School Design Guide

Los Angeles Unified School District

March 2012

PREFACE

This **School Design Guide** has been prepared to establish and sustain consistent representation of requirements and standards to all members of the Design Team. It presents design guidelines and criteria for the planning, design and technical development of new schools and modernization, and includes by reference the Facilities Space Program, the Educational Specifications, the Guide Specifications, and the Standard Technical Drawings of the District.

This new edition of the Guide has been updated and edited with the input from various Departments, to present the District's current insights and objectives. Lessons learned from post occupancy reviews of recently built and modernized schools have also been included in this Guide.

The School Design Guide is a living document which is updated yearly with a new version and periodically by the release of bulletins. Designers shall visit the Design Standards Department website to assure that the most current guidelines are followed for the benefit of our students and staff.

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1.1 PURPOSE AND PRINCIPLES

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1.1 PURPOSE AND PRINCIPLES

A. PURPOSE

The Los Angeles Unified School District is committed to creating high-quality educational environments – places that provide well-planned, high-performing, healthy school environments that foster student achievement and well-being, as well as being centers of community.

The "School Design Guide" has been prepared to establish and sustain consistent representation of requirements and quality standards for those environments to all members of the Design Teams for LAUSD school facilities. It is based on the current curricula, teaching methodologies, student groupings, and site constraints of the District. It reflects the District's experience in building and operating schools to balance the needs for instructional functionality with aesthetics, practical comforts, sustainability, accessibility, ease of maintenance and operation, and assurance of safety so that all students, staff and community members feel welcome, safe, and proud of their schools – all while reflecting the wise and efficient use of limited land and public resources.

Architects and engineers shall follow the requirements and standards presented here for the planning and design of new school construction or reconstruction. These are not intended, to stifle creativity or innovation. If a design professional feels that varying from specific requirements, while still meeting their intent, is desirable for a specific project, the variations may be incorporated into the design with written approval of the District's authorized representative.

The "School Design Guide" incorporates and complements the requirements and standards of other LAUSD documents that direct the design of school facilities (see below), and which are also part of the District's requirements and standards. The requirements and standards are updated on an annual basis. Interim changes will be published periodically. Visit the Design Standards Department webpage for the most current versions of these standards, as well as the update bulletins.

http://www.laschools.org/new-site/asset-management/design-standards

B. ORGANIZATION OF DESIGN REQUIREMENTS

The content of the "School Design Guide" is divided into four sections: Book One deals with general items, purpose and principles; Book Two deals with functional and relational planning and design criteria, including general environmental and sustainability issues; and Book Three presents more detailed information on material choices and system design criteria and requirements, by chapters on each major technical discipline. Book Four, includes submittal checklists for the various project phases.

The other requirements and standards that are incorporated by reference as part of the "School Design Guide" are:

1. **"Facilities Space Program (Program):"** Governs the capacity, size, and number of functional spaces of each school project.

2. **"Estimating Guide:"** Quantifies the quality levels of space, materials and systems for each school project:

   http://www.laschools.org/employee/design/fs-studies-and-reports/file?file_id=17807262

3. **"Educational Specifications" (Ed Specs):** Detailed descriptions of the functional and facilities support requirements for each space defined in the Facilities Space Program, including prototype drawings and equipment lists. Available for High, Middle, Elementary Schools and Early Education Centers.

http://www.laschools.org/new-site/asset-management/design-standards

4. **"Guide Specifications:"** These are construction specifications in CSI format that define the materials and systems acceptable to the District, including considerations of economy, performance, and maintenance and operations. The Guide Specifications often include alternative choices. These Guide Specifications must be edited by the Architect to suit the needs of each specific project.

   http://www.laschools.org/new-site/asset-management/guide-specifications

5. **"Standard Technical Drawings" (Std. Dwgs.):** Construction details that provide District-wide consistent operational and safety standards.

   The District also has Procedural Requirements that govern the work of the commissioned architects and engineers. Information on these is available from the District's authorized representative.

C. DESIGN PRINCIPLES

1. Learning Environment: Schools should provide instructional spaces that facilitate student-teacher interaction in the educational process, with collaborative learning and working, flexibility to accommodate different teaching styles, and a health-enhancing environmental ambience.

2. Architectural Quality: The appearance and overall character of each school should be both pleasing and stimulating to students, teachers, parents and the surrounding community, providing a welcoming and attractive place to visit or to spend the day. When working at existing sites it is important that any new structures are architecturally compatible with the existing buildings and site. Placement of new structures must take into account potential future development at the site for the Facilities Master Plan. The District has a number of historically significant sites and buildings; special attention is required when working at these sites.

3. Pride in Ownership: Each school's design should foster a sense of belonging and pride among the students, staff and community.

4. Flexibility: School planning should anticipate future growth on the site as well as provisions for equipment replacement and advances in technology.

5. Small Learning Communities: In planning larger schools, smaller schools must be created within the larger context, to reduce the perceived scale of the school for students and to provide integrated small learning communities with common affinities, such as common curricula, themed educational programs, or age and grade.

6. Accessibility: Schools must accommodate all students, staff and community members including the physically disabled and wheelchair-bound, deaf, visually or emotionally impaired. Design shall allow for construction and material tolerances to accommodate dimensional requirements set by ADA and other codes. Do not design to minimum or maximum requirements, thus risking potential non-compliant designs.

7. Safety and Security: Schools must be safe and secure without appearing prison-like. Structures, fences and site amenities shall be designed to maintain safety, prevent unauthorized access and deter vandalism. Opportunities to climb to gain access to other floors, roofs, etc. shall be eliminated.

8. Community Focus: The school, as the center of the neighborhood, must be accessible on evenings and weekends for joint use of facilities by the community and provision for securing the rest of the site shall be implemented.

9. Land Use and Site Planning: Scarcity of land demands innovative settings of buildings, playgrounds and parking to achieve educational goals on crowded urban sites.

10. Sustainability: Schools must assertively address long-term concerns for environmental impacts and water and energy conservation.

11. Maintainability: Architects and engineers must make a concerted effort to design schools that would minimize maintenance requirements. These efforts shall involve not only planning considerations, but also design of the systems, selection of materials and products. Schools with less maintenance requirements are more sustainable.

1.2 SUBMITTAL REQUIREMENTS

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1.2 SUBMITTAL REQUIREMENTS

A. GENERAL REQUIREMENTS

1. Coordination and Review of the Design

Coordination of all architectural, engineering and other associated design disciplines working on the project – including those provided by District staff or under separate contract to the District – shall take place throughout each design phase and shall be the responsibility of the commissioned Project Architect. Such coordination shall include processing and review of all drawings, specifications, cost estimates and other documentation necessary for the integration of all building trades and systems, equipment and furnishings, and resolution of constructability issues. ***With each design submittal, the Architect shall certify in writing that all required coordination has occurred and shall accept responsibility for all changes in the design and construction work which result from failure to properly coordinate the efforts of the design entities***.

2. Other Contractual Terms

In some cases, the District's A/E Contract may define different design phases and submittal terms. Adjust the requirements described below for submittals to the specific contract and as directed by the District's authorized representative.

3. Jurisdictional Agency Regulatory Code Compliance

Architect shall be responsible for verifying that all design and construction documents submitted comply with all applicable jurisdictional agency codes and operating requirements.

4. Energy Review

In order for the District to apply for State Allocation Board's energy grants, all new facilities projects and identified new buildings at existing facilities, shall apply for DSA "energy review". Also see section 2.4 "Environment and Sustainability".

B. SCHEMATIC DESIGN PHASE SUBMITTAL

1. Project Start Meeting:

a. The District's authorized representative will establish a project start meeting date with the Architect. At this meeting the Architect will receive the Facilities Space Program, Design Guidelines, available site and other relevant information, and directives to allow the Architect to begin work on the assigned project.

b. Starting Date: The District's authorized representative will issue a notice-to-proceed letter to the Architect indicating the start and completion dates of the Schematic Design Phase.

2. Information Gathering:

a. It is important that the public and utility agencies serving the school be involved in the design process from the beginning. During the Schematic Design Phase the Architect shall initiate contact with representatives of the following agencies, to inform them of the school's needs and to establish relationships that will assure coordination of their requirements with the school's design.

1) Division of the State Architect: Structural Safety, Fire Marshal, Access Compliance and High Performance Sections for Title 24 regulations.

2) Local jurisdiction (City of Los Angeles, County, or other city) for off-site street profiles, curbs and walks, storm drains and utility services.

3) Local jurisdiction Traffic Department for driveway locations and passengers loading area.

4) Local Fire Department (City or County) for site access, dispersal areas, and fire hydrants.

5) Utility agencies or companies for location of existing and proposed domestic water, reclaimed water, sewer, electric, gas, telephone and television cable services.

6) Utilities companies (Southern California Edison or Southern California Gas Company) for incentive program applications.

7) County of Los Angeles Department of Health for kitchens and swimming pools only.

8) Other agencies for specific project conditions – for example, the use of reclaimed water, or the California Department of Social Services for Early Education Centers.

b. A "Checklist of Offsite Work, Utilities & Easements" is available and shall be completed and submitted to the District's authorized representative during various phases throughout the project. See Book 4, Submittal Checklists.

c. A "CHPS Scorecard" is available and shall be completed and submitted to the District's authorized representative at various phases throughout the project. See Section 2.4 for additional information.

3. Conceptual / Preliminary Schematic Design

a. The first submittal for the Schematic Design Phase shall present the District with three or more alternative conceptual design solutions to the District's program and community requirements. One scheme will then be further developed and presented for schematic planning approval.

b. Documents submitted by the Architect for each alternative design approval shall include, but not be limited to:

1) Site analysis diagrams showing key influences, such as topographical characteristics, solar orientation, winds, views, traffic, and neighborhood context;

2) Proposed utilization study of each particular project site;

3) Schematic plans of each floor;

4) Simplified elevations indicating the fundamentals of the architectural concept;

5) Comparative cost estimates for each of the three designs.

6) At existing school sites, include site analysis showing established circulation paths, access compliance, existing site conditions including plan layouts for existing buildings, demographic information, utility location and identification of historical buildings.

c. The purpose of the conceptual / preliminary schematic-design review is to evaluate, first, the functional qualities of the proposed design to successfully fulfill the educational program of the school. Additional qualities to be considered include community impacts, energy and environmental issues, physical security, and general aesthetic factors.

d. Include the drawings and information indicated on the form "Submittal Requirements for Preliminary Schematic Design". See Book 4, Submittal Checklists.

4. Final Schematic Design Submittal

a. Documents submitted for the final schematic design phase shall include more detailed and refined drawings and a written report (Basis of Design) that includes such discussion of design factors, if any, as are pertinent in the opinion of the Architect and outline descriptions of proposed engineered systems, construction types, materials and work to be included in the construction contracts.

b. A Cost Estimate showing compliance with budget requirements and area calculations indicating compliance with the Facilities Space Program shall be included. Cost estimate and area calculations (SP-1A Diagrams) shall comply with the Estimating Guide.

c. Include the drawings and information indicated on the "Submittal Requirements for Schematic Design", See Book 4, Submittal Checklists. In addition to the boards, provide one set of printable transparencies (right reading) and three sets of prints.

C. DESIGN DEVELOPMENT SUBMITTAL

1. Procedure

a. After selection of the preferred design scheme and approval of the final Schematic Design, the Architect shall prepare and submit Design Development (DD) Documents.

b. Design Development Documents shall include drawings and a written report (Basis of Design) in more detail than the schematic documents and shall incorporate the Owner's comments from the previous submittal.

2. Submittal

a. Include all items previously required in the schematic design, as well as dimensioned site development plan, floor plans, exterior elevations and typical sections indicating proposed construction as may be necessary, as well as all major finishes. Drawings shall also illustrate fundamentals of major engineering systems including civil, landscaping, structural, mechanical, plumbing, fire protection, electrical systems and kitchen/food service.

b. On existing school sites provide phasing drawings, and illustrate barriers, partitions as needed for the school to remain in operation during construction. Where needed, provide interim housing, and indicate impacts on physical education and parking areas.

c. Include the drawings and information indicated on the form, "Submittal Requirements for Design

Development". See Book 4, Submittal Checklists. (Complete the form's checklist to indicate completion of each item and submit with the other documents.)

d. The DD update of the narrative "Basis of Design" is particularly important at this stage, both to be sure that systems requirements and parameters are consistent with LAUSD goals, and to serve as the statement of design intent for the end-of-job commissioning and performance testing.

3. Architectural Presentation Drawings and Renderings

a. Drawings shall be in color, mounted on 30" x 40" boards, with Project and Architect's name. (Renderings are not required on modernization projects unless extensive changes are made to the exterior).

b. Rendering: Perspective view and technique, 20" x 30" minimum size, that adequately and accurately indicates scope of the project, mounted and matted on board with identification.

c. Site plan, floor plans, building elevations and sections, on boards.

d. Vicinity Plan and Photographs: As described above under "Schematic Design Phase Submittal".

D. CONSTRUCTION DOCUMENTS -- 50 % SUBMITTAL

1. Procedure and Submittals

a. After written approval of the Design Development Phase, the Architect shall further develop and submit Construction Documents to a stage of at least 50% completion.

b. Include the drawings and information indicated on the form "Submittal Requirements for Construction Documents – 50%". See Book 4, Submittal Checklists. (Complete the form's checklist to indicate completion of each item and submit with the other documents.) See Section 1.2."General Requirements" for deliverables.

E. CONSTRUCTION DOCUMENTS -- 100 % SUBMITTAL

1. Procedure and Submittals

a. The Architect shall continue development of the Construction Documents, incorporating the comments received on the 50% C.D. submittal to a stage of 100% completion.

b. Include the drawings and information indicated on the form, "Submittal Requirements for Construction Documents – 100% -- DSA Submittal", See Book 4, Submittal Checklists, ready for submittal to the Division of the State Architect. The following are required:

1) Checklist of Offsite Work, Utilities & Easements (1 copy).

2) Final CHPS Scorecard signed by the design principal.

3) Specifications with General Conditions (6 bound sets or 7 sets if project has a kitchen). District furnished "boiler plate" material to complete the project manual need not be included.

4) Structural Calculations, signed by the Structural Engineer (2 sets).

5) Energy Calculations (2 sets).

6) Construction Cost Estimate on State forms 506B or 706B (3 sets).

7) Form SP3A, Area Diagrams and Tabulations (3 sets).

2. Coordination Check

a. The Architect shall have completed an "in-house" interdisciplinary coordination check, dimension check, terminology and spelling check, and detailed technical check of the Construction Documents.

b. Submit the marked up set of prints used in preparing the interdisciplinary coordination* check.

F. DISTRICT REVIEW AND PLAN CHECK

1. DSA Plan Check

a. The District will file Drawings with appropriate State agencies and will inform the Architect when State plan check comments have been received.

b. The Architect shall pick up Drawings and comments from the District and meet with the District's authorized representative to review plan check comments as well as the District review comments, and to establish a written schedule for correcting the documents and meeting with appropriate governmental agencies to obtain their approvals.

2. District Review

a. The District review is not a "plan check", but a general review of the 100% Construction Documents. The Architect is responsible for accuracy and coordination of the work, including work of the Consultants, to avoid conflicts and change orders.

b. Review of 100% C.D.'s by District staff will include:

1) Architectural.

2) Civil.

3) Structural.

4) Electrical.

5) Mechanical.

6) Landscape.

7) Specifications.

8) Food Services.

9) Other applicable disciplines (Acoustics, Theatre, etc.).

3. Corrections and Back-Check

The Architect shall complete corrections indicated by the District and DSA (SSS, FLS and ACS) as required to receive clearance and signed approvals from each agency. This includes compliance with Division of Industrial Safety, (Cal/OSHA) Title 8, and Energy Conservation Standards and Regulations.

G. FINAL BID DOCUMENTS

1. Completion Procedures

a. After completing the revisions required by the review comments, the Architect shall return one copy of the review materials with the Architect's acknowledgement on how each District comment was resolved, with a letter of transmittal to the District's authorized representative.

b. The Architect shall deliver the approved 100%-complete Construction Documents to the District's authorized representative with the completed form "Submittal Requirements for Final Construction Documents."

c. Submit one set of revised Structural Calculations, if revisions or additions have been made after the 100% DSA submission, for the District records.

