled cast iron, supply fitting with threaded spout and pail hook vacuum breaker and stops, enameled, inside trap with strainer, wall hangers, stainless steel rim guard, size 24 x 20 inches (610 x 510 mm).

3. Floor Mop Sink. Fiat or Williams, “Terrazzo” Type; size 24 x 24 x 12 inches (610 x 610 x 305 mm) deep. Cast brass drain, chrome plated, calked lead connection for 3 inch (75 mm) waste pipe. One piece 20 gage (U.S. Standard) 302 stainless steel cap and splash catcher panels on one, two or three sides as shown. Exposed type double faucet, l/2 inch (15 mm) supply, rough-plated body with backflow preventer, stops and five feet (l m 524 mm) of rubber hose. Mount faucet stops 24 inches (600 mm) above floor of sink.

F. Drinking Fountain with Cuspidor.

1. Kohler "Glenbrook-Glenguard" K-5292-A white vitreous china semi-recessed cuspidor and drinking fountain.

2. Drinking fountain “Glenbrook" K-5293A complete with K-8493 supply fitting with non-squirting bubbler head, self closing control valve, adjustable for continuous flow, automatic regulator, screw driver regulating stops with 3/8 inch (10 mm) I.P. inlet connection, bypass connection to cuspidor, strainer, l-l/4 inch (32 mm) cast brass trap with cleanout plug, metal access cover and wall screws.

3. Cuspidor "Glenguard" K-5295-A complete with K-8489 supply fitting, connection to spreader, C.P. Brass Spreader, Strainer with K-9044 1-1/4 inch (32 mm) cast brass trap with cleanout extension to wall, metal access cover, and wall screws.

G. Electric Water Coolers.

1. Haws, Oasis, Elkay, or Halsey Taylor wall mounted with 18-8 Type 302 stainless steel top with removable drain strainer and anchoring plate. Furnish anti-squirt bubbler with built-in strainer and pressure regulator and vandal-proof. Bubbler valve is adjustable and replaceable from top of cooler. Unit shall have adjustable temperature control located inside cabinet, 20 gage, (U.S. Standard) phosphatized steel.

2. Compressor. Provide hermetically sealed unit using freon 12 refrigeration system removable for service. (186W) compressor, 115 V, 60 Hz, l Ph motor, fan cooled condenser with pre-cooler. Provide with 3W grounding cord and plug. Furnish a 5-year warranty on the refrigeration system. The units shall be UL approved. All plumbing and electrical connections shall be concealed.

H. Showers

1. Gang Showers. Furnish Symmons Powers or Speakman with screwdriver stops, or approved equal. C.P. Lever Handle C.P. shower heads and wall flange. Rough-in all supplies inside wall, see drawings for wall thickness. Furnish integral flow control set for 7.8 liters per minute (2 gpm) on all shower heads.

2. Individual Showers. Furnish Symmons, C.P. Lever Handle with balanced pressure mixing valve with renewable seats, size 1/2 inch integral stops and temperature limit stop. C.P. shower head with integral ball joint, bent arm and wall flange. Furnish integral flow control on shower head set for 7.8 liters per minute (2.0 gpm).

I. Tempered Water Mixing Valves.

1. Furnish water mixing valves to provide 46 degrees C. (115 degrees F.) tempered hot water. Valve shall be Powers Regulator Company, Series 430 "hydroguard" or approved equal, and shall be mounted as shown. Unit shall be complete with inlet and outlet shut-off valves and inlet strainers. Mixing valve shall have the capacity indicated on the Drawings. Unit shall have a dial thermometer. Furnish a shut-off valve on the tempered water supply line. Cabinet construction shall be of 16 gage (U.S. Standard) steel with door and flange of 14 gage (U.S. Standard) steel. Cabinet finish, interior and exposed exterior, two coats baked white enamel. Doors shall be furnished with tumbler type lock. All piping within cabinets shall be chrome-plated. Area shut-off valve for cold water shall be furnished and installed to match shut-off valve in tempered water line. Both valves shall be located in cabinet.

END OF SECTION

SECTION 15480

DOMESTIC WATER HEATERS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Manufacturers

1. Bradford White

2. A. O. Smith

3. Raypak

END OF SECTION

SECTION 15510

HEATING BOILERS AND ACCESSORIES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Manufacturers

1. Laars
2. Ajax
3. PVI

B. Quality Assurance

1. Boilers shall meet the requirements of South Coast Air Quality Management District (SCAQMD).
2. The boiler(s) shall comply with all local and national air quality regulations for low NOx boilers and shall emit 0-20 ppm NOx emissions, depending on combustion air quality and fuel composition.
3. The boiler(s) shall meet ANSI standard Z21.13 for hot water boilers.

END OF SECTION

SECTION 15620

PACKAGED WATER CHILLERS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Centrifugal Chiller Manufacturers

1. Carrier
2. Trane
3. York

B. Reciprocating Chiller Manufacturers

1. Carrier
2. Trane
3. Multistack

C. Scroll chiller Manufacturers

1. Carrier
2. Trane
3. Multistack

D. Quality Control

1. Refrigerant used shall comply with current environmental regulations.

END OF SECTION

SECTION 15640

PACKAGED COOLING TOWERS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Manufacturers
   1. Baltimore Aircoil
   2. Marley

END OF SECTION

SECTION 15720

AIR HANDLING UNITS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Air handling units consisting of fans, coils, dampers, control devices and other accessories

B. QUALITY ASSURANCE

1. Requirements of Regulatory Agencies: All fans shall be tested and rated in accordance with AMCA Standard 210 Fans shall bear the AMCA label.

C. AIR HANDLING UNITS.

1. The units shall be provided as indicated on the Drawings.

2. Units shall be complete with fans, motors, belt drives, belt guards, filters, coils, and dampers.

3. Modular Acoustic Plenum. Air handling units shall be housed in modular acoustic plenums where shown on plans and hereinafter specified. Noise shield panels and components manufactured by Industrial Acoustics Company, acoustics panels by Eckel Corp., or noise guard panels by Korfund.

a. Plenums shall be mounted on a level concrete curb dimensions of which shall be as determined by combining standard panel sizes to form the required plenum configuration.

b. Panels shall be 4 inch (100 mm) thick with interior perforated panel sheets of No. 22 gage galvanized steel with 3/32 inch (2 mm) diameter holes spaces on 3/16 inch (5 mm) staggered centers.

c. Exterior solid panel sheets shall be 18 gage galvanized steel.

d. Sound retarding and absorbing fill shall be incombustible, inert, mildew resistant, and vermin-proof.

e. Internal panel reinforcement shall be a minimum of 18 gage galvanized steel and spaced so that span does not exceed 2 feet (600 mm). Perimeter and internal reinforcement and panel sheets shall be welded and riveted to form a rugged metal-sheathed acoustical panel. Spot welds shall not exceed 3 inch (75 mm) on centers.

f. Prior to attaching the face sheet, the panel shall be filled with sound retardant and absorbing fill, as specified above. The fill shall be slightly larger and thicker than the inside dimensions of the panel. No voids will be acceptable.

g. The face sheet shall be welded and riveted to the panel assembly so as to compress and hold the fill materials in place under severe conditions of vibration such as encountered in shipment, installation, and operation.

h. Door panels shall be constructed of solid No. 18 gage galvanized metal sides. Doors shall be as shown on the Drawings. The doors shall be 4 inch (100 mm) thick of the overlapping seal type. Each door shall be supplied with single continuous air/acoustic seals around the sill, jambs, and head. Doors shall have 2 hinges and 2 latches with an inside release handle. Each door shall be assembled with hinge hardware attached and adjusted, and latches to be installed in field. Door latches are to be the wedge lever type with inside handle. Hinges shall be heavy duty and designed for door size and weight. Doors shall be installed to open against the air pressure.

i. Windows shall be provided for doors where shown on the Drawings and shall consist of two layers of 1/4 inch (6 mm) safety glass separated by air space and sealed acoustically and air tight with rubber seals. Air space shall contain a desiccant material to prevent misting.

j. Roof channels, aprons, and corner joiners shall be made of No. 16 gage galvanized steel formed to prevent a direct path for sound and/or air leakage. Floor channels shall be made of No. 18 gage galvanized steel. Panel joiners shall be made of No. 20 gage galvanized steel and shall be roll formed to greater in strength than standard 16 gage joiners. Where these roll formed joiner sections are not utilized 16 gage shall be provided. All panel accessories shall be furnished in standard lengths to be field cut to required dimensions.

Where ramset cannot be used, floor channels shall be pre-punched with 9/32 inch (7 mm) holes spaces 24 inch (610 mm) on centers for attachment by 1/4 inch (6 mm) round head screws with expansion type inserts. All panel joiners and connectors requiring felted surfaces shall have the felt field applied.

k. Openings for fan and duct connections where required shall be provided by the plenum manufacturer. Pipe and conduit penetrations shall be located and cut in the field and sealed in accordance with the manufacturer's instructions.

l. The plenum structure shall be normally self-supporting. Where roof spans and wall loading require additional structural strength, it shall be provided either by heavier roof and wall joiners, or additional structural members and/or pipe columns.

m. Metal surfaces shall be galvanized except 5 inch (130 mm) wide flange beams when used which shall be HR steel prime painted.

n. Panels shall have a heat transfer factor of .07 Btu/hr/sq. ft./degree F. (0.40 watts per square meter degrees kelvin) temperature difference of standard air.

o. Penum installation shall be capable of withstanding a positive internal static air pressure of _____ inches (_____ mm).

p. Plenum installation shall be capable of withstanding a negative internal static air pressure of _____ inches (_____ mm).

q. Plenum design shall meet the combustion requirements established by ASTM E 84. The panels shall not exceed the following limits:

(1) Flame spread Classification 15

(2) Smoke Developed 0

(3) Fuel Contributed 0

r. Plenum manufacturer shall warrant that when plenums are installed in a workmanlike manner in strict accordance with these Specifications and manufacturer's instructions, plenums shall meet the acoustical, thermal, and air pressure performance specified.

s. Plenum components shall be furnished clean and free of any defects which may adversely affect appearance, serviceability, or performance Manufacturer shall furnish proof, satisfactory to the Architect of having manufactured similar plenums for at least five (5) years prior to this installation.

t. Casings. Each air handling unit shall be housed in a casing constructed of steel sheets not less than 0.0478 inch (1.5 mm) in thickness, 18 gage. The cabinet shall be adequately reinforced and stiffened with steel angles or other structural members, and shall be provided with all necessary interior panels, supports for equipment, access openings, and dampers. Casing openings connected to ducts shall be equipped with removable angles and bolts for attaching canvas or other flexible connections. All interior surfaces of the casing shall be rendered rust resistant. Removable panels in the casing shall provide easy access to all parts for lubrication and servicing when the unit is installed. The cabinet shall be insulated on the inside with not less than 1 inch (25 mm) acoustical insulation

u. Circulating fans in unit assemblies shall be of the centrifugal (airfoil) type, shall have an air capacity not less than indicated on the Drawings when operating against the static pressure indicated on the Drawings.

v. Each fan unit shall be installed complete with electric motor and drive equipment. The fans shall be rated and constructed in accordance with the AMCA standard test codes. Fans shall be statically and dynamically balanced at all speeds. The fan shall have externally-mounted, self-aligning, grease-lubricated ball bearings. (Fan bearings to have 200,000 hour minimum life per AFBMA-B10). The fan shafts shall be made of steel, and shall be provided with key seats and keys for the impeller hubs and fan pulleys or with other equally positive fastening. V-belt drives shall be designed for at least 50 percent overload capacity (and shall be designed to allow adjustment of fan speed). Each fan motor shall be equipped with adjustable base or rails for belt tightening. Motor mountings shall be on a resilient base constructed of steel shapes and connected through rubber-in-shear isolators. Contractor shall submit complete fan performance curves marked to indicate selection points for proposed fans. Data submitted shall also include sound power levels in all octave bands.

w. Motors shall be squirrel cage, general purpose 40 degrees C., polyphase NEMA frame, with electrical characteristics as indicated on the Drawings. Starter will be provided under Division 16, ELECTRICAL. Wiring to the motor lugs is specified under Division 16, ELECTRICAL. Provide motors with ball bearings rated for _____ hour minimum life per AFBMA-B10.

x. Coils. Coil Face areas, Rows and Fins shall be minimum as indicated in the schedule.

y. Each unit shall be provided with the necessary piping, valves, and accessories as indicated on the Drawings and as specified.

z. Mixing boxes with filters shall be field-fabricated or furnished with unit as shown. Factory built mixing boxes shall be furnished with dampers.

aa. Face and by-pass dampers shall be provided for all air handling units as shown. Multizone and double duct units shall have insulated divider between hot and cold decks, pressure equalizing baffle to equalize pressure drop between hot and cold decks, and zone mixing dampers shall be neoprene edged for tight close-off.

bb. Air handling units shall be manufactured by Carrier, Trane or York.

D. Custom Air Handling Units

1. Manufacturer's Qualifications

a. Provide custom air handling units as scheduled on Drawings. Equipment manufacturers shall be regularly engaged in the production of such units and also issue complete catalog and or computer generated performance information on them. Product shall at a minimum, have been manufactured for the last ten consecutive years and have a minimum of two hundred successfully operating installations. Field fabricated units by the Contractor are not acceptable.

b. Manufacturers: Petra Engineering, Temtrol, Energy Labs, Alliance Air.

2. Certifications

   a. Manufacturer must provide certified ratings conforming to the latest edition of AMCA 210, 310, 500 and ARI 410 for coils.

3. Codes and Standards. All air handling units must conform to the latest edition of the following:

   a. Air Movement and Control Association, Inc. (AMCA):

      (1) 210 Laboratory Methods of Testing Fans for Rating Purposes.

      (2) 310 Reverberant Room Method for Sound Testing of Fans.

      (3) 500 Test Method for Louvers, Dampers, and Shutters.

   b. Air-conditioning and Refrigeration Institute (ARI): Comply with applicable ARI including the following:

      (1) 410 Forced-Circulation Air-cooling and Air-heating Coils.

   c. National Electrical Manufactures Association (NEMA):

      (1) All electrical components and assemblies must comply and be selected with NEMA standards.

   d. National Fire Protection Association (NFPA):

      (1) Air handling unit internal insulation must have a flame spread rating not over 25 and smoke developed rating no higher than 50 complying with NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilating Systems.”

      (2) Additionally NFPA 70, “National Electrical Code,” as applicable for installation and electrical connections of ancillary electrical components of air handling units.

   e. Sheet Metal and Air Conditioning Contractors’ National Association, Inc. (SMACNA):

      (1) Comply with applicable SMACNA standards including “HVAC Duct Construction Standards - Metal and Flexible.”

f. ETL Testing Laboratories, Inc.

(1) Central station air handlers, DX, chilled water, hot water and steam coils. For indoor and outdoor use.

g. Underwriter's Laboratories, Inc. (UL):

(1) Except for motors, provide electrical components required as part of air handling units, which have been listed and labeled by UL.

h. American National Standards Institute (ANSI):

(1) Provide fan bearings in compliance with ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings. Provide filters in compliance with ANSI/UL 900 - Test Performance of Air Filter Units.

4. General Construction

a. Factory fabricated air handling unit shall be constructed of solid G90 galvanized steel, formed outer panels secured to an integral, welded tubular structural steel frame such that exterior panels are non-load bearing. All units shall come complete with a welded structural steel base around the entire perimeter. Bolted standing seam construction is also acceptable.

b. Outdoor air units shall include insulated roof with minimum 16 gauge exterior panels. Outdoor units shall be furnished with a pitched, standing seam roof, suitable for use outdoors. Indoor units furnished with extra gasketing and / or caulking will not be acceptable for outdoor application. To prevent potential leaks, outdoor units shall have one common roof height.

c. Roof curb, where applicable, shall be flat and furnished by unit manufacturer. Curb shall be insulated by the contractor. Curb shall be shipped in pieces to be bolted together in the field by the contractor.

d. Multiple sectioned units shall be shipped as a single factory assembled piece (except where shipping limitations prevent) demounted into modular sections in the field by others. Units shall be furnished with sufficient gasket and/or caulking and bolts for reassembly in the field by the Contractor.

e. All units shall be UL or ETL listed and labeled.

5. Unit Base / Floor / Framework (Typical Indoor and Outdoor Units)

a. Unit base frame shall be heavy duty rectangular structural tubing fitted with 4 inch C-Channel cross support members. Base rails shall be fitted with lifting lugs at the corner of the unit or section (if demounted). The unit base floor shall be heavy duty walk-on type made from G90 galvanized Steel 16 gauge inner liner. Floor insulation shall be minimum 2" thick, ½ lb per cubic foot density. For standing seam construction, each unit shall be constructed on a base fabricated from heavy duty welded structural steel channel. Channel bases shall be sized as a function of air handling length.

Unit length	Minimum Channel size
< = 15"	4" x 1-5/8" (5.4 lbs/lin. Ft.)
15' - 20'	6" x 2" (8.2 lbs/lin. Ft.)
20' - 25'	8" x 2-1/2" (11.5 lbs/lin.ft.)
25' - 30'	10" x 1-5/8" (15.3 lbs/lin.ft.)
30' - 35'	12" x 3" (20.7 lbs/lin.ft.)

b. Unit frame shall be from 14 gauge carbon tubular steel, fully mig welded to form a unitized assembly for support of all internal components. Base and unit frame shall be pre-primed and then painted with an industrial DTM finish with built-in rust inhibitors. Supporting of inside components such as coils and filter frames off the side panels will not be acceptable.

6. Exterior Casing

   a. The air handling unit casing shall be of "no-through-metal" design. The casing structure shall incorporate insulating thermal breaks as required so that, when fully assembled, there exists no path of continuous unbroken metal to metal conduction from inner to outer surfaces. Provide required structural frame and casing to withstand 12" static pressure. Panels shall be gasketed and secured to the tubular steel frame with 1/4" hex head, zinc plated industrial fasteners and neoprene washers. All exterior panels shall be constructed from G90 galvanized, minimum 16 gauge steel.

7. Finish

   a. Casing panels shall be coated with the below specified paint. Paint system shall be Polyceram 3200 utilizing a polyester resin that is not sensitive to moisture and remains extremely flexible, or a polyurethane finish (carboline 133).The painting system shall meet or exceed the following standards.

(1)	Adhesion	ASTM D-3359	1.5 Times Metal Thickness
(2)	Salt Spray 5% @95deg.	ASTM B-117	Passes 1000 hours
(3)	Humidity 100% @95deg.	ASTM D-2247	Passes 1000 hours. No blister, crack or peel.
(4)	Weatherometer, Type BH	ASTM G26	2,000 hours

   b. If a certain manufacturer's coating does not comply with the above specified standards of the painting system, their coating system must be reviewed and accepted in writing by the Mechanical engineer prior to bid.

c. All raw cut edges of the galvanized steel casing and liner panels shall be protected and not exposed to the air stream inside the unit or the outside whether elements. Raw cut steel edges that are exposed to the inside air stream, or the outside weather elements, shall be coated with zinc.