2. Submittal

a. Submit 3 copies of Final Construction Cost Estimate. If this final estimate differs from the agreed (or revised agreed) preliminary estimate, itemize and explain reasons and amounts. Submit SP 3A diagram ONLY if changes made after 100% submittal are great enough to require revision. Provide a brief written explanation describing each change and why it is required.

b. Submit a letter of Acknowledgement of the District Corrections. Return one set each of the District review marked up drawings and project manuals indicating resolution of comments.

c. Submit completed DSA Structural Tests and Inspection form.

d. Submit the following:

1) Complete and sign S.A.B. Form 390. Copies available from OAR.

2) Draft of deductive or additive alternates.

3. Printing

The District will be responsible for printing Drawings and Specifications for bidding, unless otherwise stated in the Contract.

H. ADDENDA

When an addendum is required, submit original copies of addendum material. Addenda cannot be issued later than 14 days prior to bid date.

I. "AS-BUILT" RECORD DRAWINGS

1. Drawings:

a. Submit one full set of the DSA approved plans updated to reflect the field marked Contractor's set of prints depicting the project as constructed. Unless otherwise indicated in the Architectural and Engineering Services Agreement, drawings shall be reduced to 50% and printed on vellum.

b. Submit an electronic file copy of the "As-built" Record Drawings in AutoCAD, current version, *.dwg format.

c. Submit updated SP Diagrams in AutoCAD .dwg format, revised to reflect "As-Built" conditions. Perimeter lines of buildings and rooms shall be edited as P-lines (polygon lines).

J. GENERAL DRAWING AND SPECIFICATION REQUIREMENTS

(FOR DESIGN DEVELOPMENT AND CONSTRUCTION DOCUMENTS)

1. Drawings:

a. For all Design Development and Construction Documents include the project name, LAUSD ID number and logo, and 1/8" minimum lettering height, and meet the following additional requirements.

b. All plan drawings shall include scale, graphic scale, north arrow, and key plan when plans are split.

c. Site and floor plan drawings of the same areas by different disciplines shall be the same scale and have the same orientation.

d. Orientation shall be the same for all similar plans.

e. All plans shall be done on or be compatible with the most recent AutoCAD version.

f. Drawings shall be formatted to AIA CADD Layer Guidelines.

2. Specifications:

a. The District maintains "Guide Specifications" in order to define the materials and systems acceptable to the District, and to establish a consistent level of quality for its schools.

b. The commissioned architect is to edit the "Guide Specifications" to reflect specific and appropriate scope and shall provide additional sections as may be necessary to cover the entire scope of work for the project.

1) Every specification submittal to the District shall be edited in MS Word with the "Track Change" feature on, so the proposed revisions can be clearly identified.

2) Specify at least three manufacturers. Where the "Guide Specifications" identify less than three manufacturers, identify additional manufacturers' products to provide a minimum of three manufacturers for each item. Inform the District's authorized representative of any such additions and of any difficulties in identifying equivalent products.

3) Any deviation from the "Guide Specifications" shall be high-lighted and brought to the attention of the Design Standards Department via the District Representative responsible for the project. Any proposed materials not listed in the "Guide Specifications" and substitutions shall be submitted via the Design Manager for Design Standards review and approval early in the design phase. If approval is granted, list not less than 3 equal manufacturers in the specifications.

4) Where optional material or equipment choices are presented in the "Guide Specifications," select the items to be used in the project and edit the specification sections appropriately. Delete the edit notes.

5) If requirements in this "School Design Guide" do not match those in the "Guide Specifications," the most stringent shall apply.

6) If a new section is added for products not included in the "Guide Specifications," follow the CSI MasterFormat and the District's page format; do not include manufacturer's standard specifications without a thorough review, editing and formatting, and listing not less than 3 equal manufacturers / products.

7) Avoid generalities or ambiguous descriptions, directions or dimensions, e.g., "as required", "install to meet all codes" and "squish to fit", are not acceptable.

c. Review Divisions 01 through 33 and download the applicable sections for the project.

1) Add the school and project name to each section footer; but do not change the section footer date; this is the District's specification issue date and is used to determine the version of the specification used.

2) Edit the Project Title Page including the school and project names, design phase and submittal date.

3) The OAR or District Representative will provide the Division 00 sections and edit the Division 01 as needed prior to bidding.

4) Prior to releasing the final specifications set, verify if there are any updates that should be incorporated by browsing the "Revision Log" and verifying that the sections used are the most current. Track versions of the revised specification sections are posted on the website so the changes to each section can be clearly identified.

d. Use of these specifications does not relieve the Architect from responsibility to verify the information contained is, applicable, accurate, and up to date.

3. Design Deliverables – Submittal Requirements

a. Design Development Submittal.

1) **For Existing Facilities Projects:**

a) Three sets of prints, and a CD with electronic CAD files (*.dwg, bind all drawings) and PDF files of all drawings.

2) **For New School Construction Projects:**

Provide prints of each drawing bundled and labeled in accordance with Table A, and a CD containing specifications and electronic CAD files.

b. Construction Documents – 50% Submittal

1) **For Existing Facilities Projects:**

a) Three sets of prints and a CD with electronic CAD files (*.dwg, bind all drawings) and PDF files of all drawings.

2) **For New School Construction Projects:**

a) Provide prints of each drawing bundled and labeled in accordance with Table A, and a CD containing specifications and electronic CAD files.

c. Construction Documents – 100% Submittal

1) **For Existing Facilities Projects:**

a) Three sets of prints and a CD with electronic CAD files (*.dwg, bind all drawings) and PDF files of all drawings.

b) One CD per Bundle # 11 of Table A (only for projects where rooms are added or layouts changed or grounds elements modified).

2) **For New School Construction Projects:**

a) Provide prints of each drawing bundled and labeled in accordance with Table A, and a CD containing specifications and electronic CAD files.

Table A:
Submittal Requirements for New Construction Projects

Each bundle shall be bound separately and clearly labeled on the outside with the project name, bundle number and discipline. Drawings shall be printed full-size, unless noted otherwise. Submit full specification package according to submittal requirements.

Bundle #1 – *Design Manager (all submittals)*
1 Full set of Drawing (½-size)
1 Full set of Specifications

Bundle #2 – *OAR Review (all submittals)*
1 Full set of Drawing
1 Full set of Specifications

Bundle #3 – *Civil-Landscape Review (all submittals)*
Architectural Site Drawings Only
1 set of Civil Drawings
1 set of Landscape Drawings
1 set of Division 31, 32 and 33 Specifications

Bundle #4 – *Low Voltage Review (all submittals)*
1 Full set of Drawing
1 set of Division 27 Specifications

Bundle #5 – *M & O Review (all submittals)*
1 Full set of Drawing
1 Full set of Specifications
Cut Sheets

Bundle #6 – *Design Standards (all submittals)*
1 Full set of Drawing (½-size)

1 Full set of Specifications
Lighting Calculations
Lighting Cut Sheets
Title 24 Report
CHPS Scorecard
Basis of Design

Bundle #7 – *Estimating Review (all submittals)*
1 Full set of drawing (½-size)
1 Full set of Specifications

Bundle #8 – *CDE Review (DD and 100% CD only)*
1 full-size & 2 ½-size drawing sets including:
General Drawings
Architectural Drawings
Civil Drawings
Landscape Drawings

Bundle #9 – *AE Tech Review* (*all submittals*)
1 Full set of Drawing
1 Full set of Specifications
Geotechnical Report
Geohazards Report
Post Construction BMP Calculations
Hydrology Report
Hydraulic Calculations
Structural Calculations
Title 24 Report

Bundle #10 – *Commissioning Agent* (*all submittals*)
1 Full set of Drawing
1 Full set of Specifications
Basis of Design
Commissioning Plan
Title 24 Report

Bundle #11 – *Facilities Records Management* (*100% CD submittals and "As-Built" Record Drawings)*
1 CD containing:

SP-Diagrams in AutoCAD .dwg format, showing all levels, rooms, and, in addition roof levels; fully dimensioned according to LAUSD standards (exterior facing wall to centerline of interior wall). Indicate room name and number of each space – room identifiers should match those provided on any schedules e.g. equipment, finishes. Perimeter lines of building levels, rooms and roofs shall be edited as closed P-lines (polygon lines). For existing facilities projects with partial floor reconfigurations, drawings should show new configurations accurately placed within floor and building boundaries

Site plan in AutoCAD .dwg format, showing all utility lines, meters, emergency shut-off valves, property lines, building perimeters, athletic fields, playgrounds, parking and paving edges. Freeze layers containing information not applicable to this submittal. Perimeters from which areas can be defined shall be edited as closed P-lines without overlaps. Utility lines shall be edited as P-lines.

Book Two
General Criteria

2.0 GENERAL CRITERIA

2.1 SCHOOL BUILDING DESIGN

A. INTRODUCTION

B. GENERAL REQUIREMENTS

C. FUNCTIONAL REQUIREMENTS – ADMINISTRATION

D. FUNCTIONAL REQUIREMENTS – CLASSROOM AREAS

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J. FUNCTIONAL REQUIREMENTS – LOCKERS

K. FUNCTIONAL REQUIREMENTS – CORRIDORS AND STAIRWAYS

L. FUNCTIONAL REQUIREMENTS – SUPPORT

M. FUNCTIONAL REQUIREMENTS - BUILDING SECURITY

2.1 SCHOOL BUILDING DESIGN

A. INTRODUCTION

The following standards complement the Facilities Space Program and the Educational Specifications, and deal with general planning and design issues.

B. GENERAL

1. District Criteria

The guidelines and criteria of this chapter must be closely coordinated with those of the **"Educational Specifications."**

2. Referenced Codes and Standards

a. Legislative and regulatory requirements affecting schools in California include:

1) Title 5 of the California Code of Regulations (especially Sections 14001 and 14030).

2) Title 24 of the California Code of Regulations (State Building Code).

3) Title 22 of the California Code of Regulations for Children's Centers.

4) American With Disabilities Act (Public Law 101-336, Title II).

5) Education Code Section 39113.5 for "before and after-school Child Care Programs".

3. General Planning Requirements

a. High Schools and Middle Schools shall be planned and designed in accordance with the "Planning & Design Guidelines for Small Learning Communities" for Los Angeles Unified School District Secondary Schools (Available on LAUSD Website:

http://www.laschools.org/employee/design/plan-des-guidelines

b. Pest Management.

1) Review the District's "Integrated Pest Management Practices" manual and refer to Section 2.2, "Site Design," for more specific criteria.

2) Birds (pigeons, gulls, others) are a persistent and provoking maintenance problem for the District, as well as a health and sanitary hazard. Exercise care in the design of all exterior facades and structures to eliminate roosting or nesting of birds. Any protrusions architectural, structural

or otherwise that are greater than 1 ½" shall be protected with bird deterrent devices or be designed to be bird unfriendly.

a) Do not use exposed truss members, flanged beams, cantilevered beams or other elements that provide such roosting. Important everywhere, it is especially so in Lunch Shelters.

b) Where essential building elements may provide such roosts, such as solar shades or light shelves, open ladders where necessary, entry covers, security devices, and similar structures, minimize the risks by sloping the element, providing, open uninviting surfaces, installing edge barriers, and similar measures.

c) This is an important District concern, and must be addressed at both the Schematic Design and Design Development stages, together with the elements of concern described above.

c. Room Access

1) Do not provide entry to any room through another room – for example, a low-voltage electrical room through a power electrical room.

2) Exceptions are teachers' workrooms from classrooms, administrators' private offices from an open work room, or smaller rooms serving a general kitchen area.

d. Building Access

1) At all building entrances, provide shelter from stormy weather (rain, hail, ice, etc.) by providing overhead cover with appropriate roof drainage.

2) At all such access, provide non-slip floor (walking) surfaces to improve safety when wet or icy. CHPS requires a walk-off mat at building entrances.

3) The entrance to the school needs to be expressed architecturally to clearly define a point of entry. Entrance shall be adjacent to the administrative offices for entry control. Signage and electronic display marquee may complement entrance design.

4) Visitors shall enter the school site through the administration area, after registering with the school staff. The Educational Specifications provides layouts to meet this critical security concern.

e. Energy and Sustainability

1) The principles of sustainable design and energy conservation, as embodied in these requirements and in the CHPS criteria, represent important District goals, and shall be applied in all aspects of school planning and design, including building orientation and configuration, envelope and fenestration selection, and selection of building systems and equipment. (See section 2.4 "Environment and Sustainability").

f. Educational Specifications

1) Refer to the Educational Specifications for additional criteria and suggested space layouts and to other sections of this Guide for items such as lighting, acoustics, finishes, air quality, communications, etc.

C. FUNCTIONAL REQUIREMENTS – ADMINISTRATION

1. Administration Unit

a. The Administration Unit provides core-area space for staff functions; provides spaces for interaction between staff, parents and students; and serves as the main public entry to the school.

b. Spaces and functional needs include:

1) Private offices for principal, assistant principals, and other appropriate staff.

2) Open office for clerical assistants, volunteer workers, computer operators.

3) Public lobby with a waiting/seating area and a counter control which separates the lobby from the back-of-house clerical operations. This is the control point for visitor access to the site.

4) Counter heights appropriate to the population age at both standing and wheelchair levels.

5) Seating and writing surfaces for staff or students to fill out forms.

6) Conference space for staff meetings, staff-teacher conferences or visitors.

7) Staff/faculty work room(s) for copying, assembling and binding, and for ample storage of supplies, sized and equipped appropriately for the school size.

8) Spaces for office supplies, reprographics equipment, staff and teachers' mail boxes, LAN central location, radio receiver/transmitter equipment, and additional spaces as programmed, such as police offices, athletic director's office, etc.

9) Public payphones in compliance with accessibility requirements. These phones shall be located in an accessible route, mounted at 48" maximum above finished floor to the highest operable part to accommodate forward reach.

10) Adult toilet rooms for principal, staff and visitors.

11) Mail boxes shall be provided at the rate of 1.5 times the number of classrooms. Size shall be 4"h x 12"w x 15"d each, with an area for larger boxes at each location. In small learning communities provide mail boxes in satellite administration office at the same rate. Total number of mail boxes required may be divided between the satellite administration office(s) and the main administration office, proportional to the number of classrooms each serve (or number of staff for Main Administration).

c. Location:

1) As the main entrance to the school campus, the Administration Unit must be prominently located and directly accessible to the public. This unit, together with Counseling and Health, may need after-hour or weekend accessibility, and should be secured against access to other school areas.

2. Counseling and Attendance Unit

a. The Unit functions as an integral part of counseling and guidance programs, and as a service center for families dealing with enrollment, transfers, transportation and work permits. Counselors confer with students and parents, administer psychological examinations, and maintain files and records for each student. The Attendance Office maintains attendance records and students' files. (The unit functions partly as an accounting department.)

b. Spaces and functional needs for this unit typically include:

1) Counselors' offices with work area, guest seating, computer workstation and window.

2) Student Waiting Area with controlled supervision, shared with Attendance Unit.

3) Work room and guest waiting area for the Psychologist's Office.

4) Interview and Testing Stations.

5) Other workstations as programmed.

6) Enclosed bulletin board outside the unit in a highly visible location.

c. Location: Counseling and Attendance activities are integrated into the Administration Unit adjacent to the Health Unit (Secondary Schools). These functions are reduced and combined in the Administration Unit at elementary schools.

3. Health Unit

a. A centrally located Health Unit provides health services to students, storage for students' health records, and information for use by teachers, counselors, school administrators and aides. Student privacy and confidentiality are important when accessing health services.

b. Spaces and functional needs for this unit typically include:

1) Nurse's desk within the health office.

2) Cot Room. At elementary schools provide a viewing window from the Administration's clerical area to the Cot Room.

3) Accessible restroom within the health office, provide a space for a changing table (3'X7') for high school and middle school.

4) Student waiting area.

5) Private storage within the health office for medical supplies and students' special medical devices and medications.

6) Exam space for visiting healthcare professionals.

7) Ten-foot long eye exam lane.

8) First aid area with lockable cabinets and space for a refrigerator.

c. Location: Adjacent to the main Administration Unit, with accessibility for the public.

4. Faculty and Staff Lounge

a. The Faculty and Staff Lounge provide space for relaxation, private work, meetings, and dining when a separate faculty dining room is not available or convenient.

b. Spaces and functional needs for this unit typically include:

1) Ample seating and table space, sized appropriately for the school.

2) Sink, tack board, and space/utilities for a refrigerator, coffee station, microwave, and vending machine.

c. Location: Centrally and conveniently located, often near food service in elementary schools, and near the Administration Unit in middle and high schools.