8. Unit Casing Insulation

a. Insulation shall not be disturbed if panels are removed. Insulation shall be secured to the panels with mechanical fasteners and/or adhesive over the entire panel surfaces, and not just around the edges. Entire unit to be insulated with 2" thick insulation, ½ lb density. The fiberglass insulation shall have an effective thermal conductivity © of .24 (BTU in./sq.ft. F degrees) and a noise reduction coefficient (NRC) of 0.70 / 1" thick (based on a type "A" mounting). Insulation shall be UL 723 fire and smoke rated.

b. Foil faced insulation is not an acceptable alternative to double wall construction.

9. Casing Liner

a. The unit shall be double wall construction with minimum 22 gauge perforated G90 galvanized liner in the maintenance access sections, except the coil section(s) shall have minimum 20 gauge solid G90 galvanized liner.

b. Plug fan section(s) shall have minimum 22 gauge perforated galvanized liner.

10. Access Doors

a. Man size Access Doors shall be provided where access for maintenance or service is required. Unit shall be supplied with galvanized, 16 gauge double wall, hinged doors.

b. Access doors shall be flushed with the outside of the unit and shall have EPDM hollow neoprene seals and fitted Ventlok 260 handle that can be opened from both inside and outside.

(1) Alternately, door construction can be of formed steel, and frame shall be fully gasketed with a closed cell, replaceable neoprene gasket. The gasketing material shall be installed to allow for easy removal for replacement.

(2) Alternately, latches shall utilize cast zinc coated or aluminum knurled knobs. The latch assembly shall incorporate a built-in safety catch to release cabinet operating pressure prior to opening the door. Handles shall allow doors to be opened from both inside and outside.

c. Tool operated safety latch shall be furnished on the fan section access door. The latch shall comply with Title 8 CAL_OSHA, ETL and the mechanical protection requirements of UL 1995.

11. Fans

a. Type PF (Plenum Fan) SWSI fans shall be Class II and shall have airfoil blades and L-L10-200,000 hour life bearings at maximum RPM of the class and not under actual conditions. The bearings shall be self-aligning, grease lubricated pillow block type. Fan shaft shall be turned, ground and polished solid steel rated at maximum RPM below critical speed. Fan wheel and sheaves shall be keyed to the shaft. Fan shall be IRD balanced at design RPM to a vibration velocity less than or equal to .075 inches per second measured at each bearing pad prior to shipment with belts and drive in place. Fan wheels shall be fabricated of heavy gauge steel. Plug fan capacities and curves shall be based on tests of complete assemblies, including housings, in an AMCA 300 certified test facility. They should not be estimates or extrapolations from free standing fan data. Fan shall be rated in accordance with AMCA 210 for performance and AMCA 300 for sound. Backward Inclined flat blades are not acceptable as a substitute for Backward Inclined airfoil blades. Submit individual fan selection with performance and sound information. Fan sizes shall be minimum as indicated in the schedule.

(1) Airfoil wheels shall be manufactured by Mechanovent Corporation, the OEM wheel division of New York Blower Corporation, Twin City or Barry Blower.

b. High-pressure lube lines shall be internally located at a common point on the drive side.

c. Fans, motors and drives shall be internally spring isolated by the unit manufacturer on a fully welded Structural Channel or Angle Steel base complete with flex connections. Formed steel bases are not acceptable. Provide seismically restrained isolator with 2" inch deflection (1" for fans 22" and smaller). Vibration isolation shall be provided with seismic restraints certified for use in Seismic Zone 4.

d. All fans designated for Variable Air Volume use shall be provided with factory installed:

(1) Variable Frequency Drive (VFD).

(2) See Variable Frequency Drive specification section for complete specifications.

e. To insure sole source responsibility, all fan assemblies shall be manufactured by the air handling unit manufacturer.

12. Motors

a. NEMA Design B T-FRAME motors are mounted on an adjustable base. Motors shall be tested to IEEE standard 112 test method B and NEMA MG 12.58.2 and 12.59 table 12-10. Motors on VFD's shall have inverter duty, Inverter Spike Resistant TM (ISR) wire.

b. Motors shall be manufactured in the USA.

c. Motors shall be Open Drip Proof (ODP), 1750 RPM, Premium efficiency, as manufactured by Baldor ISR , Lincoln, ABB or Reliance.

d. TEFC, Cast Iron Frame motors shall be provided on all Direct Drive fans.

e. Motor sizes and voltage shall be as indicated in the schedule.

13. Drives

a. VP "Variable Pitch" sheave drive shall be furnished on motors up to 7.5 HP and fixed pitch on 10 HP and above. V-Belt drives shall be selected at 150% of motor nameplate horsepower.

b. Air Handling Unit manufacturer shall provide:

(1) One set of sheaves for change out (if required) after final balancing.

(2) One extra set of belts for each fan.

14. Coils

a. All coil assemblies shall be leak tested under water at 315 PSIG and performance is to be certified under ARI Standard 410. Coils exceeding the range of ARI standard rating conditions will be as noted on a coil computer printout. Coil manufacturer shall have a minimum of 5 years experience in the manufacturing of water, condenser, evaporator and steam coils. To insure sole source responsibility, coils must be manufactured by the Air Handling Unit manufacturer.

b. Type WC (water coils) shall be constructed of seamless copper tubing mechanically expanded into fin collars. Fins are die formed plate type. Headers are to be seamless copper with die formed tube holes. 1/8" Vents and drains shall be provided for complete coil drainage. Coils shall be suitable for 250 PSIG working pressure. Intermediate tube supports shall be supplied on coils over 44" fin length with an additional support every 42" multiple thereafter.

c. Coil Face areas, Rows and Fins shall be minimum as indicated in the schedule.

d. Supply and Return connections for Water Coils shall be Male Pipe Thread (MPT) Schedule 40 Red Brass.

e. Coils shall have 5/8" OD x 0.020" wall copper tubes, 0.008" aluminum fins and 16 gauge 304 stainless steel casing.

15. IAQ Condensate Drain Pan

a. Condensate drain pan shall have 16 gauge 304 Stainless Steel inner liner and 20 gauge G-90 galvanized under liner. All pans shall be insulated "Double Bottom" construction with welded corners. Drain pans shall be IAQ type, sloped for complete drainage with no standing water in the unit. Drain connection shall be on one side, 1-1/4" MPT stainless steel at the lowest point in the pan.

b. Stacked cooling coils shall be equipped with a sloped stainless steel drain pan in the middle, with a copper down tube. Drain pans shall be provided under all cooling coils and humidifier sections.

c. Traps shall be installed deep enough to allow condensate to drain at full load of the fan.

16. Filters. See Air Cleaning Devices section.

17. Filter Gage

a. Each filter bank shall be furnished with a Dwyer series 2000 magnehelic gage.

b. Provide weather-cover on outdoor units.

18. Dampers

a. Dampers shall be furnished and installed by the unit manufacturer. Dampers shall have airfoil, extruded aluminum blades, zinc plated, steel tubular square shafts, heavy duty nylon or brass, non-corrosive bearings, rubber edge seals, stainless steel side jamb seals, and a 16 gauge galvanized steel frame.

b. Non Airfoil Blades, round shafts will not be acceptable.

19. Outside air and Exhaust Air Hood

a. Outside Air hood, shall be shop fabricated from the same material as the unit casing with 1/4" wire mesh inlet screen. Hoods shall be sized to minimize moisture carry over.

b. Unit and hood shall be shipped as a single factory assembled piece (except where shipping limitations prevent) to be demounted into modular sections in the field by the contractor.

c. Connection to the unit shall be water-tight.

20. Outside air and Exhaust Air Louvers

a. Louvers shall have extruded aluminum or double drainable blades and shall be painted. Galvanized blade louvers are not acceptable. Louvers shall be Ruskin model EL6375D.

b. Outside air louver face velocity shall be no greater than 500 FPM based on gross louver area. Exhaust air louver face velocity shall be no greater than 1000 FPM based on gross louver area.

21. Air Flow Measurement

a. General. Provide electronic measuring devices to measure air flow rates, bidirectional air flow, and temperature. All sensors shall communicate to a central processing panel that will produce individual analog output signals to the host control system.

b. System Processing Center

(1) Electronics: Solid state microprocessor based system.

(2) Display shall be backlighted 80 character, multi-line, alpha-numeric type.

(3) Analog outputs shall be 0-5 VDC or 0-10VDC, 4-20 mA, with 0.1% of full scale resolution.

(4) Power: 24VDC, isolated from other devices.

(5) Provide datalogger capability.

(a) Readings: upto 4096 events, first in, first out.

(b) Frequency of events: user programmable.

(c) Download method: RS 232 with factory provided software.

(6) Panel operating ranges

(a) Temperature: 45 to 120 deg F.

(b) Humidity: 0 to 95% relative humidity.

(7) User programmable options

(a) User selectable scaling and location naming

(b) Multi-point recalibration routine

(c) Adjustable digital output filter

(8) Diagnostics

(a) Complete sensor hardware

(9) Power loss protection

(a) Program memory shall be in EEPROM

(b) Provide Lithium battery for log.

(10) Electronics enclosure

(a) Provide powder coated steel suitable for indoor use.

(11) Manufacturer. Ebtron Model SPC.

c. Air flow sensor, duct mounted

(1) Provide duct mounted air flow and temperature measurement sensor

(2) Construction

(a) Type: duct mounted

(b) Sensors: One glass encapsulated self heated thermistor and one glass encapsulated thermistor temperature sensor for each sensing point

(c) Sensor housing shall be Noryl.

(d) Sensors per satellite probe: 1 to 8

(e) Support: Tubular aluminum extrusion struts with aluminum brackets.

(f) Connecting cable: Plenum rated PVC, UL standard 13, type CL2P with twist-lock connector to remote electronics panel.

(3) Electronics

(a) Type: microprocessor base, solid state, industrial grade integrated circuits

(b) Enclosure: Aluminum, indoor use

(4) Performance

(a) Electronics temperature range: -20 to 160 deg F.

(b) Flow station temperature range: -20 to 160 deg F.

(c) Flow station velocity range: 0 to 5,000 ft./min.

(d) Flow station pressure drop: less than 0.005 in wg at 2,000 ft./min.

(e) Flow station humidity range: 0 to 99% RH (non condensing)

(f) Digital output signals to sensor signal processor
i) Sensor velocity accuracy: +/- 2% reading
ii) Sensor temperature accuracy: typ. 0.18 deg F, max 0.36 deg. F.

(5) Manufacturer. Ebtron Model P.

d. Air Flow Sensor, Fan Inlet Mounted

(1) Provide fan inlet mounted air flow and temperature measurement sensor

(2) Construction

(a) Type: fan inlet

(b) Sensors: One glass encapsulated self heated thermistor and one 316 SS encapsulated thermistor temperature sensor for each sensing point

(c) Sensor housing shall be Nylon.

(d) Sensors per inlet: 2

(e) Support: Tubular aluminum extrusion struts with nylon brackets.

(f) Connecting cable: Plenum rated NEC type CL2P.

(3) Electronics

(a) Type: microprocessor base, solid state, industrial grade integrated circuits

(b) Enclosure: Aluminum, indoor use

(4) Performance

(a) Electronics temperature range: -20 to 160 deg F.

(b) Flow station temperature range: -20 to 160 deg F.

(c) Flow station velocity range: 0 to 10,000 ft./min.

(d) Flow station humidity range: 0 to 99% RH (non condensing)

(e) Digital output signals to sensor signal processor
   i) Sensor velocity accuracy: +/- 2% reading
   ii) Sensor temperature accuracy: typ. 0.18 deg F, max 0.36 deg. F.

(5) Manufacturer. Ebtron Model F.

22. Cabinet Leak Testing

a. At the request of the mechanical engineer, the cabinet shall be tested at the unit's design operating static pressures for both the high and low pressure sides. Cabinet leakage shall not exceed a Leakage Class rating of 9 as defined by ANSI/ASHRAE Standard 111 (Leakage class of 12 for demount units). Leak testing shall be performed by measuring the airflow pumped into (and out of) the air handling unit at the design operating static pressure for the high and the low pressure sections. All unit openings shall be sealed. The air shall then be pumped into (or out of) the unit until the appropriate operating pressures are achieved. Airflow measurements shall be performed in compliance with AMCA Standard 210. The testing shall be performed at the factory and witnessed by the owner's representative. Travel and lodging expenses of the mechanical engineer (one person), the owner's representative (one person) and the mechanical contractor (one person), to attend the factory witness leak test, shall be the responsibility of the air handling unit manufacturer. A detailed report, including all data and test methods, shall be presented to the mechanical engineer prior to equipment shipment.

23. Sound & Airflow Testing

a. The equipment manufacturer shall furnish calculations showing the estimated sound power levels at the supply and, return connections, as well as unit casing radiation for each air handling unit. Calculations shall be based on fan sound power levels which were determined in accordance with AMCA Standard 300 and 301. Sound power levels shall be determined for each octave band and shall not exceed the numbers given in Table ________.

b. In addition to the sound power level data included in the submittals, the manufacturer shall, at the request of the mechanical engineer, perform a sound test for each representative testable size unit. Testable size units shall be defined as units of less than 60,000 CFM that are less than 16 ft. wide and less than 50 ft. long. The tests will verify for each size unit that the inlet and outlet sound power levels do not exceed the specified levels, in the octave bands 63 through 8000, by more than is allowed by AMCA 311. The manufacturer shall do whatever is necessary to achieve the specified levels at no additional cost to the owner. A detailed report, including all data and test methods, shall be presented to the owner or his representative prior to equipment shipment. Test performed using sound intensity meters per the ASHRAE methods are an acceptable alternative. Tests must be performed in the manufacturer's own AMCA 300 registered Laboratory.

c. Travel and lodging expenses of the mechanical engineer (one person), the owner's representative (one person) and the mechanical contractor (one person), to attend the factory witness sound test, shall be the responsibility of the air handling unit manufacturer.

d. Air flow and static pressure measurements at each operating point shall be taken by the methods described in AMCA 210 simultaneous with all sound measurements.

e. Inlet and outlet sound power shall be determined by the reverberation room method as outlined in AMCA Standard 300, or sound intensity tests per ASHRAE methods. All sound pressure values shall be included in the final report, including ambient, reference sound source and measured values. Complete information showing the qualifications of the room shall be included in the test report.

24. Electrical

a. Manufacturer shall furnish and install a motor starter panel with all necessary starters, Transformers, fuses, fuse blocks and main disconnect. All Starters shall be NEMA rated. IEC rated starters are not acceptable.

b. Manufacturer shall provide and install Variable Frequency Drive as scheduled. Each motor shall be factory wired to its respective variable frequency drive. Supply and return (if applicable) fan variable frequency drives shall be wired to a common disconnect or circuit breaker for single point power connection.

c. Unit shall be equipped with vapor proof light fixture(s) with guard. Lights shall be provided in the fan section(s), filter service section(s), and economizer/mixing box section. All lights shall be controlled by one switch, located outside the unit, in a weather-proof enclosure.

(1) A 120 Volt duplex convenience outlet shall be provided.

(2) A single 120 VAC /1Ph power source to the Vapor proof lights and outlet shall be provided by the contractor in the field.

d. Smoke detector(s) shall be furnished, mounted and wired by contractor.

e. All electrical work shall be done in accordance with current CEC regulations.

f. Complete unit including the Starter Panel shall be ETL listed and labeled.

25. Controls

a. All controls shall be either factory mounted by the Air Handling Unit manufacturer, or field mounted by the Contractor. The controls shall include:

(1) Damper actuators

(2) Temperature sensors

(3) Pressure sensors

(4) Air flow measuring sensors

(5) Filter switches

(6) Smoke and fire detectors

(7) Any other items indicated on the Drawings

b. Electric and electronic controls shall be wired to a terminal block in a sheet metal enclosure at a common location mounted on the air handling unit. All pressure sensing controls shall be piped to a common point on the unit with 1/4" compression fittings.

c. All control items shall be supplied under Section 15900, HVAC Instrumentation and Controls.

E. Ultraviolet Disinfection. Provide ultraviolet disinfection for bacteria, mold and odor control inside each air handling unit.

1. UVC Emitters.

a. Emitters and fixtures shall be high output, suitable for HVAC applications to minimize the number fo lights affecting velocity and calculated dose of UV emission.

b. Emitters shall be of the hot cathode type, T6 (15 mm) diameter, type "L" hard quartz glass type with an initial minimum UVC transmittance of 83%.

c. Emitters shall be powered by Class P2, electronic type power supply, matched to the Emitter, and capable of producing a total intensity output per inch arc length of not less than 8μW/cm2 at 1meter in moving airstream of 50°F and 500 ft/min, with a line of power conversion efficiency of not less than 89%. They shall be capable of firing and properly operating each UVC Emitter at temperatures ranging from 35°F to 120°F and airflow velocities to 1,000 ft/min.

d. Complete unit assembly shall be listed with UL.

e. Emitter shall produce not ozone and be constructed with hard ceramic bases to eliminate deterioration.

f. Emitter housing and emitter shall be suitable for application to cold air discharge side of coil.

2. Safety. Emitters shall be installed such that they cannot be accesses without the power being off. All accesses shall be labeled with caution signs in accordance with OSHA regulations for UVC devices.

3. Manufacturer: Steril-Aire.

END OF SECTION

SECTION 15730

UNITARY AIR CONDITIONING EQUIPMENT

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. There are many type of unitary equipment. The primary manufacturers to be used are:

1. Carrier

2. Trane

3. York

END OF SECTION

SECTION 15790

VARIABLE FREQUENCY DRIVES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes all variable frequency drives.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: All variable frequency drives shall be tested and rated in conformity with applicable codes and authorities having jurisdiction, for variable frequency drives (VFD's).

1.3 VARIABLE FREQUENCY DRIVES:

A. General:

1. Motors shall be provided with UL Listed variable frequency drive (VFD) control systems.

2. Motors shall be provided with a microprocessor based, pulse width modulated (PWM) variable frequency drive (VFD) control systems as specified or noted.

3. The adjustable frequency AC motor drive shall be designed to convert the 60 Hz input power to adjustable frequency output power. The output frequency and voltage of the drive shall be adjustable such that a constant volts/Hz ratio is determined from the design parameters of the driven motor.

4. Drive shall be capable of operating any standard squirrel cage induction motor with load rating within the capacity of the drive. At any time in the future, it shall be possible to substitute a new or rewound motor in the field without requiring modification of the drive.

B. Features:

1. Drive enclosure shall be a NEMA Type I or equivalent, wall or floor mounted, metal cabinet with hinged front access door(s), filtered ventilation system (if required), and controls that are mounted, wired and tested.