D. FUNCTIONAL REQUIREMENTS – CLASSROOMS

1. General Education Classrooms

a. Classrooms are the most important single element in the school. They must be designed to flexibly accommodate varied activities and future technologies. Designs should reflect concern for the way children work and learn in the room. Adaptability of the room to various grade levels is provided through selection and arrangement of furnishings.

b. Size: The standard classroom size is 960 square feet unless the Facilities Program provides an alternative size.

c. Flexibility: Consider measures to allow some classrooms to be easily altered in size or shape at reasonable cost (for example, to accommodate changes in class-size policy).

d. Outdoor study areas: Consider for Elementary School Classroom clusters.

e. Storage units: Provide as shown in Educational Specifications. The top shelf of units shall not exceed 72" in height.

f. All elementary school classrooms must have sinks, soap dispensers and paper towel dispensers.

g. Location: Classrooms are laid out in groups, in linear form or clusters, accessed either by external walks and balconies or by internal corridors. They need convenient access to the library/ media center especially, as well as to administration, multipurpose/ food service, and physical education or playground areas.

2. Small-Group Instruction Areas

a. Small group instruction areas are sometimes provided in the vicinity of the classrooms – typically one for each four to six general classrooms, as programmed -- to allow for various collaborative learning opportunities as appropriate within the regular education program.

b. Space and functional needs: Minimum size of 480 sf. Provide tables and chairs for small group activities, tack- and white-boards, computer stations, and extra storage space for special materials.

c. Location: Close to groups of classrooms, with windows into classrooms for supervision.

d. Small group instruction areas are not included in the computation of classroom size unless as integral parts of the classroom, visually supervised by a teacher from the classroom.

3. Year-Round Education Needs:

a. Define specific space for off-track teachers' storage cabinets.

b. Provide additional storage for supplies and projects for off-track students.

c. Provide adequate work surfaces in the space, including a counter.

4. Kindergarten Classrooms

a. The Kindergarten unit is specialized and self-contained so that children may participate in active and varied learning experiences. Space and furnishings should provide flexibility for a variety of indoor and outdoor activities. Special attention should be paid to visual lines of supervision of the classroom and play yards, and provision of a safe, interactive environment.

b. Spaces and functional needs: Minimum Kindergarten Classroom size is 1,350 square feet, including storage, wet and dry areas, and restrooms self-contained within the kindergarten complex.

c. Location: Close to parent drop-off and bus loading areas.

d. Safety: Ensure that electrical outlets are "child-proof" with safety features integral to the receptacles. Receptacles shall be UL or NRTL listed.

5. Kindergarten Outdoor Play Space

a. The Kindergarten Play Space is an extension of the classroom, directly accessible and fenced for exclusive use by Kindergarten students. It accommodates a variety of outdoor activities for the development of large motor skills, including running, climbing, sliding, cycling, and dancing. Innovative design solutions are encouraged, but with maximum safety in mind.

b. Size: Refer to space program requirements.

c. Provide playground safety tile under play equipment as required by play structure design.

d. Provide age appropriate play equipment as programmed and as specified in District Guide Specifications.

e. Provide shade for active and passive recreation areas by means of building overhangs, shade structures, landscaping, etc.

f. Incorporate garden as play and learning space.

6. Special Education Classrooms and Areas

a. Refer to the Facilities Space Program and the California Education Code, Section 17047(a), for space allowances for classrooms and other spaces to support special education programs. Spaces for the special education program include Special Education Classrooms, Resource Specialist room, specially equipped classrooms where applicable, as well as those in other units such as the speech therapist, psychologist, counseling offices and conference area.

b. Properly equip the classrooms for the students who will occupy them, their age and their disabling conditions, as defined in the Facilities Space Program and code.

c. Provide 240 square feet minimum for the Resource Specialist, or as programmed.

d. Provide 200 square feet for individualized instruction in the speech and language program.

e. Distribute Special Education classrooms, when programmed, throughout the campus with age-appropriate regular education programs.

f. Provide access to a conference area to conduct individualized education program meetings for each special education student.

g. Locate medical therapy units, if planned for the site, close to visitor parking areas and with after-school-hour accessibility.

7. Early Education Center

a. Operation and licensing of Early Education Centers (EEC), is subject to design to the requirements and approval of the California Department of Social Services.

b. Provide a minimum of 24 parking spaces on site for the staff and administrators.

c. Provide provisions for drop-off by the parents by means of additional parking, internal drop-off or curb cut. Parents need to park and walk their children to the center.

d. Design, layout and material selection shall be appropriate for EEC age group kids. The center shall be inviting, fun and kids friendly.

e. Provide appropriate size and design for trash bin area at EEC site.

f. Signage shall be age group appropriate.

g. The EEC classroom shall provide opportunity for different activities, interaction and resting. This should be located directly adjacent to the outdoor play area, toilet and storage. Provide space for storage of clothing, bedding and personal belongings.

h. Size: There shall be at least 35 square feet of indoor activity space per child. Floor space occupied by shelves, built-in cabinets and office/teacher equipment shall not be included in the calculation of indoor space.

i. Children lavatories shall deliver hot water with controls to automatically regulate hot water temperature to not less than 105° degrees Fahrenheit and not more than 107° degrees Fahrenheit.

j. One flushometer style toilet and one hand washing lavatory shall be provided for every 15 children or fraction there of. Toilets shall be flush valve type. Toilet partitions or screens shall be 3'-0" high.

k. A fixed window shall be provided between classroom and toilet for observation.

l. Provide welcome banner(s) to fit the design.

m. Color scheme shall be per standard palette approved by EEC program.

n. Provide stand alone fire alarm system even if EEC is co-located on an elementary school campus.

o. Entry fences and gates shall be designed in such a way so there is no access to elementary school yard if EEC is planned on elementary campus. Entire EEC site shall be fenced off and visually protected from outside.

p. Classroom interior spaces shall be designed with clear line of sight. Avoid exposed braced frames and other projections creating hazards.

q. Provide tackable surfaces in the corridors leading to classrooms or tackable boards on the exterior walls of classrooms if the classrooms are accessible from outside only.

r. Provide public address intercom, intrusion detection, computer network and clock system.

s. Electrical outlets shall be "child proof" with safety features integral to the receptacles; Receptacles shall be UL or NRTL listed.

8. Early Education – Outdoor Play Space

a. The outdoor activity space shall be situated to provide a shaded rest area for the children. Equipment and activity areas shall be arranged so that there are no hazards from conflicting activities. Activity area shall include all components of outdoor classroom required by Nature Explore Classroom program. This program shall be designed with input from EEC program.

b. Size: There shall be at least 75 square feet per child for outdoor activity. Areas around and under play equipment shall have safety materials suitable to design and as directed by EEC program.

c. The playground shall be fenced to protect the children and to keep them in the outdoor play area.

d. All play equipment and materials used by the children shall be age-appropriate.

e. Include landscaping to enhance the outdoor activity areas and provide shade.

f. Provide an exterior outlet outside of each classroom that is childproof and waterproof with lockable cover. These outlets shall be located in such a way so they don't interfere with foot traffic.

g. Provide one deep sink in the playground area for teachers to wash paint brushes and other materials. This sink shall be centrally located among the classrooms with easy access.

E. FUNCTIONAL REQUIREMENTS – SCIENCE CLASSROOMS

1. General

a. Space and functional needs: Science laboratories typically are 1300 sf or more, with room for students around fixed learning stations and with adequate space for lectures at or adjacent to the lab benches.

b. Location: Cluster science classrooms together and locate away from other rooms. In multi-story buildings, locate on top floors to minimize vent and exhaust plumbing and ducts.

c. Preparation Rooms: Provide separate rooms directly accessible from classrooms, usually one for every two laboratories, for teacher preparation and for storage of supplies and equipment.

d. Hazardous Materials:

1) Provide science laboratory design that is consistent with the requirements for proper hazardous materials management specified in California Department of Education publications:

a) 1993 "Science Facilities Design for California Public Schools".

b) Latest edition of "Science Safety Handbook for California High Schools".

2) Provide secure storage areas for volatile, flammable and corrosive chemicals and cleaning agents.

3) Provide work surfaces/countertops with splash guards composed of epoxy resin wherever volatile, flammable or corrosive chemicals or cleaning agents may be utilized.

4) Accommodate necessary safety equipment and supplies, including emergency combination deluge shower/eyewash with direct connection to waste line, and a floor drain centered under shower head , master disconnect valve for gas, fire extinguishers, and first aid kit and eye goggle cabinet. In the Teachers' Preparation Rooms immediately accessible to a science classroom that contains an emergency deluge shower/eyewash, provide a supplemental flip- down eyewash at sink. Emergency deluge shower/eyewash shall be accessible and located on an accessible route.

5) Provide appropriate ventilation for hazardous materials, including exhaust fume hoods, and a high volume purge system in the event of accidental release of toxic substances that may become airborne.

6) Provide special plumbing, including isolated waste lines, for hazardous liquids.

7) Provide floor and ceiling ventilation in secure areas where chemicals are stored.

F. FUNCTIONAL REQUIREMENTS --LIBRARY MEDIA CENTER

1. General

a. The Library Media Center is an information laboratory serving the instructional needs of the entire school. It should be an aesthetically pleasing environment inviting purposeful activity for the development of positive attitudes toward reading and learning.

b. Space and functional needs: Library space is planned in proportion to the maximum planned enrollment, as programmed, but not less than 960 square feet. Needs include:

1) Space and technology for computer terminals for student use, research and report writing, including electrical outlets and data network connections for each computer terminal.

2) Security for technology and media equipment.

3) In Middle Schools and High Schools, provide book-theft detection system at entrances. If the space between the detection upright and the walls is too wide, it should be closed by means of a decorative or architectural feature to prevent library users from circumventing the detection system.

4) Visual supervision from the circulation desk to study areas; stack space and student reading areas. Computer screens shall be visible from the circulation desk.

5) Open and closed-circuit television, dedicated phone lines and electrical/data outlets for stand-alone as well as networked computers.

6) Area for multi-media presentations.

7) At Middle Schools and High Schools provide a private office space for the librarian adjacent to circulation desk and staff work area.

8) Staff workroom with counter desk, counter sink, shelving, copy machine, and space for library book carts.

9) Secure storage for special collections, technology and media equipment.

10) Freestanding display case near entry.

11) Assure adequate floor strength and thickness for book-shelving support and overturning anchorage.

c. Location:

1) Central to the academic areas of the school, easily accessible from classrooms.

2) Directly accessible to the public for community use and extended hours of operation. Secure the Library / Media Center from other parts of the campus to allow evening and weekend events without intruding on other school spaces

3) Locate on the first floor unless exceptions for specific reasons are given. Library shall not be designed on two floors as it creates a supervision problem.

d. Collection storage appropriate to the school, and as shown in Educational Specifications. Considerations include:

1) Bookshelves: appropriate in height for the age of the children served.

2) Kindergarten picture book shelves: 14" high by 12" deep, sectioned with vertical dividers. Angle top shelves as display.

3) End panels for exposed ends of bookshelves may be tackable surface.

G. FUNCTIONAL REQUIREMENTS –PHYSICAL EDUCATION

1. Gymnasium

a. Physical education provides directed training toward the development of physical and social skills. Activities include individual and team sports, rhythmic instruction, body mechanics, health, first aid, and safety.

b. Space and functional needs include:

1) Spaces in accordance with the Facilities Space Program, including sports areas, lockers, showers, team rooms, and such spaces as lobby or foyer, ticket booth, sound equipment room, press box, kitchenette, snack bar and laundry spaces.

2) In High Schools and Middle Schools, male and female faculty offices with line of sight to respective locker rooms.

3) Toilets for public use other than in the shower/locker areas.

4) Gyms, aerobics rooms, fitness centers, locker rooms and other activity areas must have durable, abuse resistant walls. Do not use gypsum board unless it is abuse-resistant.

5) For lockers, see Section 2.1 - J. "Functional Requirements -Lockers".

6) Gang showers (showers with no partitions) or prefabricated shower stalls are not acceptable. Showers shall be divided into individual stalls by solid phenolic partitions per Guide Specification Section 10 2116.

c. Location:

1) Adjacent to play fields.

2) Directly accessible to the public for community use and extended hours of operation, with clearly defined entrance and access control for events. Secure the gymnasium and outdoor sports areas from other parts of the campus to allow evening and weekend events without intruding on other school spaces.

3) Avoid locating the gymnasium and other facilities with wood floors at:

a) Low elevation area of the site, where water level may rise after storms and penetrate the building either through doors or as moisture through slabs and walls.

b) At locations with high water tables. Consider elevating the slab to prevent water intrusion.

c) Over cambered decks or long span structures, since adequate floor flatness and levelness may not be achieved. Cambered deck flatness will change when it settles and flattens.

2. Physical Fitness Center

a. Particularly on small urban sites, specialized P.E. Teaching Stations may be programmed. These may include a specially equipped fitness center or cyberobics lab with integrated computer technologies and physical fitness equipment, together with the necessary multiple electrical and data drops.

H. FUNCTIONAL REQUIREMENTS – MULTIPURPOSE ROOM, AUDITORIA AND FOOD SERVICES

1. Multipurpose Room

a. The Multipurpose Room functions as a combination assembly hall, lecture hall, testing room, indoor dining area, performing arts classroom, physical education classroom, and a general activity room. It may also serve community youth groups, civic organizations or professional events. (In some schools, especially high schools with auditoria, there may be a separate indoor dining area in the cafeteria. See the "Facilities Space Program" and "Educational Specifications" for specific requirements.)

b. Space and functional needs include:

1) Accessible Platform or stage serving as performance space or podium, complete with rigging and lighting.

2) Assembly area with acoustical treatment and lighting- and sound-system controls for assemblies and performances.

3) Movable chairs for assemblies or dining, with storage space for carts.

4) Folding tables for dining, with storage space.

5) In-wall tables and benches may be provided in Elementary Schools.

6) Lobby or foyer.

7) Public restrooms.

c. Location:

1) Directly accessible to the public for community use and extended hours of operation. Adjacent to Kitchen/Serving Area if used for indoor food service. Secure the areas from other parts of the campus to allow evening and weekend events without intruding on other school spaces. Ground level locations are preferred.

2. Kitchen

a. Spaces and functional needs for this unit include:

1) Food preparation area.

2) Space for a cafeteria/serving line to accommodate the flow of traffic for each lunch period.

3) Office, changing and restroom areas for food preparation staff, in compliance with local Health Department requirements.

4) Door widths to accommodate large equipment, including a service door of minimum 3'-6" by 7'-0".

5) Insect screens for operable windows.

6) Coiling counter doors (shutters) at serving windows, both interior and exterior.

7) Stainless steel sinks and work surfaces, with adequate pitch to ensure drainage.

8) Stainless steel counter tops for all serving stations.

9) In secondary schools with dishwashers, provide a dish shelf on dining room side aligned with soiled dish counter in kitchen.

10) Range hood with filters for combination supply and exhaust air system.

11) Wet chemical fire extinguishing system.

12) Floors in all the following rooms should be 6 x 6 quarry title (no grit) with coved quarry tile base. (Restrooms can be ceramic tile):

a) Serving/Scramble/Window Service.

b) Kitchen/Prep.

c) Walk-in Refrigeration/Freezer.

d) All storage rooms (If the office is in the storage room, it is a storage room and not an office by law).

e) Corridors, hallways, etc. in the food service area.

f) Locker Room(s) (for the Food Service area).

g) Janitor/Custodian (for specific use of Food Service area only).

13) Walls in Kitchen and Food Preparation Area shall be FRP (Fiberglass Reinforced Plastic) sanitary wall panels or stainless steel. All other walls in above rooms and restrooms are to be smooth (no texture) washable semi or gloss white 70% LRV (Light Reflectance Value) min.

14) Ceilings in above rooms and restrooms shall have smooth and washable finish. Hard lid (Gypsum Board) ceilings shall be painted semi-gloss or gloss. If ceiling tiles are specified they shall be of the appropriate type for this area and meet all code requirements (See Guide Specifications).

b. Plan the kitchen areas not only for functional efficiency, but also for economical sharing of services such as power, water supply, and floor sinks and drains.

c. Provide convenient access for service and delivery vehicles, separated from student areas.

d. Provide door bell and a view port at service entry door to the kitchen. Buzzer shall sound in the kitchen's office and kitchen's work area.

e. BOS Permit – All school sites must receive, in writing, Bureau of Sanitation's (BOS) approval on necessity and sizing for a Grease Interceptor tank. Architect to initiate and fulfill this requirement early during the design process and forward a copy of BOS approval letter to the OAR. Tank Design shall be based on Drainage Fixture Units (DFU) sizing criteria, with minimum tank size of 750 GPM (when a tank is required).