2. Fused, interlocked disconnect switch or input line circuit breaker, externally operated, interlocked with enclosure door. Short circuit interrupting rating of 200,000 amps.

3. Internal 115 VAC control power circuit with transformer and primary and secondary protective fuses.

4. Two normally open and two normally closed contacts from run relay, wired to terminal for customer use. Contactors to enable control of drive from a central control system for start/stop and load shed operation through remote speed reset.

5. Controlled acceleration and deceleration, separately adjustable, shall be provided from 0.5 to 200 seconds with torque limit override acceleration protection and regeneration protection during deceleration.

6. Drive shall automatically adjust the volts/Hz ratio to the motor in proportion to its load without changing speed in order to conserve the maximum amount of energy.

7. Separately adjustable maximum and minimum frequency limits shall be provided.

8. Low frequency/low voltage start with linearly adjustable ramp up to preselected speed.

9. All components shall be accessible from the cabinet door for service. Drive must be designed for side-by-side, back-to-back and against-the-wall installation.

10. Door mounted ac ammeter or percent load meter.

11. Door mounted speed control and speed indicator.

12. Door mounted voltmeter.

13. Hand/off/auto switch with start/stop pushbuttons or switches.

    a. In the "hand" position, the speed is controlled by the door mounted speed control and the start/stop commands are controlled by the door mounted start/stop pushbuttons or switches.

b. In the "off' position, the drive cannot be started.

c. In the "auto" position, the speed is controlled by a remote electronic signal and the drive can receive only a remote start command (momentary contact closure). The stop command in the auto position can be either remote or from the door mounted stop pushbutton or switch (to ensure maximum safety).

d. To facilitate equipment setup, the drive shall not undergo complete shutdown when moving the selector switch from the hand position to the auto position.

14. Drive fault alarm contact for remote indication.

15. Automatic reset of drive to receive start command after any normal shutdown, including power outages.

16. Remote electrical input signal for speed control(to be coordinated with control Contractor).

17. Critical speed rejection circuit.

18. Drive shall be constructed with integral protection against all normal transients and surges in the incoming power line, any grounding or disconnecting of the output power line, and any interruption or runaway of the incoming speed reference signal. Protection is defined as a normal shutdown or return to original speed with no component damage.

19. Drive shall protect itself against all phase-to-phase and phase-to-ground faults.

20. Drive shall protect itself against any removal of load.

21. Drive shall employ adjustable torque limit control to override the speed command and decrease the frequency while maintaining the correct volts/Hz ratio whenever the load level surpasses the drive design level.

22. Drive shall protect itself against single-phasing and power outages and shall be insensitive to input phase rotation.

23. Drive shall start into a spinning motor or shut down with no component damage.

24. Drive shall ride through any input power dip of three cycles or less.

25. Drive shall go through an orderly shutdown when the incoming voltage low limit is surpassed.

26. Instantaneous overcurrent trip (IOT) shall continuously monitor peak currents. It shall provide instantaneous shutdown without component failure when high limit setting is surpassed.

27. Torque limit shall be setable from 50 to 100% of full drive rating on variable torque loads. When torque limit engages, the output frequency is steadily reduced until the load reduces to the design capacity. At that point, the speed will stabilize. If the load reduces further, the drive shall re-accelerate to the preset speed.

28. Manual bypass starter complete with operator devices, including Drive/Off/Bypass selector and bypass indicating light. Start/Stop pushbuttons or switch to operate in bypass mode. The bypass circuit shall consist of two contactors, motor overload and two circuit breakers; (one main circuit breaker and one VFD circuit breaker, to enable isolation of the VFD).

29. UL listed, nonlinear isolation transformer to prevent noise and harmonic feedback to electrical system. Shall be mounted in NEMA I enclosure and be of dry type construction with Class H insulation. Transformer shall be provided by variable frequency drive manufacturer to match performance of variable frequency drive(s).

30. Drive shall be designed to meet the guidelines regarding emission of Radio Frequency and Electromagnetic Interference (RFI/EMI) set by FCC Class A guidelines through the use of a tuned hm filter, adjusted as required to prevent electrical power supply system. The unit shall comply with the FCC Class Anoise emissions standard. In addition, the drive manufacturer must provide lab test results from an independent test laboratory showing this compliance.

31. A digital diagnostic system which monitors its own control functions and displays faults and operating conditions.

32. Operating conditions:

    a. Line voltage variations: +10%, -5%.

    b. Line frequency variations: ±2 Hz.

    c. Overload capability of up to 130% of full drive rating for variable torque loads.

    d. Ambient temperature: 0'C to 40'C.

    e. Maximum altitude limit: 3,300 ft.

    f. Maximum humidity: 95% (non-condensing).

    g. Efficiency in excess of 95% at full load/full speed and in excess of 80% at half speed on a variable torque load (cubic load).

33. Variable frequency drives shall be manufactured by:

    a. ABB

    b. Graham.

    c. Square D.

    d. General Electric.

END OF SECTION

SECTION 15810

DUCTS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This includes furnishing and installing all material for the complete installation of the following:

1. All ductwork shown on the Drawings for the complete heating, air-conditioning, exhaust, and ventilating systems.

2. All flexible duct.

B. Reference Standards:

1. National Fire Protection Association (NFPA).

a. NFPA No. 90-A, "Air Conditioning and Ventilating Systems."

b. NFPA 96, "Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment."

2. Sheet Metal and Air Conditioning Contractors' National Association,Inc. (SMACNA), 8224 Old Court House Rd., Vienna, Virginia 22180.

a. "HVAC Duct Manual" in this Specification shall mean the second edition of the "HVAC Duct Construction Standards, Metal and Flexible."

b. "Balancing and Adjustment Manual" in this Specification shall mean the first edition of the "Manual for the Balancing and Adjustment of Air Distribution System."

C. Ductwork Construction.

1. General.

a. Ductwork construction shall, as a minimum, conform to NFPA Standard 90-A and the HVAC Duct Manual. Ducts shall be constructed of galvanized steel unless otherwise specified or shown on the Drawings.

b. The size of the ducts indicated on the Drawings shall be net inside dimensions.

c. The duct pressure class designation symbols shown on the Drawings are explained in Figure 1-1 of the HVAC Duct Manual.

d. The pressure-velocity classification for ductwork is shown in Table 1-1. Ducts shall be sealed in accordance with Table 1-2.

e. All ductwork shall be substantially and neatly supported so that horizontal ducts are without sag or sway, vertical ducts are without buckle and all ducts are free from the possibility of deformation, collapse, or vibration. Do not suspend ductwork from 1-1/2-inch metal roof deck.

2. Rectangular Ductwork.

a. Ducts shall be constructed and reinforced in accordance with Tables 1-3 through 1-13.

b. Tie rod attachments shall be in accordance with Figures 1-2 and 1-3. Tie rod classifications shall be in accordance with Tables 1-14 through 1-16.

c. Aluminum duct shall be constructed in accordance with Tables 1-21 through 1-23.

d. Duct joints and seams shall be in accordance with Figures 1-4 through 1-16.

e. Fittings and Other Construction.

(1) Duct fittings, branches, and connections shall be in accordance with Figures 2-1 through 2-9. All radius elbows and square throat elbows shall have turning vanes. A Type RE 1 and RE 4 elbow as shown in Figure 2-2 and a straight tap for rectangular ductwork as shown in Figure 2-6 is not permitted.

(2) Duct access doors shall be in accordance with Figures 2-10 and 2-11. Doors shall be adequately sized for ease of maintenance of concealed items. Insulate access doors where ducts are insulated with same insulation as on ductwork. All duct access doors shall have 18" x 18" view port.

(3) Volume dampers shall be in accordance with Figures 2-12 and 2-13. All dampers constructed in accordance with Figure 2-12 shall have continuous rod; this shall be followed without exception.

(4) Grille, register, and diffuser connections shall be in accordance with Figures 2-14 through 2-16.

(5) Flexible connections at fans shall be in accordance with Figure 2-17.

(6) Dish washer vapor exhaust shall be in accordance with Figure 2-18.

f. Flexible duct liner shall be installed in accordance with Figures 2-19 through 2-22.

3. Round and Oval Ductwork.

a. Round ducts shall be constructed in accordance with Tables 3-2 and 3-3.

(1) Seams and joints shall be in accordance with Figures 3-1 and 3-2.

(2) Fittings shall be in accordance with Table 3-1, Figure 3-3 through 3-5 with the following exceptions. In Figure 3-4, Rectangular straight tap or 45 degree lead-in is not permitted.

(3) Flat oval ductwork construction shall be in accordance with Table 3-4. Fittings shall be in accordance with Figure 3-6.

4. Hangers and Supports.

a. Rigid round, rectangular and flat oval metal ducts shall be installed with support systems in accordance with Figures 4-1 through 4-9 and Tables 4-1 through 4-3. Horizontal ducts shall have a support within two feet of each elbow and within four feet of each branch

D. Flexible Ductwork.

1. Provide flexible duct as shown and make connections between ducts and terminal boxes with a minimum of 24 inches (600 mm) of flexible tubing. No flexible duct shall be longer than 4 feet (1.2 m).

2. Flexible ductwork shall be of spiral construction composed of a corrosion resistant metal supporting spiral and a coated fabric with a metal or mineral base. Flexible duct connectors shall be listed by UL and shall have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50. Operating temperature range shall be 0 to 200 degrees F. (-18 to 93 degrees C.). Operating pressure shall be negative 0.5 inch to positive 10 inches W.G.

3. Where either acoustical duct liner or exterior insulation is shown or specified for duct systems, provide factory pre-insulated material for all flexible ductwork in the system consisting of a galvanized spring bonded to the interior liner, 1 inch (25 mm) thick. 0.75 pounds/cubic foot (12.0 kilograms/cubic meter) fiberglass insulation and a laminated vapor barrier jacket consisting of fiberglass reinforced metalized film or vinyl or synthetic film. Furnish Porter Portoduct Type TK or Thermaflex Type M-KC.

4. Provide bare flexible duct for systems not requiring acoustic lining or exterior insulation, Porter Portoduct Type T, Thermaflex Type S-TL, or Wiremold Type 57.

5. Flexible duct shall be supported in accordance with Figures 3-9 and 3-10 of the HVAC Duct Manual.

E. Field Erected Equipment Housing, Casing, and Plenums.

1. Equipment housings shall be provided for the air conditioning system as shown on the Drawings and as hereinafter specified. All sheet metal and steel framing material shall be galvanized, except that G90 coated galvanized steel shall be used in all chambers with moisture present.

   a. Entire housing shall be made airtight, suitably braced with structural iron members and free from breathing or vibration. Housing shall terminate at masonry walls and at floors with angles and a sponge rubber gasket. All welds on casing interiors shall be painted. Casings and plenums shall be constructed to withstand 133 percent of rated pressure without structural failure. Wall and roof deflection at rated pressure shall not exceed 1/8 inch per foot of width.

   b. Where housing is internally insulated, due provisions shall be made for a neat installation.

   c. Flexible connections shall be placed between fan and casings.

   d. All casing on the suction side of the fan shall be of 2 inch W.G. pressure classification. Casing on fan discharge shall be of the designated pressure class.

2. Casings and plenums shall be constructed in accordance with Figures 6-1 through 6-8 and Table 6-1 of the HVAC Duct Manual.

3. Pipe penetrations shall be sealed to prevent air leakage and condensation movement through the seal. Penetrations shall be in accordance with Figure 6-10.

4. Drain pans shall be provided under all cooling coils. Where coils are stacked, a drain pan shall be placed between the coils to accumulated moisture from the upper coils. This gutter shall be drained to the main drain pan. Provide 20 gage stainless steel drain pans of welded construction with proper drains and fittings attached. All drains and fittings shall be copper or bronze, 1 inch (25 mm) in diameter or as shown. Drains shall have water seals not less than 2 inch W.G. greater than the maximum operating pressure in the chamber. Eliminators and drain pans shall be constructed in accordance with Figure 6-9.

5. Access doors shall be provided where shown and as required for access to all mechanical equipment. Doors shall be complete with hinges, gaskets and "Ventlok" No. 260 latches manufactured by Ventfabrics, Inc., Chicago, Illinois or Young Regulator Company. Doors shall be made airtight and shall swing opposing the plenum pressure. Doors in casings shall be constructed in accordance with Figures 6-11 and 6-12 and Table 6-2. Door in connection with electric filters shall have a disconnect switch to break the circuit as the door is opened. Doors shall be insulated where casings are insulated.

F. Kitchen Exhaust Ductwork:

1. Range Exhaust Grease Ductwork.

    a. Ductwork below the ceiling shall be minimum 18 gage stainless steel with welded seams and joints. Ductwork above the ceiling shall be minimum 16 gage carbon steel or 18 gage stainless steel with welded minimum joints. Comply with all requirements set forth in NFPA 96.

2. Dishwasher Exhaust Ductwork.

    a. Dishwasher exhaust ductwork below the ceiling shall be minimum 18 gage stainless steel with watertight welded seams and joints. Ductwork above the ceiling shall be minimum 20 gage aluminum or stainless steel, or 18 gage galvanized steel with water-tight welded or soldered seams and joints. Provide moisture eliminators with drain connections in drip pan to prevent carry-over to exhaust fan. Slope all ductwork to drip pans equipped with drains.

G. Fume Hood Exhaust System

1. Ductwork shall be minimum 22 gage stainless steel (type 316L) with welded seams and joints.

H. Belowground Ductwork:

1. For belowground ductwork use "Transite" air duct manufactured by Johns Manville, of sizes shown on the plans. Couple by means of an impermeable rubber sleeve with two stainless steel straps. Pitch all duct to drain or drywell as shown. Unless specifically noted otherwise, furnish factory-made round fittings constructed of same material as duct.

a. PVC coated spiral duct by Norlock Metal Products Co., in sizes as shown on the Drawings, may also be provided. Duct and fittings shall be joined in the conventional manner and secured with metal screws. Apply 3M duct sealer No. EC-900 to all joints before connecting, in order to make a tight connection. Apply a second application of duct sealer to the exterior surface, after sections have been joined.

2. Construct below ground rectangular fittings of 16 gage (1.5 mm)(minimum thickness) galvanized steel with bolted or riveted seams using aluminum fasteners. Coat fittings with a heavy coating of asphalt.

3. Installation shall be in accordance with Figures 3-11 and 3-12 of the HVAC Duct Manual.

I. Leakage Test - Duct.

1. Test all supply, return and exhaust air duct.

a. Test Equipment. Use equipment arranged as Recommended by test and balance agency.

(1) Test apparatus and procedures shall be similar in all respects to those defined in AABC standards. Filtered blower inlet and automatic safety relief device shall be provided to protect system. Accuracy of measurement of leakage flow rate shall be certified to be within 1 percent of total system flow.

(2) Test apparatus shall consist of

(a) A source of high pressure air - a portable rotary blower or tank type vacuum cleaner.

(b) A flow measuring device usually an orifice assembly consisting of straightening vanes and an orifice plate mounted in a straight tube with properly located pressure taps. Each orifice assembly shall be accurately calibrated to its own calibration curve. Pressure and flow readings are usually taken with U-tube manometers.

b. Test Procedures

(1) Test for audible leaks as follows:

(a) Close off and seal openings in the duct section to be tested. Connect the test apparatus to the duct by means of a flexible duct section.

(b) Start the blower with its control damper closed (some small blowers popularly used for testing ducts may damage the duct because they can develop pressures up to 25 inches w.g.).

(c) Gradually open the inlet damper until the duct pressure reaches 0.5 inches w.g. greater than duct pressure class. Test pressure is read on manometer No. 1. Note that the pressure is indicated by the difference in level between the two legs of the manometer and not by the distance from zero to the reading on one leg only.

(d) Survey joints for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.

c. Field Test Procedures. After all audible leaks have been sealed, the remaining leakage should be measured with the test apparatus orifice section as follows:

(1) Seal all openings in duct section to be tested.

(2) Connect test apparatus to test section of duct, using a flexible duct connection or hose.

(3) Close damper or blower suction side to prevent excessive build up of pressure.

(4) Start blower and gradually open damper on suction side of blower.

(5) Build up pressure in duct test section to (8 inches (200 mm) W.G. in air cells of cellular deck) (and to) (150% of pressure classification for respective duct systems).

(6) Read indicated pressure or instrument that is connected to section of duct under test.

(7) Maintain this pressure for ten minutes, which will indicate audible leaks.

(8) Reduce pressure to 5 inches (127 millimetres) W.G. for cellular deck and 100% for air duct, and make survey. Repair all visual and audible leaks in duct and air cells of cellular deck. Shut down blower and release pressure when making repairs.

(9) Upon completion of repairs, build up pressure to design operating pressure, and read leakage pressure on instrument connected across test apparatus orifice.

(10) Leakage C.F.M. is read by consulting chart calibrated with orifice diameter. If no leakage exists, zero pressure differential will be indicated.

(11) Leakage allowance for duct is 1 percent of the total operating C.F.M. (cubic metres/second) of section under test. The maximum high velocity duct leakage allowance for the total of all ducts on any fan system is one percent of the fan system capacity.

d. Test Report Criteria

(1) A test report shall be provided for each system tested, identified by system or section thereof, and containing leak-test curves for apparatus used and data pertinent to acceptance requirements.

2. Engage an independent testing agency to verify the leakage tests of all duct (and air cells of cellular metal deck) and submit a certification attesting to the results obtained. Make arrangements to coordinate the field test of installed sections of ductwork. Test results and verification shall be recorded and submitted on AABC Standard Test Form No. 32267.

a. Tested sections of ductwork shall be visually marked by agency with certification sticker and initials of field test inspector. Tests shall be made before duct sections are concealed.

END OF SECTION

SECTION 15829

COMBINATION FIRE SMOKE DAMPERS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Combination fire smoke dampers with steel 3-V blades meeting requirements of UL Standard 555 and UL Standard 555S.

B. QUALITY ASSURANCE

1. Dampers shall meet requirements for combination fire smoke dampers in accordance with:

   a. NFPA 90A, 92A, 92B, and 101.

   b. CSFM Fire Damper Listing 3225-0981:103

   c. CSFM Leakage (Smoke) Damper Listing 3230-0981:104.

   d. Applicable Building Codes.

2. Dampers shall be tested, rated and labeled in accordance with:

   a. UL 555 (Sixth Edition), Listing R13317

   b. UL 555S (Fourth Edition), Listing R13447

3. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance in accordance with AMCA 511.

C. MANUFACTURER

1. Pottorf, Greenheck or Ruskin.

D. COMBINATION FIRE SMOKE DAMPERS

1. Model

   a. FSD-200 series combination fire smoke dampers.

   b. FSD - 140/340/170 series combination fire smoke dampers.

2. Ratings

   a. Fire Resistance

      (1) Dampers shall have a UL 555 fire resistance rating of 1½ hours.

      (2) Dampers shall have a UL 555 fire resistance rating of 3 hours.

      (3) Corridor Ceiling Fire Dampers shall have a UL 555 fire resistance rating of 1 hour.

   b. Fire Closure Temperature

      (1) Each combination fire smoke damper shall be equipped with a thermostat to close the damper at 350ºF.

      (2) Each combination fire smoke damper shall be equipped with a dual temperature thermostatic device which closes the damper at 165ºF, and may be overridden from the fire command center, allowing damper to resume its smoke control function. This dual temperature device shall also include a secondary thermostat (which can not be overridden) to close the damper when temperature at the damper reaches 350ºF.

   c. Elevated Operational Temperature

      (1) Dampers shall have a UL 555S elevated temperature rating of 350ºF.

      (2) Dampers shall have a UL 555S elevated temperature rating of 250ºF.

d. Leakage

(1) Dampers shall have a UL555S leakage rating of Leakage Class I.

(2) Dampers shall have a UL555S leakage rating of Leakage Class II.

(3) Dampers shall have a UL555S leakage rating of Leakage Class III

e. Differential Pressure:

(1) Dampers shall have a minimum UL 555S differential pressure rating of 4in.wg.

(2) Dampers shall have a minimum UL 555S differential pressure rating of 6in. wg.

(3) Dampers shall have a minimum UL 555S differential pressure rating of 8in. wg.

f. Velocity:

(1) Dampers shall have a minimum UL 555S velocity rating of 2000 fpm.

(2) Dampers shall have a minimum UL 555S velocity rating of 3000 fpm.

(3) Dampers shall have a minimum UL 555S velocity rating of 4000 fpm.

3. Construction:

a. Frame: Damper frame shall be 16 ga. Galvanized steel formed into a 5"x1" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1½" (minimum) integral overlapping gusset reinforcements on each corner to assure square corners and provide maximum resistance to racking.

b. Blades: Damper blades shall be 16 ga. galvanized steel strengthen by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.

c. Blade Stops. Each blade stop (at top and bottom of damper frame) shall occupy no more than ½" of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.

d. Seals:

(1) Blade Edge: Blade seals shall be extruded silicone rubber permanently bonded to the appropriate blade edges.

(2) Jamb: Flexible stainless steel compression type.

e. Linkage: Concealed in jamb.

f. Axles: Minimum 1/2 inch dia. plated steel.

g. Bearings: Axle bearings shall be sintered bronze sleeve type rotating in polished extruded holes in the damper frame.

4. Actuators:

a. Actuators must be factory mounted and test cycled by the damper manufacturer, and must be U.L. listed for use with the specific damper model they are being supplied with.

b. Actuators must be manufactured under ISO9000 by a recognized controls company (Invensys, Honeywell, Siemens, Belimo) and must have been tested for 20,000 cycles in accordance with U.L. standard 555-S, 4th edition issued June 1, 1999. Actuators must be tested for functionality at 350°F per U.L. 555S. They must be certified by the manufacturer for use in "continuous power-on" applications, and should not require test cycling more than once per year.

c. Electric actuators can be mounted externally (STD.) or internally. They can be 120VAC, 60Hz, 2 position, or 24VAC, 60Hz 2 position. Power consumption in the "hold" (open) position shall not exceed 10 watts and shall maintain a 20dba noise criteria @ 1 meter. The cycle time to open or close shall not exceed 15 seconds.

(1) Electric, 120V AC, 60Hz, 2-position, fail close.

(2) Electric, 24V, AC, 60Hz, 2-position, fail close.

d. Pneumatic actuators can be mounted externally (STD) or internally and should be controlled by a 20PSI minimum control pressure. The cycle time to open or close should not exceed 15 seconds. Pneumatic actuators must be tested for functionality at 350°F per U.L. 555-S.

e. Pneumatic, 20 psi minimum control pressure, 2-position, fail close.

f. Mounting:

(1) External

(2) Internal

END OF SECTION

SECTION 15830

FANS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Manufacturers

1. Cook
2. Greenheck
3. Barry
4. Twin Cities
5. Penn

END OF SECTION

SECTION 15840

AIR TERMINAL UNITS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Manufacturers

1. Titus
2. Price
3. Anemostat
4. Krueger

END OF SECTION

SECTION 15850

AIR OUTLETS AND INLETS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Titus

B. Price

C. Anemostat

D. Krueger

END OF SECTION

SECTION 15860

AIR CLEANING DEVICES

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. This includes providing all materials for the cleaning and filtering of the air supply.

B. QUALITY ASSURANCE

1. All panel and extended surface air filters shall be tested and rated in accordance with the ASHRAE Test Method Standards 52.1 and 52.2.

C. Panel Filters (Pleated)

1. General

a. Medium efficiency filters shall be extended surface pleated filters.

b. Filter sizes and capacities shall be as scheduled on the Drawings.

c. Filters shall be UL 900 Class 2 listed.

2. Filter Construction

a. Filters shall be constructed of reinforced, nonwoven synthetic media laminated to an expanded metal grid on the air leaving side and formed into radial wedge pleats.

b. Media support grid shall be heavy gauge expanded electro-galvanized metal with grid member being no less than 0.025 inch wide, and shall provide an open area of minimum 96%. The grid shall be 100% bonded to the media on the air exiting side to eliminate media vibration and pull-away. The grid shall be formed to provide a uniform V-shaped pleat with the open area on the air exiting side to match the open area on the air entering side for maximum utilization of the media and low airflow resistance.

c. The frame shall be constructed of a rigid, high wet-strength beverage board. Diagonal support members shall be bonded to both the air entering and the air exiting sides of each pleat. The enclosing frame shall be chemically bonded to the filter pack on all four sides.

3. Performance

a. Initial and final resistances shall not exceed the scheduled values.

b. Media area must equal or exceed that of the specified filter.

c. The filter area shall contain no less than 15 pleats per linear foot. Initial resistance shall not exceed 0.34 in wg.

d. The average atmospheric dust spot efficiency shall be 25-30% as determined by ASHRAE Standard 52.1 test method. Merv rating shall be Merv 11 by ASHRAE Standard 52.2.

e. The manufacturer shall guarantee performance as stated in the literature within tolerances as outlined in Section 7.4 of ARI Standard 850.

4. Manufacturer. Aerostar Merv 1100, American Air Filter, or Camfil Farr.

D. Extended Surface Filters:

1. General

a. Air Filters shall be high efficiency, extended media area, totally rigid and disposable type.

b. Filters shall be of the quantities and sizes as indicated on the drawings.

2. Filter Construction

a. Air Filters shall be of total rigid construction. Each 24"x24"x12" filter shall contain not less than 193 square feet of effective filter media.

b. The cellular design shall be wedge shaped and shall be arranged in such a manner that dynamic losses are minimized on the air entering and air exiting sides of the filter.

c. Each 24"x24" filter shall consist of a minimum of 8 mini pleat cells nominal size 12"x24"x1.

d. The cells shall be assembled and sealed with a polyurethane potting forming an airtight and completely disposable filter unit.

3. Performance

a. Performance of the filter shall be as follows based on a 24"x24"x12" unit tested at 2000 CFM.

b. Initial resistance at 2,000 cfm shall be 0.36 in wg.

c. Initial arrestance shall be 100%

d. Average efficiency of not less than 95% when tested in accordance with ASHRAE 52.1 Test Standard, Merv 14 Category 52.2.

e. Dust holding capacity shall be 560 grams upto 1.5 in wg.

f. Filters shall be listed by Underwriter Laboratories as Class 2 and shall be contained on the California State Fire Marshal approval list.

4. Manufacturer. Filtration Group Aerostar FP-95 Series, American Air Filter or Camfil Farr.

E. Carbon Filter (Gas and Vapor Adsorber)

1. General. Provide activated carbon filters for Gas and vapor adsorption.

2. Filter Size. Nominal dimensions for full size single header series 3653 filters shall be 24"x 24"x 12". Exact filter dimensions are 23.38"x23.38"x11.5".

3. Filter Construction

   a. The filter shall be constructed of a nonwoven media to which sorbent particles are bonded directly to the fiber without any type of adhesive additive.

   b. The filter shall be constructed in such a way as to provide essentially dust free operation. Nominal 24"x 24"x 12" filters shall have an initial pressure drop (resistance) of not more then 0.40" “ 2000 cfm.

   c. Filter Media. The filter shall contain a carbon loaded nonwoven media containing 500 g/m5 of activated carbon with 1500 m/g5 of total surface area. Nominal 24"x24"x12" filters shall contain 104 ft5 of media surface area.

   d. Frame Enclosure. The frame shall be of rigid, vacuum formed, polystyrene construction. A sealant shall be used to encapsulate the media to the filter casing, preventing and bypass. Each frame shall be labeled with the size, type, and airflow.

4. Packaging. The filter shall be packaged into a non-porous bag to inhibit adsorption during shipping and storage.

5. Performance.

   a. Each filter shall evidence a minimum initial efficiency of not less than 95% for specified contaminants when laboratory tested under dynamic conditions.

   b. The filters shall have been evaluated for contaminant removal performance at 500 fpm.

6. Manufacturer. Filtration Group Aerostar Model # 3653.

F. Air Filter Holding Frame

1. Holding frames for built up filter banks shall be constructed of 16 gage 304 Stainless Steel.

2. The holding frame shall be of all welded construction. Welds shall be

continuous on all matching joints and miters. Welds shall be ground to form a smooth surface on the outside periphery of the frame and on the flush mitered joints on the sealing flange of the frame.

3. The frame shall be equipped with various lances to facilitate the use of various types of fasteners depending on the application. The lances shall be designed in such a manner that they can be installed and removed without the use of tools. The holding frame shall be embossed with 8 elongated centering ledges for proper alignment of filters.

4. Holding Frames shall be assembled to form built up filter banks with the use of nuts and bolts and vertical support members as detailed on the drawings.

5. Dow 732 Sealant shall be applied to the periphery of all Holding Frames prior to clamping, assembly and bolting.

6. Refer to Drawings for assembly details.

7. Manufacturer. Burke Environmental Astr-Frame Model ASF.]

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

1.0 GENERAL

1.1 DESCRIPTION OF WORK

A. Procure the services of an independent air balance and testing agency, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems, to balance, adjust, and test air moving equipment and air distribution systems, water systems and steam systems as herein specified.

B. Testing Agency:

1. Qualifications.

a. Total System Balance shall be performed by an independent, non-affiliated agency certified by the Associated Air Balance Council (AABC) which specializes in and whose business is dedicated to testing, adjusting and verification of the HVAC system performance. The submittal of unbiased reports shall be timely upon completion of work. This work shall conform to AABC specifications referred to in Chapters 17 through 26 of the AABC National Standard and other criteria as set forth in this specification.

b. The independent air balance agency shall provide proof of having successfully completed at least five projects of similar size and scope and shall comply with all standards as set forth by, and be a member of the AABC.

2. Personnel

a. All Work by this agency shall be done under direct supervision of a qualified heating and ventilating Engineer (TBE) employed by them. All instruments used by this agency shall be accurately calibrated and maintained in good working order. If requested, the tests shall be conducted in the presence of the Architect, Owner, or their representative.

b. AABC Certified Technicians shall perform all work. Submit copies of certification for all technicians.

C. Reference Standards:

1. Comply with applicable procedures and standard of "National Standards for Field Measurements and Instrumentation, Total System Balance" by the Associated Air Balance Council (AABC).

D. Ongoing Inspection. The Test and Balance Agency shall visit the job site on a monthly basis during the early stages of fabrication to inspect duct Installation. A report shall be submitted to the Architect listing any deficiencies found and making recommendations for work to be performed or devices to be added to allow for proper balancing.

E. Preparation of Water Systems for Balancing:

1. The Testing Agency shall prepare the water systems for balancing in the following manner after completion of the air balance described hereinbefore.

a. Open all valves to full open position. Set mixing valve to full system flow.

b. Examine water in system and determine if waster has been treated and cleaned.

c. Have Contractor remove and clean all strainers.

d. Check pump rotation.

e. Check expansion tanks to determine they are not air bound and the system is completely full of water with no air pockets blocking water flow.

f. Set all temperature controls so all cooling coils are calling for full cooling. Use same procedure when balancing heating coils. Set on full heating.

g. Check operation of all automatic valves.

h. Check and set operating temperature of (boilers) (converters) (chiller) to design requirements.

F. Total System Balance

1. Each piece of equipment and the entire system shall be adjusted to insure proper function of all controls, proper distribution of air, maintenance or temperatures, elimination of drafts and vibration and left in first class operating condition.

2. The air system shall be adjusted to obtain the air volumes specified in the Contract Documents, but readjusted if required to obtain design temperature in each room. The Contractor shall make drive changes, install additional dampers, vanes, grille baffles, etc., as may be required on the job.

3. Wherever the use of multi-louvers (in supply, exhaust, or return air grilles) creates objectionable noise, two (2) inch thick, six (6) lb. fiberglass board shall be installed in the grille opening, slotted for the proper air quantity. This shall be accomplished by the Contractor.

4. Balance the supply and return air systems (with the chillers operating) by first arriving at the fan total air quantity, reading air velocities at cooling coils at the specified leaving air temperature, return air and outside air openings; and a duct traverse. The fan RPM shall be adjusted for the specified air quantities allowing for the maximum of 1% for duct leakage. The quantity of air to each outlet shall not be less than that shown on the drawings and not greater than 10% of that amount. If so instructed by the mechanical engineer, further balancing of temperatures shall be made and indicated by a thermometer or by temperature recorder.

5. Perform Pitot Tube Traverse of all supply, return and exhaust systems.

   a. Except as specifically indicated herein, Pitot Tube Traverse shall be taken in branch ducts to assure specified flow to all zones. Pitot tubes, associated instruments, traversing and testing techniques shall conform to the ASHRAE Handbook of Fundamentals.

   b. Pitot Tube Traverse may be omitted:

(1) Where the duct serves only a single room or the space and its design volume is less than 2000 CFM.

(2) Where duct's design velocity and air quantity may be determined by measurements of terminals served.

c. Test holes shall be in a straight duct, as far as possible downstream from the elbows, bends, take-offs and other turbulence generating devices, to optimize reliability of flow measurements.

G. Testing Procedure for Air Systems.

1. The Testing Agency shall perform the following tests, and balance system in accordance with the following requirements.

a. Check and adjust (fan rpm) (inlet guide vanes) (fan outlet damper) (maximum motor operating speed) to design requirements and record fan motor amperes.

b. Test and record fan motor amperes at design rpm.

c. Make pitot tube traverse of main supply ducts and (adjust) (inlet guide vane dampers) (fan discharge damper) (maximum motor operating speed) (fan rpm) to obtain design cfm (cubic metres per second.)

d. Test, adjust and record system static pressures, suction and discharge ducts.

e. Test and adjust system for design re-circulated air, cfm (cubic metres per second.)

f. Test and adjust system for design cfm (cubic metres per second) outside air (minimum and maximum).

g. Test and record entering air temperatures. (D.B. Heating and Cooling.)

h. Test and record entering air temperatures. (W.B. Cooling.)

i. Test and record leaving air temperatures. (D.B. Heating and Cooling).

j. Test and record leaving air temperatures. (W.B. Cooling.)

k. Adjust all main supply and return air ducts to proper design cfm (cubic meters per second.)

l. Adjust all zones to proper design cfm (cubic meters per second), supply and return.

m. Test and adjust each diffuser, and register to within -5 (five) percent and +10 (ten) percent of design requirements.

n. Each diffuser, and register shall be identified as to location and area.

o. Size, type, and manufacturer of diffusers, registers, and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.

p. Readings and tests of diffusers and registers shall include required fpm (meters per second) velocity and test resultant velocity, required cfm (cubic meters per second) and test resultant cfm (cubic meters per second) after adjustments.

q. In cooperation with the temperature control manufacturer's representative, the setting adjustments of automatically operated dampers shall be set to operate as specified, indicated, and/or noted. The air balance and testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.

r. All diffusers and registers shall be adjusted to minimize drafts in all areas.

s. Verify leakage tests of all high velocity ductwork in accordance with paragraph titled, "Leakage Test" in Section 15810, DUCTS.

t. All fans that are connected to headers only for future use shall be set to deliver the design cfm (cubic meters per second) at the design conditions as shown in the schedule.

u. All fans shall be tested and adjusted to meet the design requirements and final ampere readings shall be taken.

v. As a part of the Work of this Contract, the Contractor shall make any adjustments to the pulleys, belts, and dampers (or the addition of dampers required for correct balance) as recommended by the Testing Agency, at no additional cost to Owner.

w. Perform air pattern tests with smoke bombs in areas requested by the Architect.

H. Initial Test and Balance Procedure for Water Systems.

1. The Testing Agency shall perform the following:

a. Set chilled water pumps and hot water pumps to proper gallons per minute (liters per second) delivery.

b. Adjust chilled water flow to the building and throughout the system. Adjust hot water flow to the building and throughout the system.

c. Check water temperature entering and leaving the building mixing valve. Adjust to correct design temperatures.

d. Check water temperatures at inlet side of cooling coils. Note rise or drop of temperatures from source.

e. Proceed to balance each chilled water and hot water coil after balancing multiple coil sections for even water distribution through tubes.

f. Upon completion of flow readings and adjustments at coils, mark all settings, lock set points on all balancing valves, and record data.

I. Final Test and Balance Procedure for Water Systems.

1. The Testing Agency shall perform the following tests and adjustments upon completion of preparation and initial test.

a. After adjustments to coils and valves are made, recheck settings at the pumps, (boilers) (converters) (chillers) and readjust if required.

b. Install pressure gages or coils, read pressure drop through coils at set flow rate on call for full cooling or heating. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.

c. Record and check the following items at the following locations.

(1) Leaving and inlet water temperatures at pumps, and coils.

(2) Pressure drop of each coil within scope of Work.

(3) Gpm (liters per second) at each pump, coil, converter, chiller, and boiler.

(4) Pressure drop across control valves.

(5) Check and record the operating suction and discharge pressure of all pumps and final total dynamic head.

d. List all mechanical Specifications of pumps.

e. Check and record pressures at pressure reducing station.

f. Record water metering device readings.