3. Cafeteria

a. Spaces and functional needs for this unit include:

1) Ample area for the cafeteria waiting line, oriented to provide a smooth traffic flow.

2) Covered rain and sun protection at waiting line and food serving area. Covered access to Lunch Shelter.

3) Serving windows at the appropriate height for grade levels served.

4) Space for trash and recycling receptacles in designated areas throughout the dining areas.

5) Adjacent storage for cleaning supplies.

b. Location: Adjacent to playground with student restrooms easily accessible.

4. Lunch Shelter:

a. Spaces and functional needs for this unit include:

1) Concrete slab sloped to adequate floor drains so that all food products drain to sanitary sewer system. Verify that slopes and cross slopes do not exceed maximum allowed by code.

2) Roof structure providing shelter from rain and sun, designed to prevent birds from perching on rooftop areas in and around the lunch shelter. Shelter's height shall be proportional to its size. Design shall consider side exposure to elements and provide for maximum protection while maintaining an open and airy atmosphere. Overhangs shall be extended far enough beyond tables and benches to provide protection from rain and sun. High lunch shelters shall provide vertical screening fascias for sun and rain protection.

3) Conveniently located drinking fountains with multiple bubblers and hose bibb.

4) Provide lighting and P/A speaker system (connected to school's P/A system).

b. Location: Immediately adjacent to cafeteria, playground, and outdoor eating areas.

5. Outdoor Eating Areas:

a. Outdoor eating areas are intended to supplement cafeterias and lunch shelters.

b. Provide space for tables and chairs, low wall seating or benches.

c. Consider ways to reduce heat reflection and glare, such as shading.

d. Consider details that provide protection against birds.

e. Drains shall be provided based on requirements of this Design Guide, see section 3.2 – "Civil Engineering".

6. Outdoor Assembly Area

a. The Outdoor Assembly Area accommodates the student body for informal and instructional presentations and graduation exercises, as well as outdoor dining. (See section 2.2 - "Site Design")

b. Location: Central to campus. Preferably near cafeteria and lunch shelter.

I. FUNCTIONAL REQUIREMENTS – RESTROOMS & DRINKING FOUNTAINS

1. Fixture and General Requirements

a. Restroom stalls shall be sufficient in number to accommodate the maximum planned enrollment, staff and visitors, and located on campus for both convenience and supervision. Follow the requirements of the California Plumbing Code, except where modified below.

b. Restrooms must be designed and equipped to comply with Title 24 Accessibility Requirements, including access and usability for fixtures, mirrors, and accessories.

c. CBC and ADA accessibility regulations specify mounting heights for adults (including middle schools), and alternate mounting heights for elementary and kindergarten students. Comply with the age-appropriate CBC mounting height for the project type. Architectural drawing shall clearly identify the specific age group applicable to each restroom, and at each classroom with accessible sink(s).

d. Refer to Guide Specifications for "Toilet Accessories" for additional requirements.

e. In student restrooms (except kindergarten and early education centers), provide electric hand dryers in lieu of paper-towel dispensers and waste receptacles. Locate semi-recessed hand dryers along exit path from restroom that do not protrude more than 4" from the wall. See also Section 3.4 "Plumbing" for specific requirements for student restrooms.

f. For other restrooms, surface-mounted paper towel dispensers are standardized throughout the District (see Guide Specifications). Surface mounted paper towel dispensers, if they project more than 4" from the wall, should be located so they do not obstruct the accessible route and clear floor spaces at fixtures. Provide space for free-standing trash containers so they do not obstruct the accessible route and clear floor space at doors.

g. Plans shall include a tabulated Fixture to Occupant load calculation for all fixtures, including Drinking Fountains, Water Closets, Urinals and Lavatories.

h. Mirrors – In lieu of individual mirrors above the lavatories, provide a larger mirror in an adjacent area for use by all. Mirror shall be installed with the bottom of reflective surface in accordance with CBC and ADA height standards for access compliance. Be mindful of "Line of Sight" and privacy issues when locating the mirror.

FIXTURE REQUIREMENTS:

Type of Occupancy	**Water Closets (Fixtures per Person)**		**Urinals**	**Lavatories**
	Male	**Female**		**Male or Female**
Kindergarten	1 : 1-20 2 : 21-50 Over 50, add 1 fixture for each add'l 50 persons.	1 : 1-20 2 : 21-50 Over 50, add 1 fixture for each add'l 50 persons.		1 : 1-25 2 : 26-50 Over 50, add 1 fixture for each add'l 50 persons.
Elementary Schools	1 : 30	1 : 25	1 : 75	1 : 35
Secondary Schools	1 : 40	1 : 30	1 : 35	1 : 40
Staff and Visitor Use – All Schools	1 : 1-15 2 : 16-35 3 : 36-55 Over 55, add 1 fixture for each add'l 40 persons.	1 : 1-15 2 : 16-35 3 : 36-55 Over 55, add 1 fixture for each add'l 40 persons.	1 : 50	1 : 40

- The total number of water closets for females shall be at least equal to the total number of water closets and urinals required for males in each location. Where the above ratios do not match this requirement, increase the number of fixtures for females to achieve equity.
- Provide one drinking fountain per each 150 occupants, with a minimum of one per floor.
- The total number of fixtures required for students shall not include dressing room toilets, health unit toilet and public restrooms to be located in gymnasium's lobby and multi-purpose room lobby. Provide restrooms in these areas as indicated in the Facilities Space Program.
- For student restrooms provide a minimum of 3 fixtures
  Boys – Two (2) toilets and one urinal.
  Girls – Three (3) toilets.
- Toilets in the elementary school multi-purpose room shall be designed for adults.
- Toilet room for the health unit shall be designed for elementary school age group.

OCCUPANT LOAD FOR FIXTURE COUNT:

Type of Occupancy	Type of Space	Person/ Space
Students, Elementary Schools	Classrooms, including Kindergarten, Special Day Classrooms, Set-Aside Rooms (for total school fixture count)	25
Students, Secondary Schools	Classrooms, including Special Day Classrooms, Set-Aside Rooms (for total school fixture count)	30
Staff (and Visitors)	Classrooms, including Kindergarten, Special Day Classrooms, Set-Aside Rooms (for total school fixture count)	2

2. Location Criteria

a. Provide separate restrooms for students and faculty. Student restrooms may be used by the public for public events.

b. On classroom buildings, locate students and faculty restrooms and at least one drinking fountain on each floor as a minimum.. Number of fixtures per floor shall be per code and recommendation in this Design Guide. Restroom facilities shall be within 200 feet of all classrooms.

c. Provide a custodial room adjacent to each student restroom.

d. Distribute staff restrooms to locations proximate to their work stations, with maximum walking distance for any employee of 200 feet.

e. Locate restrooms and drinking fountains appropriately to serve such areas as multi-purpose and dining areas, media center, auditoria, lunch shelters, and athletic facilities and playfields. Make provisions for them to be fully accessible to students and staff during the day, and to the public after school and for special events without violating school security. Size restrooms to handle the anticipated capacity of each facility area.

f. Restrooms should not be visible through openings or materials selected for walls. Selected materials in the restrooms should be extremely vandal resistant, since they are high vandalism areas. Selected materials should also be repairable.

g. Provide drinking fountains in the following locations:

1) Adjacent to all interior and exterior student restroom entries.

2) At the interior, as well as exterior, of each Gymnasium.

3) Exterior play areas, including courts, play yards, and athletic fields.

4) Lunch shelters and outdoor eating areas where students have their lunch or breaks.

5) Other public areas where students will congregate.

h. Drinking fountains subject to direct sunlight exposure shall not be Stainless Steel due to heat build-up on the unit.

i. Entries to restrooms shall be only from public spaces, corridors, lobbies, or vestibules, and not through other rooms or functional spaces. All restroom entries shall have doors and screen walls or vestibules to prevent visibility of interior areas from the exterior when doors are open.

j. Restroom entrances shall be visibly prominent for ease of supervision.

k. Restrooms having direct access from the exterior shall have entries that are visible from the playground and easily supervised.

l. All drinking fountains adjacent to an accessible route, especially in corridors or along busy sidewalks shall be located in alcoves at least 18 inches deep, 32 inches minimum width; if alcove is deeper than 24 inches, then the alcove width must be 36 inches minimum. Alcove walls shall be surfaced with water-resistant material such as Ceramic Tile. Dimensions on drawings shall account for thickness of finish material and construction tolerances to assure compliant construction of clean inside accessible alcove dimensions. Provide water-resistant and slip-resistant flooring in alcove that extends minimum of 3 feet into the passageway.'

J. FUNCTIONAL REQUIREMENTS – LOCKERS

1. Book Lockers

a. In secondary schools provide one book locker for each student enrolled, with enrollment based on 32 students per classroom

b. Locate lockers in locker recesses in corridors, covered walks, or in special covered kiosks within secured areas and in highly visible and supervisable places.

c. Lockers shall be 18" high by 12" wide by 15" deep, four units high with a sloped top, mounted on a 4" minimum concrete base.

d. Construction shall be sheet steel, without vent openings, factory-applied enamel or powder-coat finish.

e. Locks shall have built-in combination locks with options for multiple combinations and openable with a master-key.

2. Physical Education Lockers

a. In secondary schools provide student lockers for the percent of enrolled students listed below, with enrollment based on 32 students per classroom – 50% in boys' locker room and 50% in girls' locker room.

1) Middle Schools: 100% of enrollment.

2) Senior High Schools 60% of enrollment.

b. In Senior High Schools provide two team locker areas with additional team lockers in each of the boys' and girls' locker rooms.

1) Team Room: 100 team lockers.

2) Team Secure Caged Area: 60 team lockers.

c. Provide faculty lockers for PE instructors and coaches.

d. Locker sizes: See Guide Specification "Metal Lockers" for sizes.

e. Verify the PE and athletic program planned for each project to confirm these allotments.

f. Construction shall be sheet steel, with vent openings, factory-applied enamel or powder-coat finish.

g. Lockers shall have built-in combination locks with options for multiple combinations and openable with a master-key.

h. Lockers shall be installed on a 4" high concrete base. Base shall be flush with the face of the lockers.

K. FUNCTIONAL REQUIREMENTS – CORRIDORS, STAIRWAYS AND EXTERIOR WALKWAYS

1. General

a. Width: Corridors and stairways shall be designed to accommodate peak student traffic flows between classes, but with a minimum width face-to-face of wall finishes or closed locker doors of 12 feet in secondary schools and 9 feet in elementary schools.

b. Finishes: Corridor and stairway walls shall have durable finishes – minimum finish construction of "abuse and impact resistant" gypsum wall board. (Not required behind or above lockers.)

c. Provide full height stainless steel corner guards to protect corner edges of interior corridors, stairways and high abuse areas.

d. Exterior walkways shall be designed to be hosed down. On upper floor exterior walkways provide recessed hose bibs and floor/area drains. Upper floor exterior walkways shall have a concrete walking surface with waterproofing system underlayment. Elastomeric walking surface coating systems shall only be used with Districts approval, due to high maintenance issues.

L. FUNCTIONAL REQUIREMENTS – SUPPORT UNIT

1. General

a. The Support Unit serves the operational and maintenance needs of the school and it includes the Plant Manager's office, central custodial receiving room, and central custodial supplies storage room, Gardening and Exterior Maintenance Equipment Room, Trash Enclosed Area, and the Custodial Closets.

b. See "Educational Specifications" for space criteria for each school level.

2. Central Support Unit

a. Plant Manager's Office

1) Elementary Schools: Must accommodate one desk with computer, three chairs, file cabinet, wall and base storage cabinets and a hopper (laundry tub) sink with drench hose/emergency eye wash.

2) Secondary Schools: Must accommodate two desks with computer, six chairs, three file cabinets, wall and base storage cabinets.

3) Locate adjacent to storage rooms and to provide visual oversight of the receiving area.

b. Central Custodial Receiving and Storage

1) In Elementary Schools and Early Education Center's (EEC's), custodial receiving and storage may be combined as one space.

2) In secondary schools, provide separate receiving and storage rooms. Receiving must have space for receiving, inspecting and breaking down shipments, adjacent to the loading dock or exterior receiving area. Cleaning chemicals may be mixed or repackaged in this room, so it must have non-recirculated ventilation. Provide a hopper sink in this room, and a deluge shower/eyewash combination unit. Provide an area for washer and dryer and their electrical requirements.

3) Storage Room must have adjustable metal shelving and a lockable metal cabinet for custodial supplies.

4) Provide six-foot wide door openings into both rooms, with pairs of three-foot doors.

5) Provide secure facilities for flammable liquid storage. In secondary schools where gasoline drums are stored (quantities greater than 55 gallons), this must be a separate building area with required fire-resistive separation and with direct truck access for refilling drums. This structure shall be completely separated from buildings used by students. For small quantities see OEHS recommendations.

6) Fueled Equipment Storage – Storage for Gardner's fueled equipment and other fueled equipment shall be in a structure completely separated from buildings used by students. This storage could be part of gardener's equipment building if it is an independent building or it could be a separate structure. Truck access must be provided. Storage shall be located away from transformer, trash area, and a minimum of 25 feet from any spark generating source. Provide grounding as required by code.

7) For additional On-Site storage requirements see sections 2.2 - B and C.

c. Locate the Central Support Unit away from the general classroom and food-service areas, to avoid material and staff congestion, reduce misdirected deliveries, and keep custodial chemicals and odors well separated from students and food preparation.

d. Provide access from a street entrance, separate from student areas, with adequate yard space for deliveries and truck turnaround. Consider maneuvering space outside school property when selecting one of the District's service yard layouts.

e. At secondary schools, provide toilet facilities and lockers.

f. Provide an outside area adjacent to Receiving for the future placement of 8' x 40' containers for future storage: one for elementary schools (about 500 sf) and two for secondary schools (about 800 sf).

3. Gardening and Exterior Maintenance Equipment Room

a. Gardener's Storage shall include workspace, equipment storage area, and equipment (shelving, cabinets, and racks).

b. Exterior Equipment Storage space shall be adequate for equipment (mowers, sweepers, vacuums, etc.) with an overhead rolling door

c. Locate adjacent to or near the Central Support Unit where feasible, but it must be easily accessible to areas to be maintained.

d. Provide a hopper sink when gardening unit is separate from Central Support Unit.

4. Trash and Recycling Enclosure

a. Provide trash enclosures that are secured by walls that screen the area from public view.

b. Provide:

1) Hose bibb and dual-mode drainage (see Section 3.4 "Plumbing").

2) Electrical outlet and exterior lighting.

3) Trash compactor with container, concrete slab floor, and electrical power (all to be included in the Construction Documents).

4) Direct truck access to all trash and recycling containers.

5) Enclosures shall be freestanding, with minimum 5'-0" distance from any occupied structure.

c. Location:

1) Remote from student activities and food service areas.

2) Accessible to street for truck pick up with truck entirely on District's property.

3) Convenient to trash-generating activities, such as food services areas.

4) Adjacent to freight elevator in a multi-story facility.

5) Avoid placing the dumpster storage area immediately adjacent to kitchen, cafeteria, and/or lunch area for more effective pest management.

6) Trash enclosure area shall be located with direct access from outside the campus/parking area for easy pick-up and without interfering with school activities. Direct access from the campus shall be provided and shall not require passing through any building space. Trash pick-up area shall be level to prevent bins from rolling.

d. Details:

1) For additional information for trash area with trash compactor see "Standard Technical Drawings".

e. Trash Area Calculation: Trash area shall be designed to accommodate the number of bins required, as follows:

1) Sites without trash compactor:

a) Elementary Schools: One 2 CY bin for each 140 students

b) Middle and High Schools: One 2 CY bin for each 125 students

2) Sites with trash compactors:

a) Elementary Schools: Four 2 CY bins

b) Middle Schools: Six 2 CY bins

c) High Schools: Eight 2 CY bins

f. Recycle Program:

1) Schools located within the geographic limit of city of Los Angeles, a city of Los Angeles "blue" 90 gallon recycle bin will be provided. For schools that are outside the city of Los Angeles limit may participate in the county "white bin" recycle program provided by the District's rubbish service contractor.

2) Recycling trash bins –. Provide bins specifically for recycling; however, where trash compactors are to be provided, there is no need for 2 cubic yard front loading recycling bin painted white.

5. Custodial Closet/ Hopper Room

a. Custodial Closets are not to be used for supplemental uses (water heaters, access ladders, other building services) without enlarging the space and assuring the full function of the custodial activity.

b. Provide:

1) Floor sink with hot and cold water and custodial faucet with standard garden-hose threads on the spigot.