J. Testing Procedure for Steam and Condensate System.

1. Check all control valves for operation from full open to close, record pressures.

2. Check and record pressures at pressure reducing station.

3. Check and record steam flow meter readings.

4. Check all humidifier valves for operation from full open to full close. Record humidity.

5. Check rotation of condensate pumps.

6. Check float control operation of condensate pumps.

K. Testing Procedure for Sound Levels.

1. Using recently calibrated instruments, conduct sound level tests in selected areas of the building. Measure sound level readings in decibels on the “A” and “C” scales of the General Radio Company sound level meter, or sound level meter that meets the current American Standard (Z24 3) based on the acoustic reference power of DB/ -RE 10. 13W. Readings shall set forth the total random sound level of the selected rooms or areas with the system in operation, as compared to total background sound level with the system not in operation. The system increase over the background level shall be recorded in decibels on the “A” and “C” scales.

   a. Identify each outlet by room name, room number, and air outlet number.

   b. Measure sound levels in decibels at each diffuser, grille or register in listed areas. Measure sound levels approximately five feet above the floor on a line directly below the center of the diffuser, etc., on the “A” and “C” scales of a General Radio Company sound level meter.

   c. Tabulate data for the following rooms:

L. Test and Balance Reports

1. The Test and Balance agency shall prepare and submit six (6) copies of the Test and Balance Analysis report to the owner within five (5) working days of completion. This report shall contain, at a minimum:

   a. Project cover sheet

   b. AABC Certification credential(s) for the responsible TBE and all technicians involved in the project.

   c. Project summary/general comments

   d. Definitions, Abbreviations, Terminology and Symbols

   e. Calibration certificates for all test equipment used on project including model and serial number.

   f. Table of contents and test forms for all systems.

g. Drawings. The Air Balance Agency shall prepare a complete set of full-scale single line schematic drawings showing actual duct runs and outlet/inlet locations. Drawings shall be keyed to and furnished with the Air Balance Report. The mechanical plans are not acceptable for this purpose. Drawings shall be in AutoCAD version 14 or later format.

h. AABC National performance guaranty

2. Furnish typewritten data for all supply fans tabulating:

a. Quantity of air in CFM at each air outlet or inlet.

b. Dry and wet bulb temperatures at each thermostat to the nearest 1/10 of 1 degree.

c. Outdoor dry and wet bulb temperatures, wind direction and velocity, and barometric pressure at the time tests are conducted.

d. RPM of fan or blower.

e. RPM of motor.

f. Ampere input of each motor (one reading on each leg if three (3) phase).

g. No load Amperage and brake horsepower calculations on all motors 1/2 horsepower or larger.

h. Static pressure in inches water gauge at inlet of fan or blower.

i. Duct Traverse data.

3. Furnish typewritten data for the Coils tabulating:

a. Entering and leaving water temperature.

b. Quantity of air in CFM.

c. Face velocity in FPM.

d. Dry and wet bulb air temperature entering and leaving coil.

e. Capacity of coil in BTUH.

f. Quantity of water circulated through coil in GPM.

4. Furnish typewritten data for the Chillers tabulating:

   a. Suction and condensing temperature and pressures.

   b. Ampere input of motors under full load (one for each phase leg).

   c. Temperatures of entering and leaving chilled and condenser water.

   d. Capacity of machine in BTUH.

   e. Quantity of chilled and condenser water circulated through machine in GPM.

5. Furnish typewritten data for the Pumps tabulating:

   a. Quantity of water circulating in GPM.

   b. Suction and discharge pressure in PSIG.

   c. Ampere input of motors (one reading for each leg on three (3) phase motors).

   d. At no flow, (valve off), measure suction pressure, discharge pressure and motor amps (on all three (3) legs).

   e. Calculate BHP.

6. Furnish typewritten data for the Cooling Tower tabulating:

   a. Quality of water circulating through Tower.

   b. Temperature of entering and leaving water.

   c. Capacity of Tower in BTUH.

END OF SECTION

SECTION 16011

SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

1. GENERAL

1.1 SUMMARY

A. Section includes short circuit and protective device coordination study encompassing portions of electrical distribution system from normal power source or sources up to and including breakers in service entrance switchboard, fuses in service entrance switchboard, main breaker in sub-distribution panels, fuses in sub-distribution panels and main breaker in each panelboard.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

1.3 DESIGN REQUIREMENTS

A. Complete Short Circuit and Protective Device Coordination Study to meet requirements of NFPA 70.

B. Report Preparation:

1. Prepare study prior to ordering distribution equipment to verify equipment ratings required.

2. Perform study with aid of computer software program.

3. Obtain actual settings for packaged chiller and motor characteristics for equipment incorporated into Work.

4. Calculate short circuit interrupting and, when applicable, momentary duties for assumed 3-phase bolted fault short circuit current and phase to ground fault short circuit current at each of the following:

a. Utility supply bus.

b. Medium voltage air interrupter switchgear.

c. Medium voltage circuit breaker switchgear.

d. Secondary unit substations.

e. Automatic transfer switch.

f. Manual transfer switch.

g. Engine generator.

h. Medium voltage motor controllers.

i. Medium voltage oil switchgear.

j. Low-voltage switchgear.

k. Switchboards.

l. Motor control centers.

m. Distribution panelboards.

n. Branch circuit panelboards.

o. Busway.

p. Each other significant equipment location throughout system.

C. Report Contents:

1. Include the following:

    a. Calculation methods and assumptions.

b. Base per unit value selected.
c. One-line diagram.

d. Source impedance data including power company system available power and characteristics.

e. Typical calculations.

(1) Fault impedance.

(2) X to R ratios.

(3) Asymmetry factors.

(4) Motor fault contribution.

(5) Short circuit kVA.

(6) Symmetrical and asymmetrical phase-to-phase and phase-to-ground fault currents.

(7) Tabulations of calculation quantities and results.

f. One-line diagram revised by adding actual instantaneous short circuits available.

g. State conclusions and recommendations.

2. Prepare time-current device coordination curves graphically indicating coordination proposed for system, centered on conventional, full-size, log-log forms.

3. Prepare with each time-curve sheet complete title and one-line diagram with legend identifying specific portion of system covered by that particular curve sheet.

4. Prepare detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

5. Plot device characteristic curves at point reflecting maximum symmetrical

fault current to which device is exposed. Include on curve sheets the following:

a. Power company relay characteristics.

b. Power company fuse characteristics.

c. Medium voltage equipment protective relay characteristics.

d. Medium voltage equipment protective fuse characteristics.

e. Low voltage equipment circuit breaker trip device characteristics.

f. Low voltage equipment fuse characteristics.

g. Cable damage point characteristics.

h. Pertinent transformer characteristics including:

(1) Transformer full load current.

(2) Transformer magnetizing inrush.

(3) ANSI transformers withstand parameters.

(4) Significant symmetrical fault current.

i. Pertinent motor characteristics.

j. Generator characteristics including:

(1) Phase and ground coordination of generator protective devices.

(2) Decrement curve and damage curve.

(3) Operating characteristic of protective devices.

(4) Actual impedance value.

(5) Time constants.

(6) Current boost data.

(7) Do not use typical values for generator.

k. Transfer switches characteristics.

l. Other system load protective device characteristics.

1.4 SUBMITTALS

A. Qualifications Data: Submit the following for review prior to starting study.

1. Submit qualifications and background of firm.

2. Submit qualifications of Professional Engineer performing study.

B. Software: Submit for review information on software proposed to be used in performing study.

C. Product Data: Submit the following:

1. Report: Summarize results of study in report format including the following:

a. Descriptions, purpose, basis, and scope of study.

b. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.

c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

d. Fault current calculations including definition of terms and guide for interpretation of computer printout.

D. Submit copies of final report signed by professional engineer. Make additions or changes required by review comments.

1.5 QUALITY ASSURANCE

A. Use commercially available software, designed specifically for short circuit and protective device coordination studies with minimum of 3 years documented availability.

B. Perform study in accordance with IEEE 242.

1.6 QUALIFICATIONS

A. Study Preparer: Company specializing in performing work of this section with minimum 3 years documented experience.

B. Perform study under direct supervision of Professional Engineer experienced in design of this Work and licensed with minimum of 3 years experience in power system analysis.

C. Demonstrate company performing study has capability and experience to provide assistance during system start up.

1.7 SEQUENCING

A. Submit short circuit and protective device coordination study to Architect/Engineer prior to receiving final approval of distribution equipment shop drawings and prior to releasing equipment for manufacturing.

B. When formal completion of study will cause delay in equipment manufacturing, obtain approval from Architect/Engineer for preliminary submittal of study data sufficient in scope to ensure selection of device ratings and characteristics will be satisfactory.

1.8 SCHEDULING

A. Schedule work to expedite collection of data to ensure completion of study for final approval of distribution equipment shop drawings prior to release of equipment for manufacturing.

1.9 COORDINATION

A. Coordinate work with local power company.

2. PRODUCTS

Not used.

3. EXECUTION

3.1 FIELD QUALITY CONTROL

A. Provide assistance to electrical distribution system equipment manufacturer during start up of electrical system and equipment.

B. Select each primary protective device for delta-wye connected transformer so device's characteristic or operating band is within transformer characteristics, including point equal to 58 percent of ANSI withstand point to provide secondary line-to-ground fault protection.

C. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by 16 percent current margin to provide proper coordination and protection in event of secondary line-to-line faults.

D. Separate medium-voltage relay characteristic curves from curves for other devices by at least 0.4 second time margin.

3.2 ADJUSTING

A. Perform field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust settings in accordance with approved short circuit and protective device coordination study.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Active electrodes.
3. Wire.
4. Grounding well components.
5. Mechanical connectors.
6. Exothermic connections.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

2. NFPA 99 - Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Existing Metal underground water pipe.

2. Metal building frame.

3. Concrete-encased electrode.

4. Existing Metal underground gas piping system.

5. Rod electrode.

6. Plate electrode.

1.4 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

2.0 PRODUCTS

2.1 ROD ELECTRODES

A. Manufacturers:

1. Apache Grounding/Erico Inc.

2. Copperweld, Inc.

3. Erico, Inc.

4. O-Z Gedney Co.

5. Thomas & Betts, Electrica.

B. Product Description:

1. Material: Copper-clad steel.

2. Diameter: 3/4 inch.

3. Length: 10 feet.

C. Connector: Connector for exothermic welded connection.

2.2 ACTIVE ELECTRODES

A. Manufacturers:

1. Apache Grounding/Erico Inc.

2. Copperweld, Inc.

3. Erico, Inc.

4. O-Z Gedney Co.

5. Thomas & Betts, Electrica.

B. Product Description:

1. Material: Metallic-salt-filled copper-tube electrode.

2. Shape: As indicated on Drawings.

3. Length: 10 feet minimum.

4. Connector: Connector for exothermic welded connection.

2.3 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 4 AWG.

C. Grounding Electrode Conductor: Copper conductor bare.

D. Bonding Conductor: Copper conductor insulated.

2.4 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches NPS by 24 inches long fiberglass pipe with belled end.

B. Well Cover: Fiberglass with legend "GROUND" embossed on cover.

2.5 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

1.0 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.
6. Underground Warning Tape.
7. Lockout Devices.

2.0 PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.

B. Letter Size:

1. 1/8 inch high letters for identifying individual equipment and loads.
2. 1/4 inch high letters for identifying grouped equipment and loads.
3. inch high letters for identifying

C. Minimum nameplate thickness: 1/8 inch.

2.2 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing type wire markers.

B. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.

2. Control Circuits: Control wire number as indicated on shop drawings.:

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.

2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors conforming to the following:

1. Black lettering on white background.

2. White lettering on gray background.

3. Red lettering on white background.

4. Blue lettering on white background.

2.4 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

2.5 LOCKOUT DEVICES

A. Lockout Hasps:

1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

END OF SECTION

SECTION 16121

MEDIUM-VOLTAGE CABLE

1.0 GENERAL

1.1 SUMMARY

A. Section includes medium voltage cable and cable terminations.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 48 - Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV.

2. IEEE C2 - National Electrical Safety Code.

B. National Electrical Manufacturers Association:

1. NEMA WC 3 - Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

2. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. NEMA WC 7 - Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electric Energy.

4. NEMA WC 8 - Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 MEDIUM VOLTAGE CABLE

A. Product Description: NEMA WC 8, ethylene propylene rubber insulated cable.

B. Voltage: 15 kV grounded.

C. Conductor: Copper, stranded, with wire-woven conductor shield.

D. Construction: Single conductor with metal wire insulation shielding.

E. Armor Material: Steel.

F. Armor Design: Interlocked metal tape.

2.2 POTHEADS

A. Product Description: IEEE 48, Class 1 termination. Pothead with porcelain insulators, cable connector and aerial lug, sealed cable entrance and support, and insulating compound.

B. Conductors: 1.

2.3 CABLE TERMINATIONS

A. Product Description: IEEE 48, Class 2 porcelain insulator cable terminator in kit form.

2.4 CAST-EPOXY CABLE TERMINATION

A. Product Description: IEEE 48, Class 1 cast epoxy cable termination in kit form with stress cone, shields ground connection, wet porcelain rain shield for outdoor units, epoxy resin molding material, and accessories and molds required for proper application.

2.5 MODULAR CABLE TERMINATION

A. Product Description: IEEE 48, Class 1, molded-rubber cable termination in kit form with stress cone, ground clamp, non-tracking rubber skirts, load break connector, rubber cap, and aerial lug.

2.6 TAPE TERMINATION

A. Product Description: IEEE 48; Class 1, tape termination kit with semi- conductive tape, stress control tape, splicing tape, vinyl plastic tape, stress cone, mechanical ground straps, and cable preparation kit.

END OF SECTION

SECTION 16130

RACEWAY AND BOXES

1.0 GENERAL

1.1 SUMMARY

A. Section includes conduit,, wireways, outlet boxes, pull and junction boxes, and handholes.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.

5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.

7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

2.0 PRODUCTS

2.1 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 PVC COATED METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel, compression or set screw type.

2.6 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 WIREWAY

A. Product Description: General purpose, oiltight and dust-tight, or raintight type wireway.

B. Knockouts: Manufacturer's standard None Bottom only.

C. Cover: Hinged Screw cover with full gaskets.

D. Connector: Slip-in Flanged.

E. Fittings: Lay-in type with removable top, bottom, and side; captive screws drip shield.

F. Finish: Rust inhibiting primer coating with gray enamel finish.

2.8 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD, cast ferroalloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

C. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 16131.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4, 4X, or 6; flat-flanged, surface mounted junction box:

   1. Material: Galvanized cast iron or cast aluminum.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:

1. Material: Galvanized cast iron Cast aluminum.

2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.

3. Cover Legend: "ELECTRIC".

E. Fiberglass or Concrete Composite Handholes: Die-molded, glass-fiber or concrete composite hand holes:

1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.

2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

END OF SECTION

SECTION 16235

ENGINE GENERATORS

1.0 GENERAL

1.1 SUMMARY

A. Section includes engine generator set, remote radiator, exhaust silencer and fittings, transfer switch, fuel fittings and day tank, remote control panel, battery, and charger.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

3. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment.

4. NEMA MG 1 - Motors and Generators.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:

1. NFPA 30 - Flammable and Combustible Liquids Code.

2. NFPA 110 - Standard for Emergency and Standby Power Systems.

2.0 PRODUCTS

2.1 ENGINE

A. Manufacturers:

1. Caterpillar

2. Cummins

3. Substitutions: Verify other acceptable manufacturers with Owner.

B. Product Description: Water-cooled in-line or V-type, four-stroke cycle, compression ignition Diesel internal combustion engine.

C. Rating: Sufficient to operate under 10 percent overload for one hour in ambient of 90 degrees F.

D. Fuel System: No. 2 fuel oil.

E. Engine speed: 1800 rpm.

F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Furnish remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.

I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F Radiator air flow restriction 0.5 inches of water maximum.

J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Furnish fuel pressure gage, water temperature gage, and lube oil pressure gage on engine/generator control panel.

K. Mounting: Furnish unit with suitable spring-type vibration isolators and mount on structural steel base.

2.2 GENERATOR

A. Product Description: NEMA MG1, single or three phase, four or six pole, reconnectable brushless synchronous generator with brushless exciter.

B. Insulation Class: F.

C. Temperature Rise: 105 degrees C Continuous.

D. Enclosure: NEMA MG1, open drip proof.

E. Voltage Regulation: Furnish generator mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Furnish manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.3 GOVERNOR

A. Product Description: Electronic governor to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

2.4 REMOTE RADIATOR

A. Product Description: discharge remote radiator, sized by engine generator manufacturer to match engine cooling capacity.

B. Fan motor voltage: volts phase.

2.5 DAY TANK

A. Product Description: day tank unit with dual integral pumps and level control.

B. Furnish flexible fuel line connections, fuel gage, check valve, high fuel level alarm contact, and indicating light.

C. Pump Motor: 120 volts AC.

D. Conform to NFPA 30.

2.6 AUTOMATIC TRANSFER SWITCH

A. Product Description: NEMA ICS 10, automatic transfer switch.

B. Configuration: Electrically operated, mechanically held transfer switch.

C. Control Features and Functions:

1. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, switch position.

2. Test Switch: Mount in cover of enclosure to simulate failure of normal source.

3. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate source to normal source.

4. Transfer Switch Auxiliary Contacts: 2 normally open; 2 normally closed.

5. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.

6. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.

7. In-Phase Monitor: Inhibit transfer until source and load are within electrical degrees.

8. Switched Neutral: Overlapping contacts.

D. Automatic Sequence of Operation:

1. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

2. Time Delay to Start Alternate Source Engine Generator: adjustable.

3. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

4. Time Delay before Transfer to Alternate Power Source: adjustable.

5. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.

6. Time Delay before Transfer to Normal Power: adjustable; bypass time delay in event of alternate source failure.

7. Time Delay Before Engine Shut Down: adjustable, unloaded operation.

E. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control when normal source fails during exercising period.

F. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.7 ACCESSORIES

A. Skid-Mounted Fuel Tank: steel tank, with fill and vent.

B. Exhaust Silencer: Critical type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.

C. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Furnish cables and clamps.

D. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.

E. Battery Charger: Current limiting type designed to float at 2.17 volts for each cell and equalize at 2.33 volts for each cell. Furnish overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Furnish wall mounted enclosure to meet NEMA 250, Type 1 requirements.

F. Line Circuit Breaker: NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole. Furnish battery voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit-mount in enclosure to meet NEMA 250, Type 1 requirements.

G. Engine-Generator Control Panel: NEMA 250, Type 1 generator-mounted control panel enclosure with engine and generator controls and indicators. Furnish provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.

2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.

3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.

4. Output voltage adjustment.

5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and over crank.

6. Engine start/stop selector switch.

7. Engine running time meter.

8. Oil pressure gage.

9. Water temperature gage.

10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.

11. Additional visual indicators and alarms in accordance with by NFPA 110.

12. Remote Alarm Contacts: Factory wire SPDT contacts to terminal strip for remote alarm functions in accordance with NFPA 110.

H. Remote Annunciator Panel: Surface Flush mounted panel with brushed stainless steel. Furnish alarm horn, and indicators and alarms as follows:

1. High battery voltage (alarm).

2. Low battery voltage (alarm).

3. Low fuel (alarm).

4. System ready.

5. Anticipatory-high water temperature.

6. Anticipatory-low oil pressure.

7. Low coolant temperature.

8. Switch in off position (alarm).

9. Over crank (alarm).

10. Emergency stop (alarm).

11. High water temperature (alarm).

12. Over-speed (alarm).

13. Low oil pressure (alarm).

14. Line power available.

15. Generator power available.

16. Lamp test and horn silence switch.

I. Weather-protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Furnish fixed louvers, fuel tank, battery rack, and silencer.

****** OR ******

J. Walk-in Enclosure: Pre-fabricated, skid-mounted unit with engine generator, motorized air intake and exhaust louvers, controls, space heaters, and lighting fixtures. Provide 3 foot access aisle around engine-generator, with at least two doors for personnel access. Provide 7 feet clear height. Construct unit from insulated sheet metal panels for sound and thermal insulation.

2.8 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. Make completed engine-generator assembly available for inspection at manufacturer's factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.

C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

END OF SECTION

SECTION 16362

SECONDARY UNIT SUBSTATIONS

1.0 GENERAL

1.1 SUMMARY

A. Section includes secondary unit substation and accessories.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.

2. ANSI C37.06 - American National Standard for Switchgear - AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities.

3. ANSI C37.46 - Special Power Fuses & Fuse Disconnecting Switches.

4. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

5. ANSI C57.12.28 - Pad-Mounted Equipment - Enclosure Integrity.

6. ANSI C57.12.55 - Dry Type Transformers in Unit Installations, Including Unit Substations-Conformance Standard.

B. Institute of Electrical and Electronics Engineers:

1. IEEE 48 - Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV Through 765 kV.

2. IEEE C57.12.91 - Standard Test Code for Dry-Type Distribution and Power Transformers.

3. IEEE C57.13 - Standard Requirements for Instrument Transformers.

4. IEEE C57.94 - Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers.

5. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA FU 1 - Low Voltage Cartridge Fuses.

3. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

4. NEMA PB 2 - Deadfront Distribution Switchboards.

5. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 SECONDARY UNIT SUBSTATION

A. Manufacturers:

1. Square D Model.

2. General Electric.

3. Eaton Cutler Hammer.

4. Siemens.

5. Substitutions: Not Permitted.

B. Product Description: Secondary selective type unit substation.

1. Primary Section: Duplex fused air switch configured with two incoming lines, looped.

2. Transformer Section: Dry-type transformer.

3. Secondary Section: Low-voltage switchgear.

C. Space Heaters: $\pm$300 watt, sealed, resistance type, anti-condensation heater in each section, controlled by adjustable thermostat/humidistat, factory pre-wired with circuit breaker protection and supply voltage from equipment bus.

D. Key Interlocks: Provide key interlock to allow selection of only one incoming feeder at a time.

2.2 SERVICE CONDITIONS

A. Meet requirements for usual service conditions and for ambient temperature conditions at the site.

2.3 INCOMING AIR TERMINAL COMPARTMENT

A. Product Description: Fabricated structure with clamp-type terminal or pothead cable terminations bussed to primary switch.

B. Maximum Design Voltage: 15 kV.

C. Basic Impulse Level: 95 kV.

2.4 POTHEADS

A. Product Description: Potheads conforming to IEEE 48.

2.5 MEDIUM-VOLTAGE SURGE ARRESTORS

A. Product Description: Distribution class surge arrestors; mount in incoming line compartment.

2.6 PRIMARY SWITCH

A. Switch: IEEE C37.20.3, duplex, fused, selector type air interrupter switch.

2.7 MEDIUM-VOLTAGE FUSES

A. Product Description: IEEE C37.46, enclosed current limiting, non-expulsion type expulsion type suitable for use indoors outdoors in enclosure.

2.8 DRY TYPE TRANSFORMERS

A. Product Description: ANSI C57.12.55; three phase, pad-mounted, self-cooled or forced-air cooled transformer unit with solid-cast primary and secondary windings.

B. Cooling and Temperature Rise: ANSI C57.12.55; Class AA, 220 degree C insulation class with 150 degree C rise over 40 degree C ambient.

C. Taps: Standard primary taps.

D. Impedance: 5.75 percent maximum.

E. Accessories: ANSI C57.12.55, standard accessories.

F. Tap Changer: Externally-operated type.

2.9 SECONDARY SWITCHBOARD

A. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

B. Device Mounting:

1. Main Section: Individually mounted, solid-state circuit breaker.

2. Distribution Section: Panel mounted molded-case circuit breakers.

3. Auxiliary Section: Individually mounted.

C. Bus:

1. Material: Copper with silver plating, standard size.

2. Connections: Bolted, accessible from front for maintenance.

3. Insulation: Fully insulate load side bus bars in rear accessible compartments. Do not reduce spacing of insulated bus.

D. Ground Bus: Insulated, extend length of switchboard.

E. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on Drawings.

F. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Furnish continuous current rating as indicated on Drawings.

G. Enclosure: Type 1 - General Purpose or Type 2 – Rain-tight.

1. Align sections at front and rear.

2. Switchboard Height: 96 inches, excluding floor sills, lifting members and pull boxes.

3. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

4. Mimic Bus: Show bussing, connections and devices in single line form on front panels of switchboard using blue color plastic strips, fastened flat against panel face with screws or rivets.

H. Molded Case Circuit Breaker:

1. Product Description: NEMA AB 1, molded-case circuit breaker.

2. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time current setting for automatic operation.

3. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.

4. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.

5. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault

sensing; instantaneous trip; and adjustable short time trip.

6. Current Limiter: Designed for application with molded case circuit breaker. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

7. Accessories: Conform to NEMA AB 1.

   a. Shunt Trip Device: 120 volts, AC.

   b. Under-voltage Trip Device: 120 volts, AC.

   c. Auxiliary Switch: 120 volts, AC.

   d. Alarm Switch: 120 volts, AC.

   e. Electrical Operator: 120 volts, AC.
   f. Handle Lock: Provisions for padlocking.

   g. Insulated Grounding Lug: In each enclosure.

I. Ground Fault Devices:

1. Ground Fault Sensor: Ground return type.

2. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Furnish monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

2.10 METERS AND VOLTMETERS

A. Ammeters: ANSI C39.1; direct-reading, full range, indicating ammeter with 4.5 inch square recessed case and 250 degree scale, white dial with black figures and pointer, 5 ampere, 60 Hertz movement, 1 percent accuracy.

B. Voltmeters: ANSI C39.1; direct-reading, full range, indicating voltmeter with 4.5 inch square recessed case and 250 degree scale, white dial with black figures and pointer, 120 volt, 60 Hertz movement, 1 percent accuracy.

2.11 METER TRANSFER SWITCHES

A. Ammeter Transfer Switch: Rotary multistage snap-action type with 600 volt AC-DC silver plated contacts, engraved escutcheon plate, pistol-grip handle, and four positions including OFF.

B. Voltmeter Transfer Switch: Rotary multistage snap-action type with 600 volt AC-DC silver plated contacts, engraved escutcheon plate, pistol-grip handle, and four positions including OFF.

2.12 OWNER METERS

A. Circuit Monitor: Square D PowerLogic meter or equal, microprocessor type, multi-function, digital meter on the low-voltage side of the unit substation with the following characteristics:

1. True RMS sensing through the 31st harmonic with 0.2% accuracy.

2. Ambient temperature operating range form 0 degrees C to 55 degrees C.

3. Provide RS-485 communications port for 2 or 4 wire connection.
4. Programmable logic.

5. Maximum/minimum readings for the following:

   a. KW

   b. KWH

   c. KW Demand (Max. And Min.)

   d. KVA, KVAR, KVAH

   e. Power Factor

   f. Volts, Amps, Frequency

6. Provide control panel on front of the meter for user access to all meter displays, functions, and programming features.

2.13 FARICATION

A. Conform to requirements of ANSI C57.12.28.

B. Construction:

1. Suitable for installation by authorized personnel only.

2. Provide sloped drip-proof roof and door in door construction on incoming switches.

3. Provide rodent screens on all ventilation openings.

4. Provide tamper-proof construction. Stainless steel type 302 or 304.

5. Full height hinged doors with provisions for padlocking.

C. Height: 96 inches maximum, including auxiliary support members on top and bottom.

D. Main Bus: Silver-plated copper, full length, full capacity neutral bus.

E. Ground Bus: Copper. Provide continuous ground bus through assembly, securely connected to frame of each cubicle.

2.14 FACTORY FINISHES

A. Clean surfaces before applying paint.

B. Apply corrosion-resisting primer to surfaces.

C. Apply finish coat of baked enamel paint to 4 mils thick.

D. Finish Color: Manufacturer's standard light gray finish.

2.15 SOURCE QUALITY CONTROL

A. Provide factory tests to IEEE C57.12.91. Include routine tests as defined in IEEE C57.12.00 and the following other tests:

1. Impedance voltage and load loss.

2. Dielectric tests.

3. Audible sound level.

4. Short circuit capability.

5. Telephone influence factor (TIF).

6. Zero-phase-sequence impedance voltage.

7. Temperature rise.

END OF SECTION

SECTION 16411

ENCLOSED SWITCHES

1.0 GENERAL

1.1 SUMMARY

A. Section includes fusible and non-fusible switches.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.

2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:

1. GE Electric.

2. Square D

3. Cutler Hammer

4. Siemens

B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Fuse clips: Designed to accommodate NEMA FU 1, Class R or J fuses.

D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.
3. Industrial Locations: Type 4X.

E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

F. Furnish switches with entirely copper current carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:

1. GE Electrical
2. Square D
3. Cutler Hammer
4. Siemens

B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.
3. Industrial Locations: Type 4x.

D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

E. Furnish switches with entirely copper current carrying parts.

2.3 SWITCH RATINGS

A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere), 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes), 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

END OF SECTION

SECTION 16441

SWITCHBOARDS

1.0 GENERAL

1.1 SUMMARY

A. Section includes main and distribution switchboards.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.

2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

B. Institute of Electrical and Electronics Engineers:

1. IEEE C57.13 - Standard Requirements for Instrument Transformers.

2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA FU 1 - Low Voltage Cartridge Fuses.

3. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

4. NEMA PB 2 - Deadfront Distribution Switchboards.

5. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 DISTRIBUTION SWITCHBOARDS

A. Manufacturers:

1. Cutler Hammer.

2. General Electric.

3. Siemens.

4. Square D.

5. Substitutions: Not Permitted.

B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

C. Device Mounting:

1. Main Section: Individually mounted.

2. Distribution Section: Panel mounted.

3. Auxiliary Section: Individually mounted.

D. Bus:

1. Material: Copper with silver plating, standard size.

2. Connections: Bolted, accessible from front for maintenance.

3. Insulation: Fully insulate load side bus bars. Do not reduce spacing of insulated bus.

E. Ground Bus: Insulated, extend length of switchboard.

F. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on Drawings.

G. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents. Furnish continuous current rating as indicated on Drawings.

H. Enclosure: Type 1 - General Purpose or Type 2 - Raintight.

I. Align sections at front and rear.

J. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.

K. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.2 MOLDED CASE CIRCUIT BREAKER

A. Product Description: NEMA AB 1, molded-case circuit breaker.

B. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time setting for automatic operation. Range of Adjustment:

C. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.

D. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.

E. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing; instantaneous trip; and adjustable short time trip.

F. Current Limiter: Designed for application with molded case circuit breaker.

1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.

2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

G. Accessories: As indicated on Drawings. Conform to NEMA AB 1.

1. Shunt Trip Device: 120 volts, AC.
2. Undervoltage Trip Device: 120 volts, AC.
3. Auxiliary Switch: 120 volts, AC.
4. Alarm Switch: 120 volts, AC.
5. Electrical Operator: 120 volts, AC.
6. Handle Lock: Provisions for padlocking.
7. Insulated Grounding Lug: In each enclosure.

2.3 GROUND FAULT DEVICES

A. Ground Fault Sensor: Ground return type.

B. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Furnish monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

2.4 ACCESSORIES

A. For exterior boards furnish thermostatically controlled electric heaters in each section, sized to prevent condensation under expected weather conditions at Project site. Furnish terminals for separate connection of heater power circuit. Voltage Rating: 120 volts.

END OF SECTION

SECTION 16442

PANELBOARDS

1.0 GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA FU 1 - Low Voltage Cartridge Fuses.

3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.

5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

6. NEMA PB 1 – Panelboards.

7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

1. UL 67 - Safety for Panelboards.

2. UL 1283 - Electromagnetic Interference Filters.

3. UL 1449 - Transient Voltage Surge Suppressors.

2.0 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:

1. Cutler Hammer.

2. General Electric.

3. Siemens.

4. Square D.

5. Substitutions: Not Permitted.

B. Product Description: NEMA PB 1, circuit breaker type panelboard.

C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical for 240 208 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated on Drawings.

E. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

H. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.

I. Enclosure: NEMA PB 1, Type 1 3R, 14inches deep, 24inches wide, cabinet box.

J. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:

1. Cutler Hammer.

2. General Electric.

3. Siemens.

4. Square D.

5. Substitutions: Not Permitted.

B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

E. Minimum Integrated Short Circuit Rating: 22,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

H. Enclosure: NEMA PB 1, Type 1 or Type 3R.

I. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

J. Cabinet Front: Flush Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

2.3 ELECTRONIC GRADE PANELBOARD

A. Integral Surge Suppresser:

1. Component recognized in accordance with UL 1449 and UL 1283.

2. Independently tested with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.

3. Furnish copper bus bars for surge current path.

4. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.

5. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.

6. Meet or exceed the following criteria:

a. Maximum single impulse current rating not less than 80 kA for each phase.

b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.

c. Clamping voltage not exceeding the following:

Voltage	L-N	N-G	L-G
208Y/120	500 V	500 V	500 V
480Y/277	1000 V	1000 V	1000 V

7. Furnish response time no greater than five nanoseconds for individual protection modes.

8. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.

9. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.

10. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50: 1 using Mil Std. 220A methodology.

B. Panelboard:

1. UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.

2. Top or bottom feed as indicated on Drawings. Furnish circuit directory inside door.

3. Construct box of galvanized steel. Box size as indicated on Drawings.

4. Main bus constructed of copper and rated for load current.

5. Furnish interior with branch circuit breakers. Furnish one circuit breaker, with appropriate number of poles, as dedicated disconnect for TVSS.

6. Furnish 200 percent rated neutral assembly with copper neutral bus.

7. Furnish with insulated ground bus and safety ground bus.

8. Furnish wiring gutters in accordance with NEC.

9. Field connections to panelboard: main breaker type.

10. Construct with flush surface mounted trim and NEMA Type 1 enclosure.

11. Furnish with branch breaker positions and nominal current rating as indicated on Drawings.

END OF SECTION

SECTION 16443

MOTOR CONTROL CENTERS

1.0 GENERAL

1.1 SUMMARY

A. Section includes motor control centers.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA FU 1 - Low Voltage Cartridge Fuses.

3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

4. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers.

5. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.

6. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.

7. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives.

8. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.

9. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 MOTOR CONTROL CENTER

A. Manufacturers:

1. Cutler Hammer.

2. General Electric.

3. Siemens.

4. Square D.

5. Substitutions: Not Permitted.

B. Main Overcurrent Protection: Molded case circuit breaker.

C. Feeder Tap Units: Molded case thermal-magnetic circuit breakers.

D. Voltage Rating: volts, three phase, wire, 60 Hertz.

E. Horizontal Bus: Copper, with continuous current rating of as indicated on Drawings. amperes. Include copper ground bus entire length of control center.

F. Vertical Bus: Copper.

G. Integrated Equipment Short Circuit Rating: amperes rms symmetrical at volts.

H. Configuration: Units front mounting only, accessible from front only.

I. Enclosure: NEMA ICS 6, Type.

J. Finish: Manufacturer's standard gray enamel.

2.2 FULL-VOLTAGE NON-REVERSING CONTROLLERS

A. Product Description: NEMA ICS 2, AC general-purpose Class A solid-state controller for induction motors rated in horsepower.

B. Control Voltage: 120 volts, 60 Hertz.

C. Overload Relay: NEMA ICS 2; bimetal.

D. Product Options and Features:

1. Auxiliary Contacts: NEMA ICS 2, 2 each field convertible contacts in addition to seal-in contact.

2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oil-tight type.

3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated.

4. Pushbuttons: Recessed type.

5. Indicating Lights:, LED type.

6. Selector Switches: Rotary type.

7. Relays: NEMA ICS 5.

8. Control Power Transformers: 120 volt secondary, 100 VA minimum, in each motor controller. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

2.3 MOLDED CASE CIRCUIT BREAKER

A. Product Description: NEMA AB 1, molded-case circuit breaker.

B. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time setting for automatic operation. Range of Adjustment:

C. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.

END OF SECTION

SECTION 16461

DRY TYPE TRANSFORMERS

1.0 GENERAL

1.1 SUMMARY

A. Section includes two-winding transformers; shielded transformers; autotransformers; and buck-and-boost transformers.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).

2. NEMA ST 20 - Dry Type Transformers for General Applications.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

A. Manufacturers:

1. Square D

2. General Electric

3. Cutler Hammer

4. Substitutions: Not Permitted.

B. Product Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as indicated on Drawings.

C. Insulation system and average winding temperature rise for rated kVA as follows:

1. 1-15 kVA: Class 185 with 115 degrees C rise.

2. 16-500 kVA: Class 220 with 115 degrees C rise.

D. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.

E. Winding Taps:

1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

2. Transformers 15 kVA and Larger: NEMA ST 20.

F. Sound Levels: NEMA ST 20.

G. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.

H. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.

I. Mounting:

1. 1-15 kVA: Suitable for wall mounting.

2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor or trapeze mounting.

J. Coil Conductors: Continuous copper windings with terminations brazed or welded.

K. Enclosure: NEMA ST 20. Furnish lifting eyes or brackets.

L. Isolate core and coil from enclosure using vibration-absorbing mounts.

M. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

2.2 SHIELDED TRANSFORMERS

A. Manufacturers:

1. Square D

2. General Electric

3. Cutler Hammer

4. Substitutions: Not Permitted.

B. Product Description: NEMA ST 20, factory-assembled, air-cooled, dry type shielded isolation transformers, ratings as indicated on Drawings.

C. Insulation system and average winding temperature rise for rated kVA as follows:

1. 10-15 kVA: Class 185 with 115 degrees C rise.

2. 16-500 kVA: Class 220 with 150 degrees C rise.

D. Case temperature: Do not exceed 50 degrees C rise above ambient at warmest point at full load.

E. Winding Taps:

1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

2. Transformers 15 kVA and Larger: NEMA ST 20.

F. Sound Levels: NEMA ST 20.

G. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.

H. Ground core and coil assembly to enclosure with visible flexible copper grounding strap.

I. Winding Shield: Electrostatic, with separate insulated grounding connection.

J. Mounting:

1. 1-15 kVA: Suitable for wall mounting.