2) Electrical GFCI receptacle.

3) Light fixture with guard to prevent lamp from breakage.

4) Motion Detector pre-programmed to turn off light no more than five minutes after room has been vacated.

5) Outswinging door.

6) Exhaust air to outside (non-recirculated).

7) Tool / mop rack and metal storage with adjustable shelves and space for custodial carts.

c. Provide custodial closets in the following locations:

1) Adjacent to all Student Restrooms; one per floor minimum.

2) One per each 15 classrooms.

3) One in each Boys and Girls Locker Rooms at Gyms.

4) Multi-Purpose Room/Auditorium.

5) Kitchen food preparation area only.

6) Other locations when necessary to assure adequate custodial coverage of building areas (Administration, Library, Cafeteria, etc.).

M. BUILDING SECURITY

1. Windows

a. The following security measures must be addressed in the initial design concepts, and shall be integrated with the overall building design.

b. All windows accessible from the exterior shall have security measures as described in Section 3.1, "Architectural", to prevent breaking, entering and vandalism. Accessible windows include any windows with:

1) Bottom sills less than ten feet above grade.

2) Bottom sills less than ten feet above balconies, stairs, or other circulation means.

3) Bottom sills less than ten feet above roofs that have any portion less than ten feet above grade, adjacent walls, or other access points.

c. Do not locate windows within 48 inches of exterior doors unless protective security screens have been utilized to prevent an intruder from gaining access to door hardware.

2. Doors

a. Do not locate exterior doors in recesses or alcoves that would provide cover for an intruder attempting to enter the door.

b. Provide exterior security lighting that illuminates all exterior doors.

c. Provide overhead rain protection overhangs for all unprotected exterior doors.

d. Glass on exterior doors shall be protected against vandalism and to deter breaking and entering by use of security grilles. Laminated glass is not sufficient.

2.2 SITE DESIGN

A. INTRODUCTION

B. BUILDING PLACEMENT AND CIRCULATION

C. OUTDOOR SPACE AND FUNCTIONAL REQUIREMENTS

D. LANDSCAPING

E. SECURITY

F. SIGNAGE

2.2 SITE DESIGN

A. INTRODUCTION

1. General Requirements

a. The site design process must balance many diverse requirements including convenient circulation, accessibility, security, ease of supervision, and community image. Context, adjacencies, aesthetics as well as the physical and geotechnical characteristics of the site must be considered.

b. Sites are to be designed to conform to the requirements of the "Guide to School Site Analysis and Development," to the "Small School Site Policy", both published by the California Department of Education, and to the Rodriguez Consent Decree.

c. Playgrounds, playfields, and outdoor instructional spaces are essential to the instructional program, and must be carefully integrated into the site plan.

d. The circulation system, both on- and off-site, must safely separate pedestrians, bicycles, cars, buses and delivery vehicles while providing immediate access for emergency vehicles.

e. Plan pedestrian circulation carefully to reduce opportunities for short cuts over planting areas, which greatly increase maintenance.

f. Skating or skateboarding is not allowed on school property. Paving and other site structures such as raised planters, benches, and low walls shall be designed, or have skate deterrent devices installed to discourage such use.

g. Careful consideration should be given to consolidating building program elements into a compact, space-conserving floor plate in order to maximize open space and enable a more energy-efficient building shell.

h. LAUSD has a "Greening Program" that recommends lawn and other planting on at least 30% of the outdoor space on each school site. On tight urban sites, this is not always achievable, but space for planting must nevertheless be given high priority in site planning. Opportunities exist at school entries and perimeters, kindergarten play spaces, instructional gardens, and other strategic planting areas.

i. See Section 2.4, "Environment and Sustainability," for additional site design criteria. The reduction of storm-water runoff is an important component of sustainable design, and is greatly improved by more planting, water absorption areas and permeable paving surfaces.

j. Site Signage: See section 2.2, F "Signage" for the requirements for site perimeter and other building signs and integrate them into the site design. Signs must be reviewed, through the District's authorized representative, with the school principal or other local district staff to assure the correct content.

2. Future Expansion

a. Site layouts shall have the capacity for future expansion without substantial alterations to existing structures or playgrounds. Indicate future building locations on site plans.

b. Make provisions in utilities systems to accommodate future growth without rework of installed components.

c. Exits, walkways, stairs, and elevators must be sized and located to accommodate capacity of future growth, particularly in multipurpose, cafeteria, gymnasium and auditorium facilities.

3. Site Plan Information

a. Plans shall clearly identify and reference the limits of all project related contract work including site lighting, landscaping, paving, utility system connections and improvements, etc., to specific benchmarks, property lines and/or existing significant site improvements (buildings, street center-lines, etc.) with easily understood and straightforward dimensioning.

b. Locations of buildings, site improvements (including shoring needed to develop structures or features), underground/sub-surface structures, etc., shall be referenced to specific benchmarks, property lines and/or existing significant site improvements (buildings, street center-lines, etc.) with easily understood and straightforward dimensioning.

c. All grades, slopes, required cuts/fills shall be appropriately depicted dimensioned, and quantified. Over-excavation requirements shall be defined with both horizontal and vertical dimensions sufficient for accurately calculating cut and fill quantities.

d. Plans shall clearly identify locations for staging of construction materials, site access for the contractor's workforce and delivery of materials, and temporary fencing and barricades for site security and safety. On sites with existing school functions/facilities, construction staging and work areas shall be separated from the school functions/facilities by temporary fencing and/or barricades. The location of this area shall be coordinated with District staff.

e. When planning walkways consider shortest routes and consider design elements, so students avoid trampling landscaped areas. Widen or feather out the walkways at junctions to accommodate natural foot traffic movements and student gathering areas.

B. BUILDING PLACEMENT AND CIRCULATION

1. Building Location

a. Site layout of buildings, parking, driveways and physical education areas shall be planned to meet the instructional, security and service needs of the Facilities Space Program prepared by the District.

b. Place buildings to be compatible with adjacent functions. (For example, do not place the band room adjacent to the library.)

c. Physical relationships of classrooms, auxiliary and support areas must allow unobstructed movement of staff and students around the campus, and provide optimum patterns for pedestrian traffic flow around and within buildings. (For example, students should not have to pass through one building to get to another.)

d. Place buildings to have favorable relationships to wind, sun, and natural light and to optimize the effects of sun light and solar loads. Provide an analysis of sun effects on energy consumption and on interior day lighting.

e. Provide a system of covered walkways between all buildings.

f. Consider location of buildings relative to parking areas and other paving to minimize solar reflectance and dust impacts on the buildings.

g. Locate restrooms to provide easy access from playgrounds and classrooms with a minimum of supervision.

h. Locate buildings in ways that improve campus security.

i. Exit doors and stairways from buildings shall be located so there is no direct exit from the building to the street. Students must be able to circulate to an emergency assembly area without exiting the school grounds.

C. Outdoor Space and Functional Requirements

1. Playground and Field Areas

The Space Facilities Program governs the number, types and sizes of outdoor Physical Education spaces, which includes a variety of physical education teaching stations, including hard courts, fields and apparatus areas.

a. Plan outdoor play areas and fields to accommodate public access and joint use with other public agencies.

b. Locate buildings (including relocatable buildings) so they do not impair observation or obstruct play field supervision.

c. Minimize potential for distraction or harm to occupants of lunch shelters, outdoor classrooms and assembly areas, by Physical Education spaces and related activities, including balls, noise, incidents, etc.

d. Provide playground safety tile surfacing at playground structures as shown in District Standard Details.

e. Athletic competitive facilities are regulated by the National Federation of High Schools (NFHS). These facilities should also comply with CDE and California Interscholastic Federation (CIF) standards. Support facilities such as spectators seating, lighting, etc. shall be provided per program.

f. Turf areas should be located and graded to accommodate drainage of on-site surface runoff.

g. Athletic Equipment Storage – At High School fields provide space for a 40' container for storage of athletic equipments.

2. Outdoor Assembly Area:

a. The Outdoor Assembly Area is the heart of the campus. It may serve as a theatre area for outdoor programs, assembly for graduation ceremonies, an informal gathering space, and outdoor dining.

b. Locate it near the cafeteria and lunch shelter, preferably.

c. Provide a central lawn area large enough to accommodate the enrollment wherever site size permits. Create compact alternatives for smaller urban sites.

d. Minimize walks crossing grass area.

e. Plan a raised stage considering solar orientation, preferably facing away from morning sun. Accessible route of the travel to the stage shall be provided.

f. Slope ground toward stage for amphitheater-style seating. Identify and disperse accessible seating positions.

3. Outdoor Classroom:

Outdoor Classroom shall be provided if it is required as part of the Facilities Space Program and desired by the school. The Outdoor Classroom shall be age appropriate and shall not impact the physical education area, parking or any other essential element of the school facility.

a. The Outdoor Classroom is an intimate cost effective space for outdoor teaching, as well as a good meeting place for parent-teacher meetings and student groups. It serves multiple occupants and is intended to grow into a place of outdoor beauty that offers an enhanced environment for instructional activities.

b. As space permits provide paving, grass and seating (benches or low walls).

c. Locate near classroom clusters.

d. The Outdoor Classroom area shall not be paved with asphalt, and must utilize permeable surfaces and natural materials wherever possible. Utilize materials including, but not limited to, trees, rocks, boulders, and natural pavers, in addition to planting and shrubbery, to create a natural space that reflects a native California landscape. The space should also include items such as wood decking, benches, and arbors. Reclaimed materials should be utilized wherever possible.

e. Each outdoor classroom must contain the following basic elements:

1) Gathering or meeting area.

2) Planting beds.

3) Work table or other work surfaces.

4) Lockable storage unit.

5) Decorative Instructional Signage.

6) Permanent hose bibb and/or irrigation system.

7) Seating for a full class (may be informal and/or dispersed).

8) "Messy" space for interactive play with natural materials, if appropriate for age group.

f. Provide space for:

1) Student planting beds.

2) Compost bin.

3) Rain barrel.

4) Solar feature.

5) Student art display – provide an opportunity for students to add to the space artistically, such as a blank mural wall.

6) Green waste storage.

g. Provide a landmark indicating a clear transition from the schoolyard or other play space. It should be prominent and should provide a sense of moving into a special space.

h. Seating should take into consideration the age of the school population. Disperse a variety of seating and various seating heights throughout the area. Utilize natural materials, and consider reuse of materials found on site. Choose materials for durability and sustainability. Consider the educational and experiential value of seating materials and their construction. Seating should be provided as follows:

1) Provide seating for full class meeting up to 25 students in one area. For short term use, this area may be densely packed.

2) Provide seating for small groups.

3) Provide seating for single students for quiet observation or data collection.

i. Circulation:

1) Separate foot traffic from planted areas.

2) Provide main pathway from entrance to main gathering, planting and work areas. Main pathways from entrance to gathering, planting and work areas should be a minimum of 48" and accessible.

3) Provide secondary pathways clearly distinguished from primary circulation, utilizing a contrast in materials and/or scale.

4) When adding an outdoor classroom or garden to an existing campus, be aware of existing walking path of travel.

5) Utilize a range of permeable and non-permeable surfaces such as:

a) Permeable and non-permeable concrete.

b) Permeable pavers.

6) Design for sustainability, locally sourced and recycled materials, etc.

j. Planting beds – a dedicated place for hands-on gardening, either in-ground or raised. Raised beds should be no more than 3' wide for primary and elementary schools to allow access to younger students, and should be between 18" and 24" high. Raised beds should have a wide edge for sitting. Site water source proximate to planting beds.

k. Topography:

1) Mound and shape landscape to 18" to 24".

2) Incorporate gardens and landscape areas into storm water runoff BMPs through rain gardens, permeable pavers, infiltration swales, and other topographical features.

l. Outdoor classrooms should contain one or more of the following elements:

1) Orchard – a space for growing fruit trees.

2) Edible Garden – a space for growing vegetables and herbs from seed to harvest. Beds may be in ground or raised, depending on site features and soil condition, but must be suitable for food production. Edible gardens should contain an area that can accommodate a whole class. Orchards and edible gardens must contain a potable water source, and where feasible, a safe space for food preparation.

m. Instructional and/or Experiential Space – Instructional gardens may be formal or informal. Consider elements such as informational signage, root view windows in planting beds, thermometers, sundials, writing surfaces, structural elements such as mounting location for teaching materials.

n. Where feasible, provide signage indicating:

1) Plant/tree species.

2) Special care for plants that have dormant periods, require little to no water, or have other special needs.

3) Composting areas.

4) Garden Type.

4. Outdoor Eating Spaces:

a. Outdoor eating spaces supplement cafeterias and lunch shelters. See section 2.1 "School Building Design" – Multipurpose and Food Service.

b. Integrate with lunch shelter and outdoor assembly area.

5. Emergency Assembly Area:

a. Designate an "Emergency Assembly Area" (EAA) on the site with a net area of six square feet for each programmed student (6 sf/occ.) or 3 SF per calculated exiting load, which ever is greater.

b. Edge of EAA shall not be less than 50 feet from the face of the nearest structure.

c. EAA shall have a gate that discharges directly to the sidewalk. Use a single 4'-0" gate to swing in the direction of egress. Gate shall not project into sidewalk.

d. Gates shall not be closer than 15'-0" from the edge of a vehicular drive gate unless separated by a perpendicular fence or wall.

e. Grades to, and within the EAA shall conform to accessibility requirements.

f. Provide additional space for emergency supply containers (standard 20-ft. or 40-ft. shipping containers.). The primary unit stored is emergency water supply for three days for the entire site population (students, teachers and staff). The requirement is one barrel of water for each 35 people. A 20-ft. container will hold 30 water barrels. A 40-ft. container will hold 60 barrels. Calculate the size and number of containers and provide a flat, smooth-graded area for the containers, containers will be provided by the District. This area shall be accessible and comply with ADA path of travel requirements.

g. Access to EAA shall be designed in such a way that would not require students to go off campus, or into the public right of way to get to EAA.

6. Bicycle and Skateboard Storage Areas:

a. Identify a designated area for bicycle and skate board storage. Location and number of bike racks and skate board storage for employees and students are at the discretion of the local districts. Coordinate requirements with Design Manager.

b. Bike racks and skate board storage shall be installed on hard-surfaces.

c. Location shall be visible for security and designed for minimized vehicular and pedestrian traffic conflicts.

d. Provide adequate clearance where bicycle racks and skate board racks are located adjacent to buildings, structures or pathways, so they don't restrict the path of travel.

D. LANDSCAPING

1. Planning

a. Because schools represent important visual elements in the community, a well-conceived landscape design is essential – one that provides a naturally beautiful campus that enhances its neighborhood yet still is physically secure and economically maintainable.

b. Landscape and planting standards must be adapted to the specific site, with designs scaled to fit the ecological, cultural and economic requirements of the project.

c. In addition to the aesthetic considerations, an important role of trees and large shrubs is providing shade – for buildings, for play areas, and for paved heat islands. Use trees to provide:

1) Year-round shading of outdoor teaching, dining, gathering and play areas.

2) Seasonal shading of buildings to reduce cooling energy requirements, while allowing winter warming of buildings in the cooler climatic areas.

d. Use trees and shrubs to provide wind-breaks on those sites exposed to strong winds, but without disrupting favorable summer wind patterns.

e. Identify existing trees and plant structures that should be saved, and, so far as possible, incorporate them in site planning.

2. Planting

a. Based on long experience with landscaping maintenance, the District has prepared a list of plants that are appropriate to the region, are not hazardous to students or staff, and require relatively little maintenance. Select plants appropriate to the site from the LAUSD Approved Plant List. Refer to Section 3.9 for additional information.

b. The District is committed to a long-term program to conserve water. Therefore, select drought-tolerant planting, with durable, long-lived plants requiring the least amount of maintenance and water.

c. The District's "Integrated Pest Management Program" has requirements for plant locations to be not closer to buildings than:

1) Mature canopy of trees: 5 feet.

2) Mature canopy of shrubs: 3 feet.

3) Ground cover or jute matting: 3 feet.

d. Use low spreading shrubs and vine-type plants on slopes.

e. Avoid all poisonous plants and shrubs with dangerous thorns.

f. Allow space for normal growth of plants.

g. Do not locate large shrubs in front of windows or school sign.

h. In front of graffiti-prone walls, provide trees, shrubs and ground treatments that will deter taggers and reduce visibility of applied graffiti.