2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor or trapeze mounting.

K. Coil Conductors: Continuous copper windings with terminations brazed or welded.

L. Enclosure: NEMA ST 20. Furnish lifting eyes or brackets.

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplate: Include transformer connection data.

END OF SECTION

SECTION 16462

TRANSFORMERS FOR NONLINEAR LOADS

1.0 GENERAL

1.1 SUMMARY

A. Section includes transformers for nonlinear loads.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA ST 20 - Dry Type Transformers for General Applications.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2.0 PRODUCTS

2.1 TRANSFORMERS FOR NONLINEAR LOADS

A. Manufacturers:

1. Square D Model.

2. General Electric Model.

3. Cutler Hammer Model.

4. Substitutions: Not Permitted.

B. Product Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated on Drawings, designed to supply 100 percent nonlinear load.

C. Primary Voltage: 480 volts, 3 phase.

D. Secondary Voltage: 208Y/120 volts, 3 phase.

E. Core Flux Density: Below saturation at 10 percent primary overvoltage.

F. Insulation and temperature rise: Class 220 insulation system with 115 degrees C average winding temperature rise.

G. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.

H. Winding Taps:

1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

2. Transformers 15 kVA and Larger: NEMA ST 20.

I. Sound Levels: NEMA ST 20.

J. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.

K. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.

L. Mounting:

1. 1-15 kVA: Suitable for wall mounting.

2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor or trapeze mounting.

M. Coil Conductors: Continuous copper windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice secondary phase conductor ampacity.

N. Electrostatic Shield: Copper, between primary and secondary windings.

O. Enclosure: NEMA ST 20. Furnish lifting eyes or brackets.

P. Isolate core and coil from enclosure using vibration-absorbing mounts.

Q. Nameplate: Include transformer connection data.

2.2 SOURCE QUALITY CONTROL

A. Production test each unit according to NEMA ST 20.

END OF SECTION

SECTION 16510

INTERIOR LUMINAIRES

1.0 GENERAL

1.1 SUMMARY

A. Section includes interior luminaries, lamps, ballasts, and accessories.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.

2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

2.0 PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Product Description: Complete interior luminaries assemblies, with features, options, and accessories as scheduled.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:

1. Cooper Industries Inc.

2. Duro-Test Corp.

3. General Electric Co.

4. Hubbell Lighting.

5. Magnetek Inc.

6. Pass & Seymour.

7. Philips Electronic North America.

8. Thomas Industries, Inc.

B. Product Description: Electronic ballast, instant start, less than 10 percent THD, suitable for lamps specified, with voltage to match luminaries voltage.

2.3 HIGH INTENSITY DISCHARGE (HID) BALLASTS

A. Manufacturers:

1. Duro-Test Corp.

2. General Electric Co.

3. Philips Electronics North America.

4. Radiant Lamp Co.

5. Venture Lighting International Inc.

6. Siemens.

B. Product Description: ANSI C82.4, HID lamp ballast, suitable for lamp specified, with voltage to match luminaries' voltage.

2.4 FLUORESCENT DIMMING BALLASTS AND CONTROLS

A. Manufacturers:

1. Cooper Industries Model.

2. Duro-Test Corp. Model.

3. General Electric Co. Model.

4. Hubbell Inc. Model.

5. Pass & Seymour Model.

6. Thomas Industries Model.

B. Product Description: Electrical assembly of control unit and ballast to furnish smooth dimming of fluorescent lamps.

C. Control Unit: Linear slide type, rated 1000 watts minimum at 120 /277 volts.

D. Ballast: Selected by dimming system manufacturer as suitable for operation with control unit and suitable for lamp type and quantity specified for luminaries.

2.5 FLUORESCENT LAMPS

A. Manufacturers:

1. Sylvania Model.

2. General Electric Co. Model.

3. Philips Electronics Model.

2.6 HID LAMPS

A. Manufacturers:

1. Sylvania Model.

2. General Electric Co. Model.

3. Philips Electronics Model.

END OF SECTION

SECTION 16520

EXTERIOR LUMINAIRES

1.0 GENERAL

1.1 SUMMARY

A. Action includes exterior luminaries, poles, and accessories.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.

2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

3. ANSI O5.1 - Wood Poles, Specifications and Dimensions.

2.0 PRODUCTS

2.1 LUMINARIES

A. Product Description: Complete exterior luminaries assemblies, with features, options, and accessories as scheduled.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:

1. Cooper Industries Inc.

2. Duro-Test Corp.

3. General Electric Co.

4. Hubbell Lighting.

5. Magnetek Inc.

6. Pass & Seymour.

7. Philips Electronic North America.

8. Thomas Industries, Inc.

B. Product Description: High-power-factor type electromagnetic ballast certified by Certified Ballast Manufacturers, Inc. to comply with ANSI C82.1, suitable for lamps and environmental conditions specified, with voltage to match luminaries voltage.

2.3 HIGH INTENSITY DISCHARGE (HID) BALLASTS

A. Manufacturers:

1. Duro-Test Corp.

2. General Electric Co.

3. Philips Electronics North America.

4. Radiant Lamp Co.

5. Siemens Corp.

6. Venture Lighting International Inc...

B. Product Description: ANSI C82.4, HID lamp ballast, suitable for lamp and environmental conditions specified, with voltage to match luminaries' voltage.

2.4 FLUORESCENT LAMPS

A. Manufacturers:

1. Sylvania.

2. General Electric Co.

3. Philips Electronics.

2.5 HID LAMPS

A. Manufacturers:

1. Duro-Test Corp.
2. General Electric Co.
3. Philips Electronic North America.
4. RCS Industries North America.
5. Siemens Corp.

END OF SECTION

SECTION 16775

ASSISTIVE LISTENING SYSTEMS

1.0 GENERAL

1.1 SUMMARY

A. The work includes the provision of Assistive Listening Systems (ALS) as part of the building project.

B. The fixed ALS shall function with the voice reinforcement systems to be installed by the Audiovisual Contractor or Owner.

C. In the absence of fixed ALS, portable ALS shall be provided to the Owner, where specified.

D. Scope of Work: The work shall consist of the design, provision, termination, testing, and documentation of a complete and fully functional ALS. The instructions in this section are specific to the ALS installations and should be read in conjunction with other contract documents as applicable.

E. Deliverables: Prior to ordering materials or commencing any construction activities, the contractor shall provide the Owner with a complete bill of materials, including all quantities of components, devices, equipment, and wiring required to complete this work.

2.0 PRODUCTS

A. ALS equipment to be manufactured by Listen Technologies or equal.

2.1 FIXED / PORTABLE ALS EQUIPMENT

A. Provide the following Listen Technologies FM equipment for operation with the fixed voice reinforcement systems or portable systems as described below.

1. Transmitter product – Listen Technologies # LT-700-216 with the following capabilities:

a. The transmitter must be capable of transmitting on one of 57 FCC - approved narrow-band channels in the 216.025 to 216.975 MHz band.

b. The transmitter must have the ability to transmit up to 46m/150ft.

c. The transmitter must have an easy-to-read channel label on the front face.

d. The transmitter must be powered by two easily changed AA rechargeable NiCad batteries or two AA alkaline disposable batteries. The design must allow rechargeable batteries to be recharged without removal from the transmitter, have a charging indicator light, and be capable of operating for up to 20 hours with two AA alkaline batteries, and up to 10 hours with two AA NiCad batteries.

e. The transmitter must have a 3.5mmauxiliary input jack that allows transmission of audio from an auxiliary source such as a cassette recorder or television. The transmitter must also have a 3.5mm mic input jack.

2. Receiver Product # LR-500-216 with the follow capabilities:

a. The Receiver must be useable with included ear-buds. Ear-bud quantity = 1 per receiver.

b. The single-channel or multi-channel narrow-band FM receiver must be a small unit capable of being clipped to a pocket or belt.

c. The receiver must be capable of operating for up to 30 hours with two AA Alkaline batteries and up to 15 hours with two AA NiCad batteries. The receiver must have a charging indicator light. The receiver design must allow rechargeable batteries to be recharged without removal from the receiver.

d. The receiver's batteries must be capable of being recharged either in LA-321 charger/carrying case or with the LA-202 wall transformer/charger and have an on/off switch and volume control that adjusts the output level as required by the listener.

e. The receiver must have a 3.5mm output jack that accepts any one of the Listen Technologies listening accessories.

f. The receiver must have a protection circuit that prevents battery back-drain if the power to the charger is turned off while the receiver is being recharged.

g. The receiver must have an easy-to-read channel label on the front face.

h. The receiver must incorporate a squelch circuit that eliminates white noise when the receiver is out of transmission range.

i. The multi-channel receiver must be capable of receiving any of the 57 approved narrow-band FM frequencies within the 216.025 to 216.875 MHz band.

j. The user must be able to change to any one of these channels by using a buttons on the front of the receiver.

k. The receiver must have a label on the front face indicating that the receiver is a multi-channel unit.

3. Charger #LA-321 with the following capabilities:

a. The charger must be capable of storing or recharging up to 8 transmitters or receivers at once.

b. The charger must have an external UL- and CSA-approved wall transformer that plugs directly into the charging unit itself. It must have a pocket to contain the power wall transformer during storage. There must be no on/off switch.

c. The charging circuitry must be fully automatic and be capable of recharging the transmitter/receiver batteries in 14 hours maximum when 500mA/Hr batteries are used.

d. The charger must be capable of recharging NiCad batteries without the need for removal of the batteries from the transmitter/receiver.

e. The charger must have a large, foam-lined storage space for accessories, a locking lid, and a handle.

2.2 FIXED ALS EQUIPMENT

A. Provide Listen Technologies digital FM equipment for operation with the fixed voice reinforcement systems only as described below.

1. Base Station #LT-800-216 for fixed installations only with the following capabilities:

a. The receiver shall have 57 user-selectable, 216MHz FCC compliant, approved channels.

b. The receiver shall have on/off, FM volume, Aux volume, Monitor volume, test tone on/off,, Super Quiet Companding Technology on/off, Contour and channel up/down controls and an FM reception LED on the front panel. The front panel shall include a 2-digit channel LED display.

c. The receiver must have installer controls and ports on the back panel which include: antenna port; transmitter power settings; (2) mix outputs; (2) unbalanced audio inputs, selectable between +10 dBu and -10 dBu; (1) balanced XLR/¼" audio input, selectable between microphone, microphone with phantom power, and line level; and a separate DC jack to power the transmitter.

d. The channel display shall have an indicator light illuminated when the main power is off. The size of the receiver must be 20.3 (W) x 1.75 (H) x 20 (D) cm/8.0 (W) x 1.75 (H) x 8.0 (D) in. and weigh 1.4kg/3lbs.

e. The receiver must operate on 216MHz band, or other operating band approved by FCC for assistive listening devices.

2. Miscellaneous transmitter equipment to include the following:

a. Transmitter Antenna – provide a standard or large area antenna as required to generate a signal to receivers located at any point in the instructional space covered by the dedicated transmitter.

3.0 EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Assistive Listening transmitters shall be provided to the Owner in the following rooms:

1. Each room with 50 seats or more shall receive a fixed and installed ALS transmitter system.

2. Each room with a sound reinforcement system shall receive a fixed and installed ALS transmitter system.

B. Assistive Listening receivers shall be provided to the Owner as follows:

1. Each classroom with 50 or more seats shall receive a quantity of ALS receivers that equals at least 4% of the number of seats in the room (rounding up to the nearest integer), or at least 2. (I.e. A classroom of 80 would receive 4 receivers.)

C. Fixed ALS transmitters will be located at AV Equipment rack positions dedicated to each room listed above, or where applicable in portable AV racks.

D. Portable ALS transmitters and receivers will be given to the Owner for distribution.

E. Equipment to be installed in accordance with manufacturer's instructions.

3.2 TESTING

A. Following the installation of transmitters and antenna, each transmitter and receiver will be tested.

B. Transmitters shall support signal distribution at all specified channels at any position in the instructional room to which its use is dedicated.

C. Receivers shall be tested to verify function as specified by manufacturer.

END OF SECTION

College of the Desert

Section V – Appendix

October 2005

COLLEGE OF THE DESERT

CAMPUS STANDARDS HANDBOOK

COLLEGE OF THE DESERT
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Redmond Schwartz Mark Design

COLLEGE OF THE DESERT

CAMPUSWIDE DESIGN GUIDELINES

August 2005

CAMPUS STANDARDS HANDBOOK

PRESENTATION OUTLINE

- Purpose/ Contents
- Design Guidelines Overview
- Room Design Criteria
- Draft Handbook Review Process

CAMPUS STANDARDS HANDBOOK

PURPOSE

- Articulate the goals outlined in the Master Plan.
- Create a cohesive framework to develop a unified campus.
- Develop a simple design evaluation tool consisting of criteria and standards.

CAMPUS STANDARDS HANDBOOK

REVIEW OF CONTENTS

CAMPUS STANDARDS HANDBOOK

CAMPUS DESIGN GUIDELINES

- Architecture
- Landscape
- Signage

- Guide future development of the campus to unify and reinforce the unique identity of the College of the Desert.

COLLEGE OF THE DESERT

CAMPUSWIDE DESIGN GUIDELINES

August 2005

DESIGN GUIDELINES

ARCHITECTURE: HISTORY

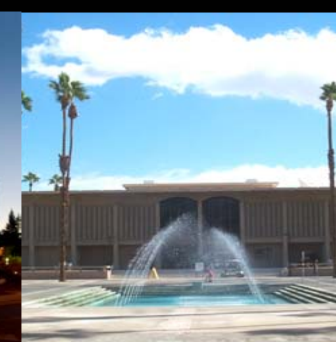
• Respect the "architectural traditions" and look toward the future……

DESIGN GUIDELINES

ARCHITECTURE: MASSING

- Gateway buildings to have special roofs
- All other buildings to have flat roofs
- Entries and lobbies to be easily identified





ARCHITECTURE: MATERIALS

- Distinctive high desert style: raw stone, glass, stainless steel, wood in protected areas.

DESIGN GUIDELINES

ARCHITECTURE: ARCADES

- Employ arcades around all buildings
- Vary arcade style per campus sector.

DESIGN GUIDELINES

ARCHITECTURE: SUN CONTROL

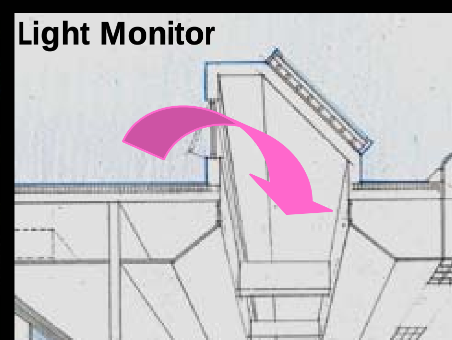
- All window openings to be shaded with vertical or horizontal shading devices.
- Each campus sector to have a distinct sunshade pattern to enhance way-finding.

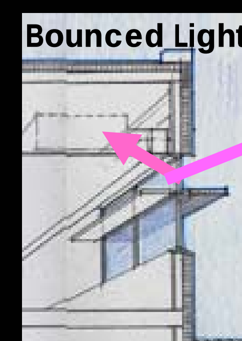
ARCHITECTURE/ INTERIORS: LOBBIES

- Lobby spaces to have distinctly colored walls to provide way-finding and a positive memorable environment.
- Provide generous height for lobby spaces.

ARCHITECTURE/ INTERIORS: NATURAL LIGHT

- Use skylights, light monitors and indirect light from sunshades to naturally light all student and faculty occupied spaces.
- All natural lighting to be indirect.





DESIGN GUIDELINES

ARCHITECTURE: EVENING USE

• Utilize colored lights to reinforce campus identity/ way-finding and create a memorable identity.

DESIGN GUIDELINES

LANDSCAPE

- Civic Responsibility
- Clarity of Way-finding
- Quality of Life

- *All aspects of Design at College of the Desert should relate to and be in harmony with the Coachella Valley.*

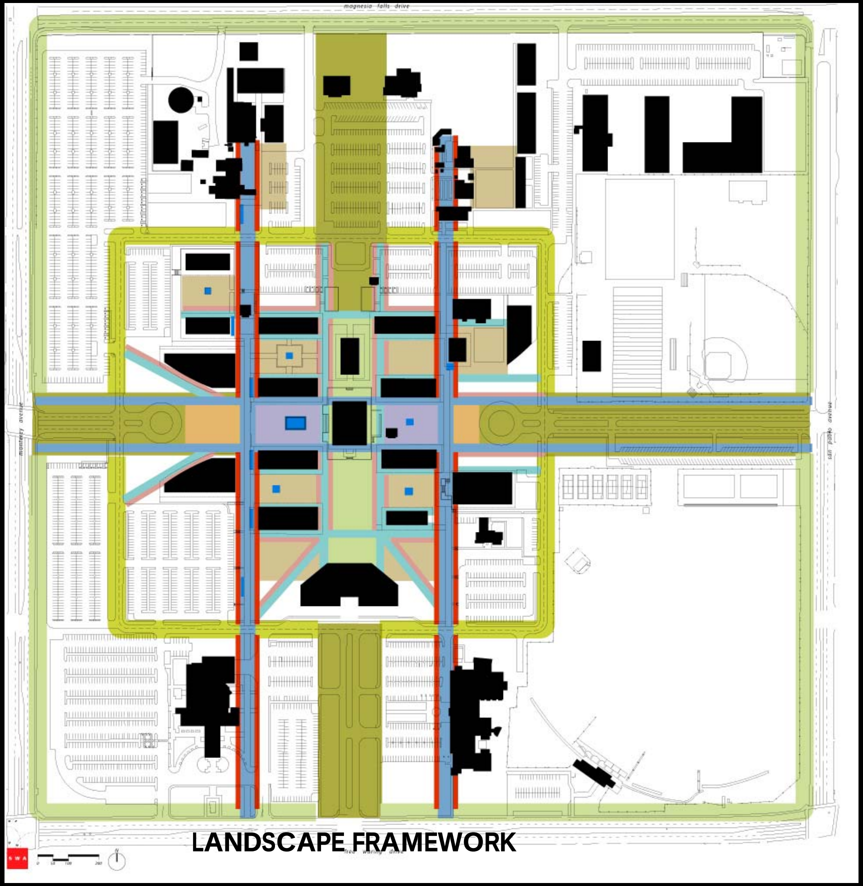
DESIGN GUIDELINES

LANDSCAPE: CIVIC RESPONSIBILITY

- Reduce natural resource demands.
- Create a "landscape of learning".
- Promote more interaction with the community.