3. Trees

a. Provide for fast-growing shade trees on perimeter of Elementary School Playgrounds, surrounding Outdoor Assembly Areas, in Outdoor Eating Areas, in Kindergarten Play Areas, and in selected areas for outdoor instruction and small group gatherings.

b. Provide trees to shade buildings, where other conditions permit, as follows:

1) On south exposure, tall deciduous trees to provide shade for high summer sun and warming from low winter sun.

2) On east exposure, deciduous trees for morning shading in summer and warming in winter.

3) On west exposure, evergreen trees for year-round shading.

c. Provide at least one mulberry tree on each Primary Center or Elementary School Campus, in the Kindergarten or Primary Grade Play Areas.

d. Provide trees to shade parking and other large paved areas to reduce the heat-island effect.

e. Keep trees out of drainage flow lines and 20'-0" feet away from vitrified clay sewers.

f. Avoid trees that drop excessive fruit, leaves, or pods.

g. Space trees to have a maximum of 5-feet overlap of full canopies.

h. Location of trees shall be designed to avoid providing access to upper floors, roof and impacting building foundation and sidewalks.

i. No tree box smaller than 24 inches is to be specified.

j. Trees provided by the Los Angeles Department of Water and Power (15 gallon) shall be located in areas away from student activities and access to maximize their survival.

k. Trees and tree wells shall be located in such a way so they do not interfere with children's natural instinct to take the most direct path from one area to another.

l. Avoid the use of chips or gravel in tree wells as they become throwing material for students.

4. Mowing Strips and Paving:

a. Separate lawn and planting areas with concrete mow strips per LAUSD standard technical drawings.

b. Provide a continuous concrete mowing strip, 12" wide, on each side of a fence which separates two adjacent lawn areas, and for lawns next to raised planters, buildings, fences, walls or curbs.

c. Provide a continuous mow strip, 8"wide, for lawn or turf areas next to fences by extending concrete or asphaltic paving outside fence into lawn or turf areas.

d. Pave corners of planting areas at walk intersections to reduce pedestrian traffic thru planting areas.

e. Adjacent to buildings, provide a separating strip from plant areas that is 6"-thick concrete and not less than 24" wide.

f. All covered and main circulation walks shall be of concrete or similar durable surface. Decomposed granite shall only be used in garden pathways that are not adjacent to buildings, assembly areas, or walkways.

5. Middle and High School Physical Education Fields and Exterior Courts:

a. Provide turf fields for Middle and High School Physical Education Areas that may include space for football, soccer, baseball and track and field. Where programmed, these facilities may be used for interscholastic athletics as well as physical education.

b. Coordinate location of backstops, pitching mounds and skinned areas with sprinkler layouts.

c. Design grading so that surface drainage from sprinklers will not channel across skinned infield area of baseball and softball diamonds.

d. Pave small areas behind back stops where large mowers cannot operate efficiently. Provide mow strips if planted with turf.

e. When possible, turf area shall be located and graded to accommodate drainage of on-site surface runoff.

f. Provide a scoreboard outside of the playing field and track.

g. Provide an area to place a storage bin for athletic equipment.

h. Exterior volleyball courts and basketball courts should be separate when ever possible. If volleyball courts are being combined with basketball courts due to site constraints, provide ground sleeves and removable volleyball posts and nets.

6. Synthetic Turf Field

a. As programmed and directed by the District, design and specify a complete synthetic turf field to meet the District's minimum requirements.

b. Synthetic turf is recommended for high use/Multi-Purpose fields and joint use.

c. If shot put is part of the program, it shall be located in such a way to avoid damaging the field.

d. Drainage System:

1) The drainage system should provide sufficient drainage of the entire playing surface to meet local conditions.

2) Design shall comply with the District's requirements and state storm water arrangement.

3) The drainage systems may include the synthetic turf, pad, base materials and collector pipes that collect and remove storm water from the playing field.

4) Design shall consider existing surrounding conditions, location and soil type.

e. Based on the location of the school and it's annual average temperature, design a cooling system per turf manufacturer's recommendations and District's standards.

7. High School Running Track:

a. Track Length: The running track shall be not less than 400 meters (1,312.34 feet) in length.

b. Track Width: A track width of 28 feet (8.53 meters) / 8 lanes is required for Synthetic and D.G. (decomposed granite) track surfaces unless approval is obtained by the District's Athletic Department.

1) Overall Track Width: Outside dimensions of track shall not be less than 262.86 feet (80.12m): 2 x 104.43' (track radius) + 2 x [28' (track width) – 1' (distance to measurement line)] = 262.86'.

2) There shall be a 4'-0" high fence between the track and the bleacher areas. This fence should not encroach into the track and shall be located a minimum of 18" from the outer lane of the track. The public viewing area shall not be blocked by the fence.

3) Distance to Bleachers and Fences: A minimum clear distance of 18 inches (45.7cm), fall zone, shall be provided from the outer track edge to any obstacle, such as fences or light standards. Ground level bleachers shall be provided a minimum 5 foot distance from the front row of the bleacher to the fence.

c. Lane Width: Lanes shall have the same width including the white line to the right. A minimum lane width of 42 inches (1.07 m) is required unless approval is obtained by the District's Athletic Department.

1) Track Lane Measurement: Distance which are run in lanes and which involve a curve shall be separately measured for each lane. The measurement shall be based upon a line 8 inches (20cm) from the nearer edge of the lane line which is on the runner's left, except the lane next to the inside raised curb shall be measured 12 inches (30cm) into the lane from the raised curb.

2) Inside Curb: The track may be bordered on the inside by a concrete curb. If exposed the edges of the curb shall be rounded.

3) Lane Edge Lines: Lanes shall be marked on both sides by white lines 2 inches (5.08cm) wide. The lanes shall be numbered with lane one on the left when facing the finish line.

d. In Field Surface: The playing field area and radius ends within the track should be natural grass or synthetic turf. A synthetic track surface is recommended when synthetic turf is used. The minimum distance from the curb to the active soccer / football playfield is 10ft. Runways for long jump and pole-vaults should be placed in the radius ends of the field and have synthetic surface when synthetic turf is used. For natural grass fields, runways may be either decomposed granite or synthetic surface.

e. A separate decomposed granite or natural grass fenced area should be provided for shot put.

f. Wind: Prevailing wind conditions should be considered when planning running tracks.

g. Minimum Considerations: On very small sites and with District approval practice and local competition meets may be run on 6 lanes of 42".

8. Outdoor Assembly Area:

a. Provide lawn at the Outdoor Assembly Area amphitheatre area.

b. Plant perimeter trees for shade while maintaining interior line of sight toward stage.

c. Plant screening foliage behind stage as a visual backdrop.

d. Plant shade trees on either side of stage to cast protective shadows.

E. SECURITY

1. Gates and Fencing

a. Design special gates and fencing for main entry to school. Entry Gates and Security Fences shall be designed to maximize security while at the same time enhancing the appearance of the school.

1) Design special gates for main entry to school with direct line of site from main office.

2) If concrete planters or other climbable elements are adjacent to an entry fence or gate, the fence and/or gate height must be adjusted accordingly.

3) The design of the entry gates and security fences should minimize horizontal bars and low curbs so that they do not provide a "ladder" that allow the gate or fence to be easily scaled.

4) Clearances for all gates and doors shall be according to good industry practice and in no case large enough to permit entry or bypassing security measures.

5) When gates are required to have emergency push bars for exiting, the gates and adjacent fencing must be designed to prevent activation of the push bar from the outside.

6) If ornamental fencing (wrought iron) is proposed, the design shall be approved by LAUSD'S metal shop, during the design phase.

b. Provide full perimeter fence or wall enclosure for school campus. Buildings may be used in lieu of a fence when located within 5'-0" of the sidewalk or entry plaza if classroom windows are not positioned so that pedestrians are a distraction to classroom students.

c. All accessible gates on an accessible route shall have required level landings on each side of the gate with 2% maximum slope in any direction. Gates shall conform to CBC accessibility regulations.

d. Fence, wall and gate dimensions:

1) Perimeter and parking area walls and fences: 8'-0" height.

2) Interior security fences: 8'-0" height.

3) Interior playground fences: 4'-0" height.

4) Pedestrian gates: 4'-0" width in 6-foot or higher fences.

5) Driveway gates: 20'-0" wide.

6) Tennis court fence 12'-0". Gates: 6'-0" wide (to accommodate sweepers). If this is the only access, it shall meet CBC accessibility requirements.

7) Gates that provide access to maintenance equipment shall be 6'-0" wide.

e. At adjoining residential areas, provide CMU walls.

f. Provide full perimeter fence enclosure for all parking areas.

g. In general, provide swinging gates rather than sliding. Emergency gates shall be swing gates; for new sites provide emergency gates on more than one street. Use sliding gates for large openings where normally open swinging gates would cause obstructions. Ensure that sliding gates are designed to open with minimal effort and that the track will not deteriorate under normal use and traffic. Rolling gates must be designed with gate stops to prevent gates from rolling past the mid-closure point and clear of vertical supports. Provide one stop on the track and another welded to the top rail. Rolling metal gates shall be engineered to account for its weight, in order to provide safe and smooth operation.

h. Enclose the Trash Yard with solid walls on three sides. Locate it for easy access and trash pick-up, away from student areas, and out of direct view of neighboring property owners. Trash yard gate shall be located to accommodate trash pick-up. See District's Standard Technical Drawings for additional details.

i. All perimeter gates exiting campus are typically locked during school hours. These gates and their location should be designed in such a way so they are not considered legal exits; thus not requiring panic hardware that compromises security to school site. In the event a gate requires panic hardware, it shall be at least 7'-)' high and shall have coverings to prevent operation of the panic device from the locked side of the gate.

j. Avoid placement of activities where the ball can easily go over the fencing and out of the campus, causing hazards. Where this is unavoidable, increase the height of the fencing to prevent balls going outside playgrounds.

k. Pool Area: The fence shall be designed and constructed so that it cannot be readily climbed by small children. Horizontal and diagonal member designs, which might serve as a ladder for small children, are prohibited. Horizontal members shall be spaced at least 48 inches apart. Planters or other structures shall not be permitted to encroach upon the clear span area. Chain link may be used provided that openings are not greater than 1 ¾ inches measured horizontally. The fence minimum effective perpendicular height shall be 8'-0" measured from each side.

l. Provide sliding gates to control pedestrian traffic into field bleacher areas.

m. At tops of banks, near play areas set fence line back 18" minimum if bank is paved, and 24" minimum if bank is not paved.

n. Fence service yards. Provide sliding drive gate where possible.

o. Because of safety and maintenance concerns, motorized gates at perimeter fences are not allowed without prior written approval from the District. Sides of ramps leading to subterranean garages shall be fenced off to prevent access to the rest of campus when the perimeter gate is open.

2. Utilities Protection

a. Wherever pipe-and-valve assemblies are exposed above grade, provide a secure locked enclosure to protect them from unauthorized use or vandalism. These may be walls, fences, or manufactured enclosures that are made for this purpose.

3. Site Lighting

a. Provide exterior lighting to enhance site security, including area lighting, walkway lights, and building perimeter illumination. See section 3.7 "Electrical Power and Lighting" for illumination levels.

b. Eliminate direct-beam projection off-site or glare off buildings into adjoining residential areas or other occupancies.

F. SIGNAGE

1. Identity

a. Provide metal letter signs at the main entry of school to identify the name of the school and street address. Signs shall be visible by both pedestrian and vehicular traffic.

b. Identify an area on site plan for locating a future electronic marquee near the main entry. Marquee to be visible by pedestrian and vehicular traffic. Contract documents shall include a stub out at this location and installation of conduit only for future power requirements. Another conduit shall be provided for data from this location to MDF room and shall be identified accordingly. If marquee is wireless, conduit to MDF room shall not be provided. Make provisions for marquee according to the following criteria:

1) Location Considerations:

a) Available space for support.

b) Maximum exposure for message display and school name.

c) Proximity to power and location of computer for wireless system to work.

2) Design:

a) Local ordinance restriction for square feet area, setback and minimum distance from roadway or sidewalk, internal/external illumination limitations, and moving message restrictions.

d) Speed of traffic on the street that the sign will be located.

e) Minimum 8'-0" clear to the bottom of the sign.

f) Verify logo and exact name of school with school administrator.

g) Coordinate cabinet color(s) with the school.

h) Coordinate location of computer and other equipment with the school.

3) Hours of Operation:

a) New schools shall comply with CEQA study. If any was done it was addressed in the study.

i) Existing schools shall comply with local ordinances and the location of school. (residential/commercial street)

j) Address message deactivation time.

2. Vehicular Directional

a. Provide signage and striping as necessary to provide rational and safe vehicle flow in parking and vehicular traffic area.

3. Pedestrian Directional

a. Provide sufficient directional signs to accommodate way finding of joint-use facilities. Special signage may be required.

4. Regulatory

a. Provide signage identifying ADA accessible routes, exits, stairwells, room occupancy, evacuation plan, Assistive Listening Device availability, and other code-required signage.

5. Perimeter

a. Identify location of "WELCOME TO OUR SCHOOL SIGNS" on plans at the main entry and all vehicular and pedestrian entry points to the school. Signs are approximately 2'-0" by 3'-0" and are owner furnished/contractor installed.

6. Room Numbering

a. Architect shall follow LAUSD room numbering guidelines to identify each room on the construction documents. A copy of the guidelines can be found on the web at the following link: http://www.laschools.org/employee/design/fs-studies-and-reports/?folder_id=4301053

b. Provide room number and room identification signs per LAUSD Guide Specifications.

7. Roof Address

a. Provide school's street address numbers in contrasting color roofing material on the roof of main administration building per LAUSD Guide Specifications, roofing sections.

2.3 VEHICULAR ACCESS AND PARKING

A. PARKING SPACE REQUIREMENTS

B. GENERAL PARKING GUIDELINES

C. VEHICULAR ACCESS AND PEDESTRIAN SAFETY

D. PARKING STRUCTURE SECURITY

2.3 VEHICULAR ACCESS AND PARKING

A. PARKING SPACE REQUIREMENTS

1. School sites vary greatly in terms of size and configuration. In order to accommodate staff and student parking the District uses a variety of site-specific parking solutions, including:

- **a.** Surface Parking.
- **b.** Free Standing Structures.
- **c.** Underground Structures.
- **d.** Rooftop Parking.
- **e.** Leased Parking on Adjacent Sites.

2. Because of limited site space for recreational use, high-intensity parking solutions are encouraged.

3. Provide parking spaces based on the following ratios to programmed classrooms.

a.	Elementary School	2.25	per Classroom
b.	Middle School	2.25	per Classroom
c.	High School	2.50	per Classroom

4. Provide Accessible Parking per CBC ratios.

5. Visitor parking: Allocate surface parking spaces for visitors adjacent to the Administration Unit.

6. Provide secure Bicycle and skateboard racks. Also see section 2.2."Site Design".

B. GENERAL PARKING GUIDELINES

1. On small urban sites, seek creative parking solutions to maximize usable land for educational and recreational functions.

2. Parking layouts shall conform to good design practices. Los Angeles City requirements shall be used as minimum criteria. See Parking Standards drawings in the District's "Typical Standard Drawings."

3. Avoid placing student parking in remote areas where there is little supervision. In general, locate student parking near the classrooms.

4. Parent's student drop-off and pick-up, bus loading areas, and parking areas shall be separated to allow students to enter and exit the school grounds safely.

5. Driveways shall not be located in a bus-loading area, student drop-off or pick-up area.

6. Parking stalls shall not be located, or parking patterns so designed, so that a vehicle must back into a public street, bus-loading area, or student drop-off or pick-up area.

7. Avoid herringbone-pattern parking layouts and tandem parking. (Tandem parking may be used in special circumstances with District permission.)

8. Requirements for accessible parking shall conform to Title 24.

a. When one stall for accessible parking is provided the space shall be 17'-0" wide and striped to provide 9'-0" wide van accessible parking space and 8'-0" wide access aisle on the passenger side. Accessible parking stalls and access aisles shall have a maximum slope of 2% in any direction.

b. When more than one stall for accessible parking is provided, 2 parking spaces can be provided within a 24'-0" (26'-0" at van spaces) wide area striped to provide a 9'-0" wide accessible parking space on each side and a 6'-0" wide access aisle (8'-0" at van spaces) in between. Accessible parking stalls and access aisles shall have a maximum slope of 2% in any direction.

c. Minimum length of each parking stall shall be 18'-0".

d. A CBC compliant Tow-Away sign with contact information.

e. Slope for parking stalls, aisles, and path of travel shall be designed for less than maximum slope allowed by code.

f. Coordinate location of ducts, piping and equipment to avoid overhead obstructions into the minimum vertical clearance (8'-0") along the vehicular route connecting the parking garage entrance to the accessible spaces, and at the accessible spaces themselves. Coordinate location of ducts, piping and equipment to avoid obstructing the accessible route, and to avoid protrusions >4" into the protected zone that are not cane detectable by visually impaired persons.

9. Percentage of Compact Cars shall conform to Los Angeles City, Department of Building and Safety Requirements in parking areas or garages containing 10 or more spaces, up to 40% of the total required parking spaces and 100% of the non-required parking spaces may be compact. Compact-car stalls shall be clearly marked and appropriate signs installed at all entrances to parking areas.

10. Provide a wheel stop for each parking stall wherever stalls are head-on to fencing, wall, building, and planting area or other obstructions.

a. Wheel stops shall be reinforced precast concrete, 6'-0" long.

b. Locate wheel stops with a minimum setback of 3'-0" from fences, walls, and buildings.

c. Straight-line arrangement of wheel stops is preferred.

11. Placement of speed bumps in parking areas is allowed only in long driveways where it is necessary to protect pedestrians crossing the aisles.

12. Secure surface parking areas with an 8'-0" high fence or wall.

13. Provide aesthetically pleasing perimeter walls, fencing and planting.

14. Provide lighting levels for surface parking areas that will create a secure environment for nighttime users of school facilities.

C. VEHICULAR ACCESS AND PEDESTRIAN SAFETY

1. Ensure adequate and safe access for students, staff and visitors, walking, entering and circulating on the campus. Vehicle traffic patterns shall not interfere with major pedestrian traffic patterns. Foot traffic shall not pass through entrance driveways. Crosswalks must be clearly marked. Refer to the OEHS Traffic and Pedestrian Safety Requirements for New Schools at the following link:

http://www.laschools.org/employee/design/fs-studies-and-reports/file?file_id=2777980

2. In general, orient the primary site and building entrance toward the street with the least traffic volume and activity.

3. To optimize the traffic flow to and from the school site and to minimize traffic hazards to pedestrians, meet with representatives of the Los Angeles Department of Transportation (or other local traffic authority) early in the design process to review the schematic site design.

4. Provide safe and clearly indicated student drop-off and pick-up provisions by car or bus.

a. For new schools, provide on-site drive lanes or curb inset lanes for parent and bus drop-off and pick-up wherever space permits. Comply with ADA requirements for curb drop-off and site access as well as LAUSD's Office of Environmental Health and Safety's (OEHS) "Traffic and Pedestrian Safety Requirements for New School" requirements.

b. Provide the parent's student drop-off area adjacent to the main entry gate.

c. Locate the main gate in the farthest forward position along the curb to maximize curb space for stacking vehicles and to allow visual supervision of the greatest number of vehicles.

d. Provide adequate curb length for expected drop-off and pick-up traffic, with a minimum of 160 feet for Elementary Schools and 200 feet for Secondary Schools. Use curb cuts and inset drop-off lanes when site space permits.

e. Separate parent's student drop-off and bus loading areas to minimize traffic conflicts and to allow more effective supervision of waiting areas.

f. Locate bus drop-off space at a separate secondary entry or from a perpendicular street wherever possible. Provide adequate safe waiting space for students.

g. Provide adequate curb length for expected bus parking for drop-off and pick-up, with a minimum of 100 feet for Elementary Schools and 200 feet for Secondary Schools.

h. Locate bus drop-off areas for special education students in the same area as regular education students to provide equal access and the least restrictive environment.

i. Provide curb cuts for accessibility at both bus and automobile loading zones.

j. Provide appropriate "Passenger Loading" signs at all passenger loading zones.

5. Delivery and Utility Areas.

a. Provide vehicular access that does not jeopardize staff and student safety. Separate access from bus and parent loading areas and parking areas.

b. Delivery and utility vehicles shall have direct access from the street without crossing playgrounds or fields.

c. Isolate trash pick-up from student activities.

d. Design the trash pick-up area for maneuverability to accommodate 35 foot trash trucks. See Standard Technical Drawings for minimum requirements.

e. Delivery trucks are approximately 50 feet and need approximately 60 feet of turn radius. Design the Service Area to accommodate turn around, backing and forward movement of truck.

D. PARKING STRUCTURE SECURITY

1. Provide automatic Overhead Coiling Shutters for all parking structure entrances to prevent any unauthorized access once gates have been closed. Provide Separate Entrance and Exit Shutters with minimum 3'-0" space in between. Minimum width for each gate shall be 11'-0". The location of card readers in relation to shutters shall be designed to provide maximum security and proper gate operations. Adequate room for vehicles should be allowed for off street access to card reader.

2. Provide gates that shut immediately following the entrance of each car or pedestrian.

3. Entrance gate into parking structures shall be activated by Proxy Card Reader pads. Connect entry to Administration Clerical Offices, Adult School Office, and/or security personnel by 2-way speaking/listening device (see Section 3.8 "Electrical Communications and AV Systems").

4. Locate gate enclosure, motor, safety edge cords, and electrical power supply lines inside the secure garage structure and so that they are protected from access or vandalism.

5. Provide bollards to protect garage ventilation ducts, as well as other features, such as doors, gates, card readers, elevator lobby, etc.

6. Protect garage electrical, mechanical rooms and elevator lobby by raising 6 inches above garage floor (See Section 3.7.C.1.c for additional requirements).

7. Parking structures, whenever possible shall be designed to allow maximum degree of visual surveillance from outside the structure.

8. Parking structure design shall avoid creating dark corners or other spaces where assailants may conceal their presence.

9. Provide closed circuit television cameras encased for protection against vandalism, to link parking areas to a monitor in the Administration Clerical Office and in Adult School Office (see Section 3.8 "Electrical Communications and AV Systems").

10. Provide microphones throughout the structure linked to the Administration Clerical Office to monitor noises in the parking areas.

11. Provide lighting levels to create a safe environment for users at all times. Photoelectric devices in conjunction with the lighting control system controller shall control outdoor lighting. Subterranean and covered parking lighting shall be controlled via the lighting control system.

12. Provide adequate night lighting throughout the site, especially to and from parking areas.

13. Columns adjacent to parking spaces in parking garages shall be painted yellow or other bright contrasting color to increase visibility and avoid accidents.

14. Where subterranean parking is provided, the elevator should ideally come up into the administration area, or close to it.

2.4 ENVIRONMENT AND SUSTAINABILITY

A. GENERAL

B. NEW CONSTRUCTION (NEW SCHOOLS AND NEW BUILDINGS ON EXISTING CAMPUSES)

C. EXISTING FACILITIES (MODERNIZATION PROJECTS)

D. LAUSD RECOMMENDED CHPS POINTS

2.4 ENVIRONMENT AND SUSTAINABILITY

A. GENERAL

1. LAUSD is committed to sustainable or "high performance" design in all of its schools. A well-designed high performance school enhances student and teacher performance, reduces operating costs, and protects the environment. The LAUSD Board of Education recognized these advantages in its October 2003 High Performance Schools Resolution. The Resolution directs staff to **"continue its effort to ensure that every District new school and modernization project, from the beginning of the design process, incorporate high performance school criteria to the extent feasible."**

2. The District endorses the high performance school strategies defined in the Collaborative for High Performance School (CHPS) Best Practices Manuals, in particular "Volume II, Design," and "Volume III, Criteria" (available at www.chps.net).

3. High performance schools have the following characteristics:

a. **Optimal Lighting & Daylighting:** Research has repeatedly shown that students learn 20 to 30% faster in classrooms that take full advantage of daylight and optimum electric lighting. Daylight and electric light should be integrated and glare eliminated. Lighting should be "designed," not simply specified.

b. **Healthy Indoor Environment:** A healthy indoor environment is essential. According to the Environmental Protection Agency, indoor air is frequently up to five times more polluted than outside air. Children are particularly susceptible to indoor pollutants. The key factors are proper ventilation using outside and filtered air and low-emitting materials such as flooring, ceiling tiles and paint.

c. **Comfort:** Classroom comfort includes thermal, visual, and acoustic comfort. Thermal comfort ensures that students and staff are neither hot nor cold. Visual comfort means lighting that makes visual tasks easier and visual stimulation and a connection to the out-of-doors through the use of eye level windows. Acoustic comfort means teachers and students can hear one another because ventilation system and outdoor and indoor noise are minimized.

d. **Energy Efficiency:** Energy efficiency saves money while conserving nonrenewable resources and reducing pollution. Space conditioning systems should use high efficiency equipment, be "right sized" for the estimated demand, and include controls that boost system performance. Lighting systems should use high efficiency lamps and ballasts, optimize the number of light fixtures, incorporate controls that ensure peak system performance, and successfully integrate electric lighting and daylighting. Building shells must integrate and optimize insulation, glazing, shading, thermal mass, air leakage, and light-colored exterior surfaces.

e. **Water Efficiency:** Reducing indoor and landscaping water use minimizes the use of this scarce resource and saves money. Indoor strategies include water efficient toilets, non-water urinals, faucets, showerheads and appliances. Landscaping strategies include drought tolerant plants and water efficient irrigation systems.

f. **Storm Water Management:** Minimizing and cleaning stormwater runoff can further reduce water demand and help clean the Pacific Ocean.

g. **Outdoor Surfaces and Spaces:** Where practical schools should incorporate cool roofs, landscaping, teaching gardens, and high albedo paving materials in order to minimize heat island effects.

1) Care must be exercised to minimize glare.

h. **Environmental Materials:** Schools should incorporate materials and products that are durable, nontoxic, grown sustainably, have a high-recycled content, and can easily be recycled. Properly specified materials that can meet these goals include flooring (linoleum, carpet), ceiling tiles, insulation and concrete containing fly ash.

i. **Waste Management:** Schools should be designed with appropriate spaces for the storage and collection of recyclables. Construction and demolition waste should be recycled to the maximum extent feasible.

j. **Easy to Maintain & Operate:** Schools should be easy to use and maintain. Surfaces and equipment should be durable. Teachers should have control over classroom temperature and lighting, and, along with Maintenance and Operations staff, be trained in their effective use.

k. **Commissioned:** Commissioning helps ensure that schools operate as designed. Commissioning tests, verifies, and fine-tunes key building system performance so that it reaches the highest levels of efficiency.

l. **Schools That Teach:** Permanent educational displays that describe the school's high performance features further enhance learning. Schools can be tools that illustrate a wide spectrum of scientific, mathematic, and social issues. For example, mechanical and lighting systems can illustrate energy use and conservation, and daylighting systems can help students understand the sun's daily and yearly movements.

m. **Community Resource:** The most successful schools have a high level of parent and community involvement. Involvement can be enhanced by designs that facilitate the school's use for neighborhood meetings and other community needs.

B. NEW CONSTRUCTION (NEW SCHOOLS AND NEW BUILDINGS ON EXISTING CAMPUSES)

1. High Performance School (CHPS) Requirement

a. All new schools and new occupiable and conditioned buildings on existing campuses shall, at a minimum qualify as a CHPS project as defined in the version of CHPS "Best Practices Manual Volume III, Criteria", applicable at the time the project is submitted to the Division of State Architect (DSA). (CHPS Volume III is available at www.chps.net) All projects submitted to DSA after January 1, 2010 shall be either self certified or CHPS verified. Coordinate with Design Manager.

b. The District seeks to meet as many CHPS criteria as economically feasible. Defining characteristics are listed in Section A.3, above. Some are referenced in this "School Design Guide" as specific LAUSD requirements for new schools. Others are included in the CHPS Best Practices Manual, "Volume II, Design" and "Volume III, Criteria."

c. The District advocates an integrated "whole building" design approach to maximize the interactive effects of good practice and the District's criteria and requirements. Key systems and technologies must be considered together from the beginning of the design process, at preliminary schematic design and optimized for long-term performance.

d. Architect shall coordinate with District to maximize the high performance points from school's operation policy, and facilities standards. Architects shall submit a CHPS Scorecard at the following milestones:

1) **Schematic Design:** Forecast of CHPS points anticipated to be achievable supported by project Basis of Design and preliminary plans.

2) **Design Development:** Detailed account of CHPS points achieved in the school design with supporting references to specific narratives, plans, specifications and cut sheets in the submittal.

3) **Construction Drawings (50%):** Detailed account of CHPS points to be achieved in the school design with supporting references to specific narratives, plans, specifications and cut sheets in the submittal.

4) **Final Design (100% Construction Drawings):** Final accounting of CHPS points achieved with the signature of the registered project architect.

e. During the Construction Phase, the Architect shall have at least two meetings with the District's Representative, Contractor and Inspector to review, confirm and document, that the claimed points are being achieved, as designed: Final accounting of CHPS points achieved with the signature of the registered project architect shall be submitted at construction completion.

2. CHPS Specifics

CHPS Best Practices Manual "Volume III, Criteria" defines many prerequisites and optional credits that address a wide range of high performance design opportunities. The following topics address key areas of priority to the District.

a. Lighting and Daylighting

1) Electric lighting standards and control requirements are described in the Electrical Power and Lighting section of this "School Design Guide."

2) Adequate daylighting, integrated with electric lighting and controls, is required in all classrooms.

3) Lighting and daylighting shall be designed and calculated in accordance with the criteria and examples included in the Southern California Edison "Classroom Lighting Guidelines." For daylighting, this approach requires computer analysis – utilizing a CHPS-approved methodology (see CHPS "Volume III, Criteria, IEQ Credit Daylighting")

b. Energy Performance

1) By integrating the design of all building components to increase energy efficiency, the source energy requirement of each proposed new school shall be a minimum of 15% better than required by the California Energy Efficiency Standards (Title 24) in force at the time the project is submitted to DSA, unless compelling justification is provided to the District for a lower efficiency. Under no circumstances shall any new school perform less than 10% better than Title 24.

2) The Design Team shall study the use of renewable energy sources for all new schools and new buildings on existing campuses. The goal is for 50% - 100% of each new school's electricity or new building on existing campus to be provided by on site renewable energy. A feasibility study shall be submitted by the end of schematic design and shall determine the most cost effective renewable energy technology or combination of technologies, such as solar (photovoltaic), wind and solar hot water systems. A percentage weighted value of the school annual electrical energy consumption calculated for the Title-24 performance compliance

approach may be used as the basis of this study. The percentage value will vary for each building type and will be provided by the District. The study shall include the following as a minimum:

a) The description of technologies considered.

b) A discussion on the feasibility of each technology.

c) Supporting facts and figures.

d) Impact on the architecture, structure of the building(s), and site.

3) The renewable energy system shall be OFOI (Owner Furnished Owner Installed). However, A&E shall design the infrastructure required to support the selected system.

a) Photovoltaic: Grid interactive only (no battery backup) system with the following considerations.

(1) Building Considerations: It is recommended that mechanical PV panels be located on taller buildings with less equipment such as Multi Purpose, Gym, Lunch Shelter and Classroom Buildings, (if the equipment allows enough space), other structures such as stair case shelter or covered walkways shall be considered as well. Another consideration may be displacement of some of the conventional roofing product with building integrated PV modules, such as roof slates and standing seam metal roofing products.

(a) Building orientation to maximize system efficiency.

(b) Ensure the roof area or other installation site is capable of handling the desired system size.

(c) Locate the array to minimize shading from foliage, vent pipes, and adjacent structures.

(d) If roof mounted, verify that the roof is capable of handling additional weight of PV system. Augment roof structure as necessary.

(e) Roof mounted system shall include considerations for roof maintenance and access.

(f) System to be installed on taller buildings or areas where it is not accessible to students to prevent vandalism.

(2) System Design Consideration:

(a) Specify sunlight and weather resistant materials for all outdoor equipment.

(b) Design the system in compliance with all applicable building and electrical codes.

(c) Design the system with a minimum of electrical losses due to wiring, fuses, switches and inverters.

(d) Ensure the design meets local utility interconnection requirements.

(e) Properly ground the system parts to reduce the threat of shock hazards and induced surges.

(f) PV system equipment such as inverters shall be located in appropriate spaces. Take into consideration the necessity for air conditioning.

i. Avoid roof installation of inverters.

(g) Demand, KWh, KW, VAR, VARS meters shall utilize BACNET communication protocols. Provide connections between this the PV system and the Energy Management System.

(h) Specify equipment that has been approved by the California Energy Commission and listed in LAUSD standard specifications.

(i) Refer to 3.7.E for additional requirements.

(j) The renewable energy system shall be design to meet all state requirements, codes, utility company incentive programs requirements, and industry standards.

b) Wind Technology.