DESIGN GUIDELINES

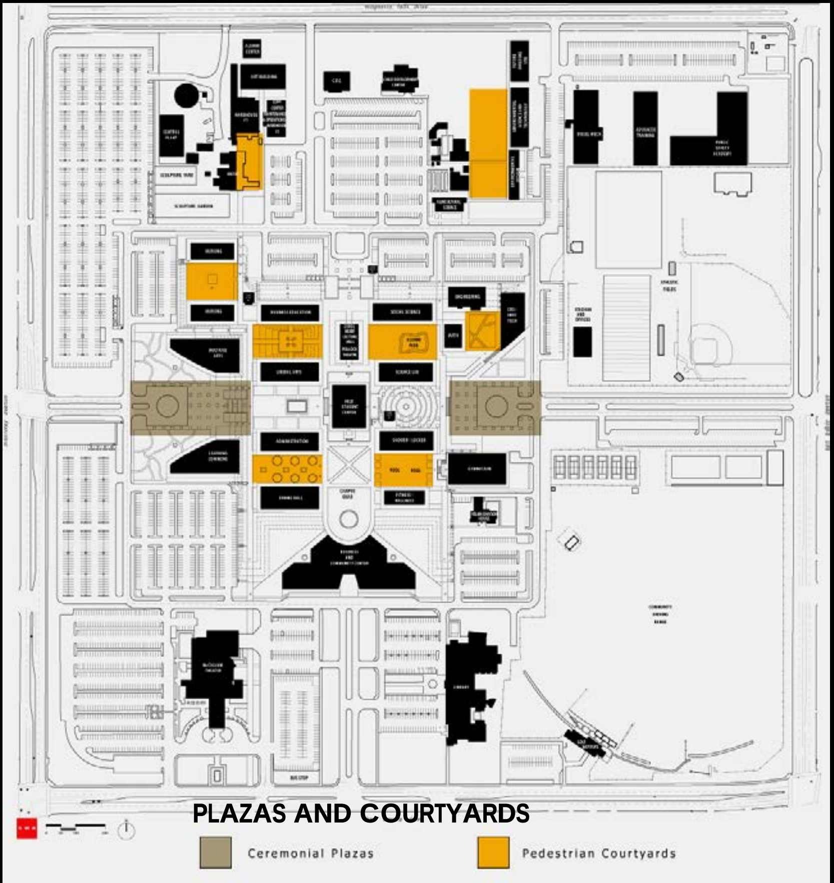
LANDSCAPE: CLARITY



- Create identifiable spatial and circulatory hierarchies.
- Reinforce campus-wide art program.

DESIGN GUIDELINES

LANDSCAPE: QUALITY OF LIFE



- Create outdoor rooms that promote active learning
- Develop active plazas and courtyards

DESIGN GUIDELINES

LANDSCAPE: MASTER PLAN

- Landscape concept: From the arid periphery to the interior oasis

DESIGN GUIDELINES

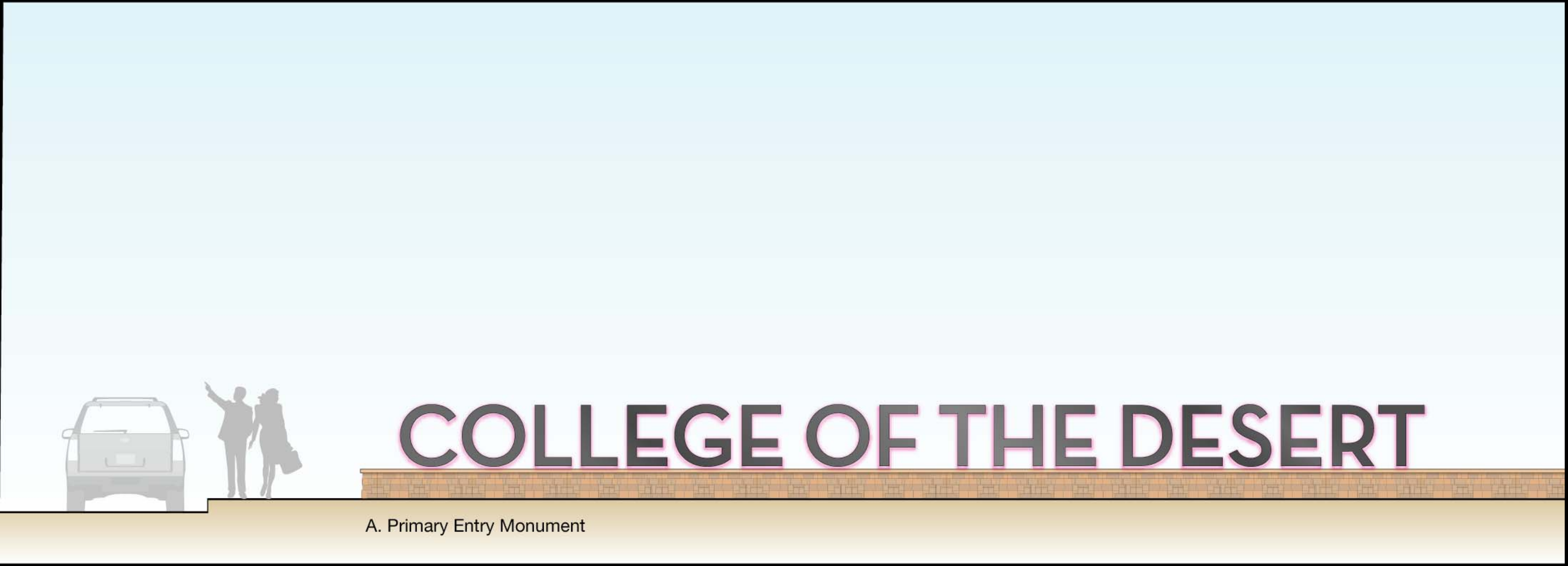
SIGNAGE: GOALS

- To make way-finding information clear
- Use signage to reinforce the identity of College of the Desert as an educational institution located in the Coachella Valley.

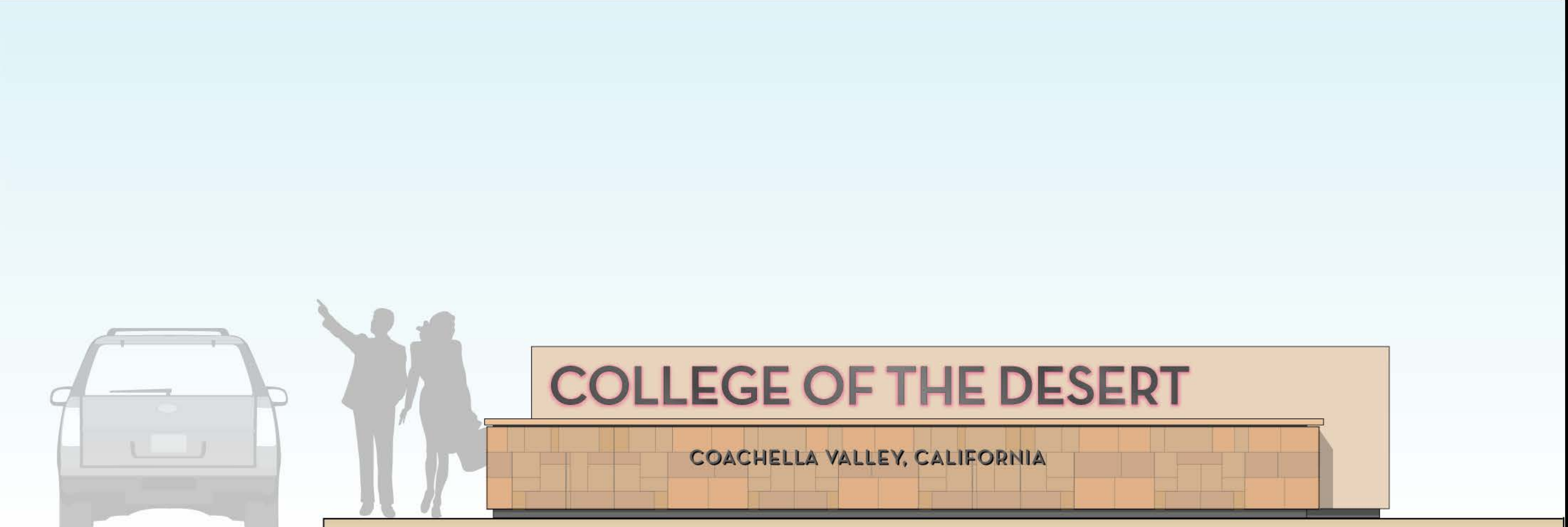
SIGNAGE: LOCATIONS

Site Signage Plan:
A. Primary Entry Monument
B. Secondary Entry Monument
C. Primary Vehicular Directional
D. Secondary Vehicular Directional
E. Street Signs
F. Parking Lot Signs
G. Directory
H. Pedestrian Directional
M. Electronic Readerboard

A. Primary Entry Monument

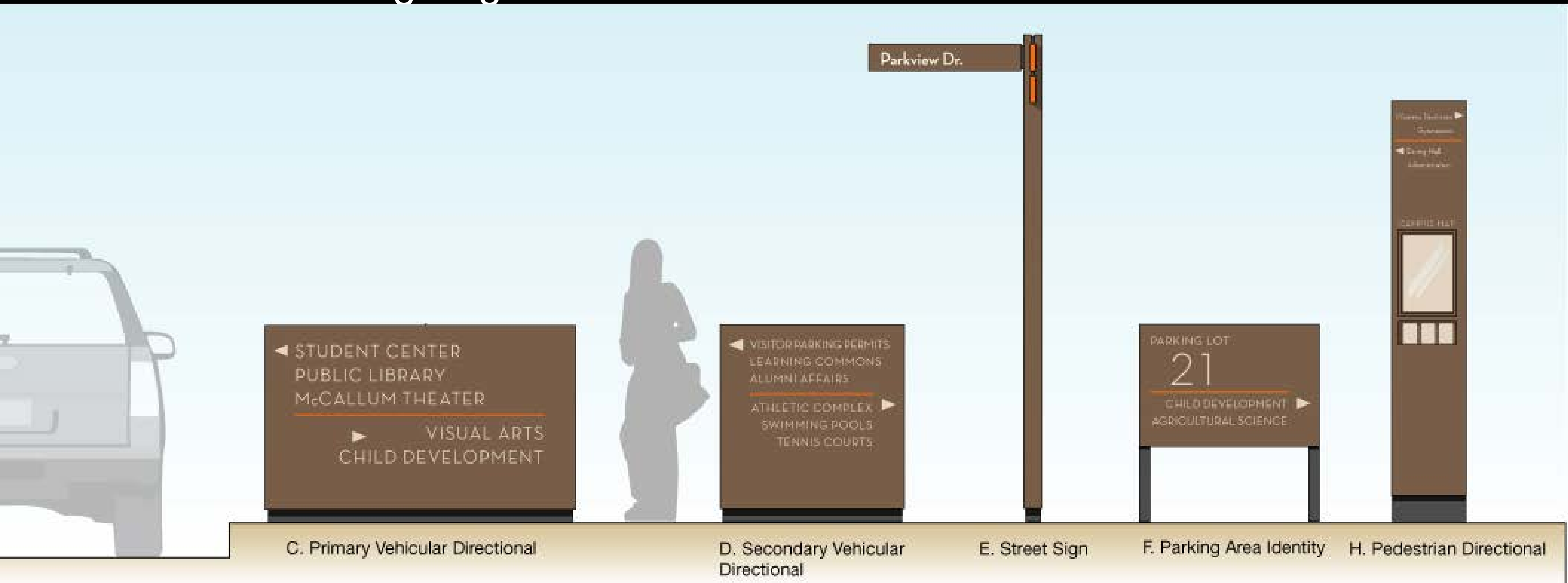


B. Secondary Entry Monument



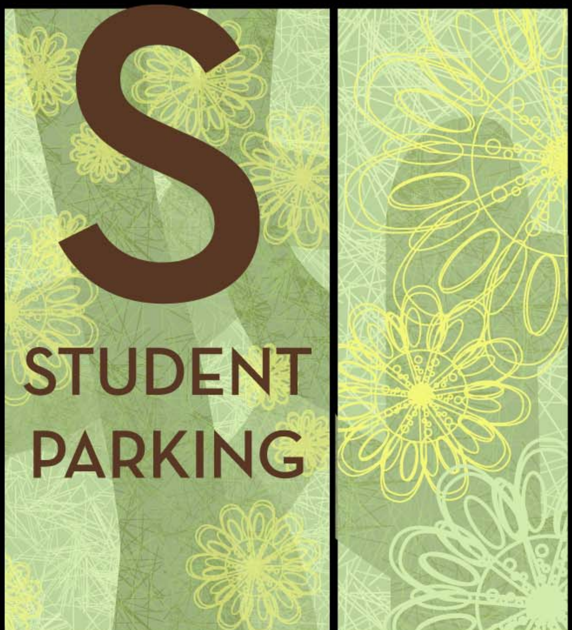
B. Secondary Entry Monument

C-H: Directional Signage



Use of Color

Red Ocotillo



Light Green Cholla

Violet Chia

Room Design Criteria

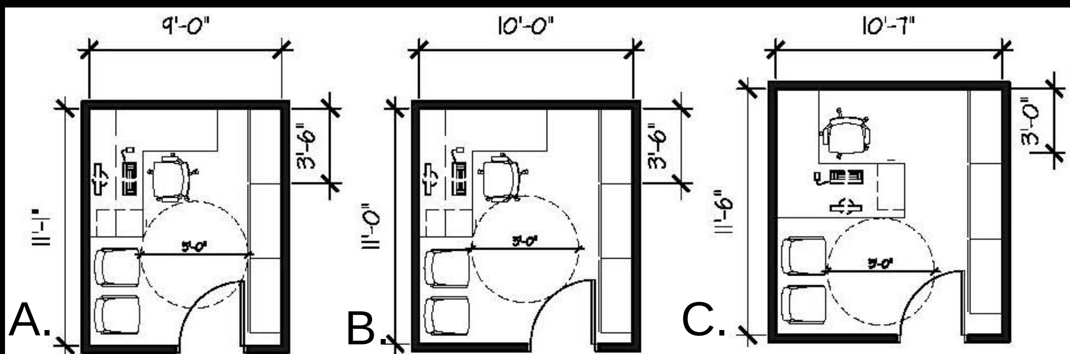
- Office space standards
- Classroom design criteria

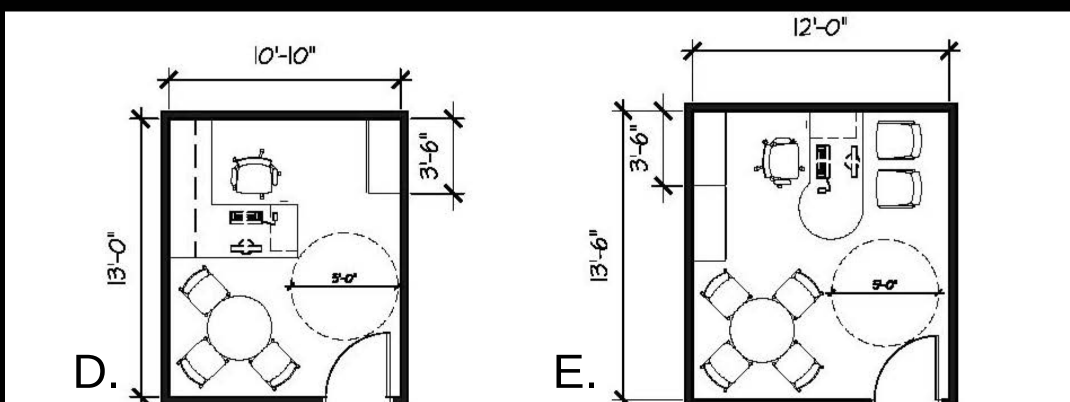
Space Standards Principles:

- Comply with State Standards
- Position the College to maximize state funding
- Base recommendations on WSCH projections
- Coordinate with campus-wide inventory of space

ROOM DESIGN CRITERIA

OFFICE SPACE STANDARDS





A. Faculty: 100 s.f.

B. Coordinator/Counselor: 110 s.f.

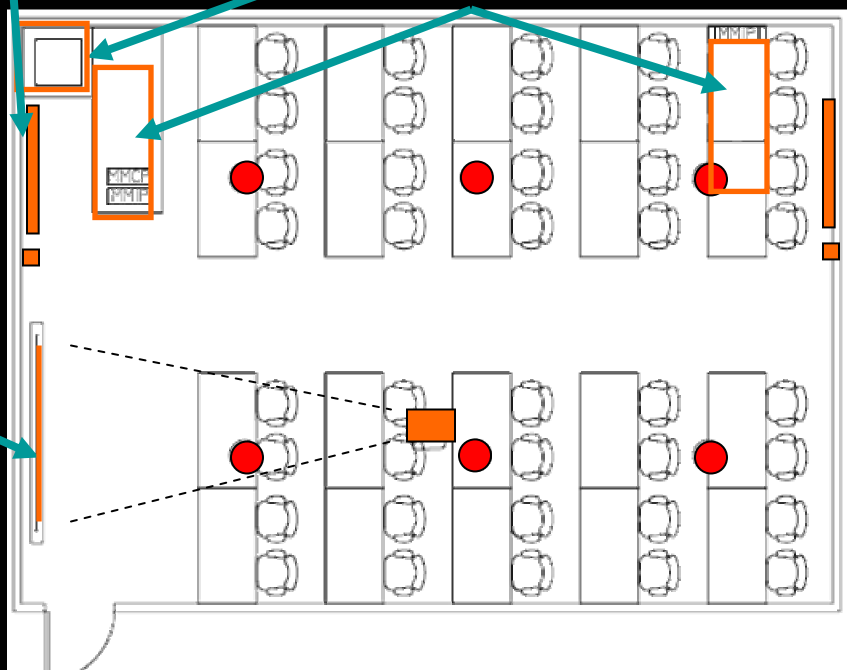
C. Director: 120 s.f.

D. Dean: 140 s.f.

E. Vice President: 160 s.f.

ROOM DESIGN CRITERIA

SMART CLASSROOMS



- Projection screen display (Video/Computer)
- Ceiling speakers (Audio)
- Monitors and cameras for distance learning functions. (Video display and capture)
- Power/data connections at each seat.

DRAFT HANDBOOK REVIEW PROCESS

PHASE	Building Design Team	Design Review Task Force	Facilities Master Plan Committee	Board of Trustees
PROGRAMMING	●	●	●	
SCHEMATIC DESIGN	●	●	●	●
DESIGN DEVELOPMENT	●	●	●	●
CONSTRUCTION DOCUMENTS	●	●	●	●

DRAFT HANDBOOK REVIEW PROCESS

- August 23, 2005: Deliver draft for College review
    - 4 week review period
- September 28, 2005: Receive comments
- October 23, 2005: Final Handbook delivered

CAMPUS STANDARDS HANDBOOK

tBP

SWA

Redmond Schwartz Mark Design

COLLEGE OF THE DESERT

CONCEPT PRESENTATION

17 MAY2005