(1) Small Building mounted wind turbines may be a viable option depending on site location.

c) Solar Hot Water Systems. (not OFOI, Preferably as part of construction stage)

(1) Solar Hot Water Systems should be considered for pool heating as supplement to natural gas or Heat Pump Heating Systems.

c. Acoustics

1) Analyze the acoustical environment of the site (such as traffic) and the characteristics of planned building components (such as HVAC), and design to minimally achieve a classroom acoustical performance of 45 dBA background noise level (unoccupied with HVAC system on) or better (see CHPS "Volume III, Criteria," IEQ Prerequisite Minimal Acoustical Performance and Credit Improved Acoustical Performance).

2) While the desired performance target of 35 dBA may not be practicably achievable, the Architect shall explore innovative design options for obtaining its speech cognition goal with wall and ceiling reflective surfaces, strategically placed absorptive surfaces, and voice reinforcement systems.

3) For additional criteria, refer to the District's "Building Acoustical Requirements", Section 3.10.

d. Indoor Air Quality

1) Appropriate design strategies shall be utilized to ensure healthy indoor air quality (see CHPS "volume III, Criteria," IEQ Prerequisite Indoor Air Quality Minimum Requirements).The issues that shall be addressed include minimum outside air ventilation, HVAC design and air filtration, and moisture control.

2) During construction, steps must be taken to provide CHPS-mandated temporary construction ventilation; dust protection; product preconditioning; sequencing; vacuuming and duct cleaning; building flush-out; and post-occupancy ventilation (see CHPS "Volume III, Criteria," IEQ Prerequisite Indoor Air Quality Minimum Requirements).

e. Commissioning

1) The District will provide CHPS-compliant commissioning services for all new school building construction (see CHPS "Volume III, Criteria, Energy Prerequisite Fundamental Building Systems Testing and Training and Credit Enhanced Commissioning). The Architect shall assist the District-appointed Commissioning Agent as required, and incorporate in the Contract Documents the necessary provisions specifying the General Contractor commissioning-related tasks, including Division 1 to 33 Specification Section(s), Commissioning Plans, and other documents. Contact the District representative for further information.

2) The required "Basis for Design" must be complete with all design parameters, assumptions and criteria (not simply a reference to LAUSD design guidelines).

3) The following systems and assemblies will be commissioned:

a) Roof Top Units.

b) All equipment and controls of Heating, Ventilating, and Air Conditioning (HVAC) Systems.

c) Lighting Controls, including all equipment, light sensors, motion detectors, etc.

d) Dimming controls and interaction to lighting systems.

e) Domestic and process water piping and mixing systems.

f) Energy Management Systems.

g) Photo-Voltaic Systems.

h) Irrigation Systems.

i) Acoustical Performance.

f. Water Efficiency

1) To the maximum extent feasible, incorporate landscaping and interior water efficiency strategies as listed in Section A3e, above. Develop a water use budget for exterior and ornamental water use as specified in design Guide Section 3.9.D.1 Planting and Irrigation, Irrigation Design Requirements (see CHPS "Volume III, Criteria," Water Prerequisite Create Water Use Budget).

g. Storm Water Management

1) Utilize the LAUSD "Post-Construction Storm Water Management Plan" ("BMP Selection White Paper") and accompanying Check List for site planning for enhanced water quality and for the selection of appropriate Best Management Practices. (See also CHPS "Volume III, Criteria," Credits Limit Stormwater Runoff and Treat Stormwater Runoff.

h. Construction Waste Management

1) Establish a minimum non-hazardous construction and demolition debris recycling requirement of 75% by weight as defined in Specification 01 7419, Construction & Demolition Waste

Management (see also CHPS "Volume III, Criteria," Materials Prerequisite Construction Site Waste Management).

i. Materials

1) To the maximum extent feasible, specify CHPS-compliant low emitting materials (see CHPS Best Practices Manual "Volume III, Criteria," IEQ Credit Low-Emitting Materials). On its website, CHPS maintains a list of low emitting materials.

j. Educational Displays

1) Provide at least one permanent education display on the school site that describes the high performance features that are part of the school's design (see CHPS "Volume III, Criteria, Prerequisite Educational Display).

k. Showcase Schools

1) For specific schools or buildings, the District may elect to increase the utilization of CHPS "Best Practices" – especially those in "Volume III, Criteria" – to improve "green" performance and obtain incentive funding.

l. Incentive Programs

1) The Architect shall submit each project to the applicable high performance related incentive programs.

C. EXISTING FACILITIES (MODERNIZATION PROJECTS)

1. Overview

a. High performance strategies shall be integrated into all appropriate school modernization and addition projects. Defining characteristics are listed in Section A.3, above. The strategies detailed in CHPS "Best Practices Manual Volume II Design" shall be followed. Where appropriate, the CHPS "Best Practices Manual Volume III Criteria" prerequisites and credits shall be followed. Major modernization projects as defined in CHPS "Best Practices Manual Volume III Criteria," shall qualify as CHPS projects under the CHPS Volume III minimum standards and as defined in section B.

2. Specifics

a. Lighting and Daylighting

1) When designing classroom lighting and daylighting systems, seek opportunities to incorporate the criteria and examples included in the Southern California Edison "Classroom Lighting Guidelines."

b. Energy Performance

1) To the maximum extent feasible, all relevant projects shall incorporate energy efficiency measures. Whenever the building envelope (roofs, walls), electrical system, space conditioning or water heating system is upgraded, opportunities for improving energy efficiency shall be identified and implemented.

2) As required by the District, the Design Team shall study the use of renewable energy sources, ad feasibility of application to the project(s). Unless required otherwise by the District, the goal is for 50%-100% electricity on existing campus to be provided by renewable energy. A feasibility study shall be submitted by the end of schematic design and shall determine the most cost effective renewable energy technology or combination of technologies, such as solar (photovoltaic), wind and solar hot water systems. A percentage weighted value of the school annual electrical energy consumption calculated for the Title-24 performance compliance approach may be used as the basis of this study. The percentage value will vary for each building type and will be provided by the District. The study shall include the following as a minimum:

   a) The description of technologies considered.

   b) A discussion on the feasibility of each technology.

   c) Supporting facts and figures.

   d) Impact on the architecture, structure of the building(s), roofs, and site.

3) The renewable energy system shall be design to meet all state requirements, codes, utility company incentive programs requirements, and industry standards.

   a) Photovoltaic (PV): Grid interactive only (no battery backup) system with the following considerations.

      (1) Building Considerations: It is recommended that mechanical PV panels be located on buildings with less equipment such as Multi-Purpose, Gym, Lunch Shelter and Classroom Buildings, (if the equipment allows enough space), other structures such as stair case shelter or covered walkways shall be considered as well. Another consideration may be displacement of some of the conventional roofing product with building integrated PV modules, such as roof slates and standing seam metal roofing products.

         (a) Building orientation to maximize system efficiency.

         (b) Ensure the roof area or other installation site is capable of handling the desired system size.

         (c) Locate the array to minimize shading from foliage, vent pipes, and adjacent structures.

         (d) If roof mounted, verify that the roof is capable of handling additional weight of PV system. Augment roof structure as necessary. Address any necessary modifications and alterations to the roof.

i. Roof mounted systems shall include considerations for roof maintenance and access.

(2) System Design Consideration:

(a) Specify sunlight and weather resistant materials for all outdoor equipment.

(b) Design the system in compliance with all applicable building and electrical codes, and industry standards.

(c) Investigate the existing structural conditions to determine feasibility of structure to receive the PV panels; reinforce structure as needed. Provide structural analysis, calculations and construction details for DSA submittal and approval.

(d) Locate Inverters and other equipment in appropriate locations. Take into consideration the room's conditions, including necessity for air conditioning.

i. Avoid roof installation of inverters as much as possible.

(e) Design the system with a minimum of electrical losses due to wiring, fuses, switches and inverters.

(f) Ensure the design meets local utility interconnection requirements.

(g) Properly ground the system parts to reduce the threat of shock hazards and induced surges.

(h) Demand, KWh, KW, VAR, VARS meters shall utilize BACNET communication protocols. Provide connections between this the PV system and the Energy Management System.

(i) Specify equipment that has been approved by the California Energy Commission and listed in LAUSD standard specifications.

(j) Refer to 3.7.E for additional requirements.

c. Acoustics

1) Incorporate strategies to maximize classroom acoustics in all projects that impact classroom acoustics, such as space conditioning systems, exterior and interior walls, and floor, ceiling and wall finishes.

d. Water Efficiency

1) To the maximum extent feasible, incorporate interior and landscaping water efficiency strategies as identified in Section A3e, above.

e. Storm Water Management

1) Utilize the LAUSD "Post-Construction Storm Water Management Plan" ("BMP Selection White Paper") and accompanying Check List for site planning for enhanced water quality and for the selection of appropriate Best Management Practices.

f. Construction Waste Management

1) Establish a minimum non-hazardous construction and demolition debris recycling requirements of 75% by weight as defined in Specification 01340, Construction & Demolition Waste Management (see also CHPS "Volume III, Criteria, Materials Prerequisite.

g. Materials

1) To the maximum extent feasible, specify CHPS-compliant low emitting materials (see CHPS Best Practices Manual "Volume III, Criteria," IEQ Credit Low-Emitting Materials). On its website, CHPS maintains a Low Emitting Materials Table listing compliant materials.

h. Commissioning

1) The District will determine which modernization and expansion projects will provide CHPS-compliant commissioning services (see CHPS "Volume III, Criteria, Energy Prerequisite Fundamental Building Systems Testing and Training and Credit Enhanced Commissioning). The Architect shall assist the District-appointed Commissioning Agent as required, and incorporate in the Contract Documents the necessary provisions specifying the General Contractor commissioning-related tasks, including Division 1 to 33 Specification Section(s), Commissioning Plans, and other documents. Contact the District representative for further information.

2) The required "Basis for Design" must be complete with all design parameters, assumptions and criteria (not simply a reference to LAUSD design guidelines).

3) The following systems and assemblies will be commissioned:

   a) Roof Top Units.

   b) All equipment and controls of Heating, Ventilating, and Air Conditioning (HVAC) Systems.

   c) Lighting Controls, including all equipment, light sensors, motion detectors, etc.

   d) Dimming controls and interaction to lighting systems.

   e) Domestic and process water piping and mixing systems.

   f) Energy Management Systems.

   g) Photo-Voltaic Systems.

   h) Irrigation Systems.

   i) Acoustical Performance.

i. Incentive Programs

1) The Architect shall submit each project to the applicable high performance related incentive programs.

D. LAUSD RECOMMENDED CHPS POINTS

LAUSD has determined the following categories and points to be readily achievable in new construction and major modernization projects. The following table provides a summary of recommended points. Refer to LAUSD CHPS Score Card for additional information and requirements. The score card can be accessed via the following link:

http://www.laschools.org/employee/design/fs-studies-and-reports/file?file_id=226118933

CLASS (CHPS PTS.)	CREDIT NUMBER	CREDIT TITLE (POTENTIAL POINTS)	LAUSD RECOMMENDED POINTS
LEADERSHIP, EDUCATION AND INNOVATION (1 prerequisite; 13 possible points)			
Leadership (4 pts.)	LEI 1.1	District Level Commitment	1
	LEI 1.2	Integrated Design	2
Schools as Learning Tools (1pts.)	LEI 2.0	Educational Display (Prerequisite)	Mandatory
	LEI 2.1	Demonstration Areas	1
Innovation (8 pts.)	LEI 3.1	Innovation	0
	LEI 3.2	Design for Adaptability, Durability and Disassembly	0
SUSTAINABLE SITES (2 prerequisites; 14 possible points)			
Site Selection (5 pts.)	SS1.0	Code Compliance (Prerequisite)	Mandatory
	SS1.1	Environmentally Sensitive Land	1
	SS1.2	Central Location	1
	SS1.3	Joint Use of Facilities	1
	SS1.4	Joint Use of Parks	0
	SS1.5	Reduced Footprint	1

Transportation (3 pts.)	SS2.1	Public Transportation	1
	SS2.2	Human Powered Transportation	1
	SS2.3	Parking Minimization	1
Stormwater Management (2 pts.)	SS3.0	Construction Site Runoff Control (Prerequisite)	Mandatory
	SS3.1	Limit Stormwater Runoff	1
	SS3.2	Treat Stormwater Runoff	1
Outdoor Surfaces & Spaces (3 pts.)	SS4.1	Reduce Heat Islands – Landscaping Issues	1
	SS4.2	Reduce Heat Islands – Cool Roofs	1
	SS4.3	School Garden	1
Outdoor Lighting (1 pt.)	SS5.1	Light Pollution Reduction	0
WATER (1 prerequisite; 9 possible points)			
Outdoor Systems (4 pts.)	WE1.0	Create Water Use Budget (Prerequisite)	Mandatory
	WE1.1	Reduce Potable Water Use for Non-Recreational Landscaping Areas	1
	WE1.2	Reduce Potable Water Use for Recreational Area Landscaping	1
	WE1.3	Irrigation Systems Testing and Training	1
Indoor Systems (4 pts.)	WE2.1	Reduce Sewage Conveyance from Toilets and Urinals	1
	WE2.2	Reduce Indoor Potable Water Use	2
Water Efficiency (1 pt.)	WE3.1	Water Management System	1
ENERGY (2 prerequisites; 29 possible points; At least 2 points required)			

Energy Efficiency (22 pts.)	EE1.0	Minimum Energy Performance (Prerequisite)	Mandatory
	EE1.1	Superior Energy Performance	5
	EE1.2	Energy Conservation Interlocks	0
	EE1.3	Natural Ventilation	0
	EE1.4	Energy Management Systems	0
Alternate Energy Sources (5 pts.)	EE2.1	On Site Renewable Energy	0
Commissioning & Training (2 pts.)	EE3.0	Fundamental Commissioning (Prerequisite)	Mandatory
	EE3.1	Enhanced Commissioning	2
CLIMATE (8 possible points)			
Greenhouse Gas Emission Reduction (3 pts.)	CL1.1	Climate Change Action	0
Greenhouse Gas Emission Reduction (5 pts.)	CL2.1	Grid Neutral	0
	CL2.2	Zero Net Energy	0
MATERIALS AND WASTE MANAGEMENT (2 prerequisites; 18 possible points)			
Recycling (P)	ME1.0	Storage and Collection of Recyclables (Prerequisite)	Mandatory
Construction Waste Management (2 pts.)	ME2.0	Minimum Construction Site Waste Management (Prerequisite)	Mandatory
	ME2.1	Construction Site Waste Management	1
Building Reuse (3 pts.)	ME3.1	Building Reuse -Structure and Shell	0
	ME3.2	Building Reuse - Interior	0

		Non- structural Elements	
Sustainable Materials - Single Attribute (7 pts.)	ME4.1	Recycled Content	1
	ME4.2	Rapidly Renewable and Organically Grown Materials	0
	ME4.3	Certified Wood	0
	ME4.4	Salvaged Materials	0
INDOOR ENVIRONMENTAL QUALITY (4 prerequisites, 25 possible points)			
Lighting and Daylighting (6 pts.)	EQ1.1	Daylighting	2
	EQ1.2	View Windows	1
	EQ1.3	Electric Lighting	1
Indoor Air Quality and Thermal Comfort (16 pts.)	EQ2.0A	Minimum HVAC and Construction IEQ Requirements (Prerequisite)	Mandatory
	EQ2.0B	ASHRAE 55 Thermal Comfort Code Compliance and Moisture Control (Prerequisite)	Mandatory
	EQ2.0C	Minimum Filtration (Prerequisite)	Mandatory
	EQ2.1	Enhanced Filtration	0
	EQ2.2	Low-Emitting Materials	3
	EQ2.3	Ducted Returns	0
	EQ2.4	Thermal Displacement Ventilation	1
	EQ2.5	Controllability of Systems	2
	EQ2.6	Chemical and Pollutant Source Control	1
	EQ2.7	Mercury Reduction	0
Acoustics (3 pts.)	EQ3.0	Minimum Acoustical Performance (Prerequisite)	Mandatory

	EQ3.1	Improved Acoustical Performance	0
TOTAL RECOMMENDED POINTS			**43**

Book Three
Technical Criteria

3.0 TECHNICAL CRITERIA

3.1 ARCHITECTURAL

A. GENERAL REQUIREMENTS

B. MATERIALS AND FINISHES

C. MODERNIZATION AND ALTERATIONS

D. HISTORIC PRESERVATION

3.1 ARCHITECTURAL

A. GENERAL REQUIREMENTS

1. Architectural Discipline

a. The architectural personnel must review all sections of the School Design Guide and coordinate the requirements of the different disciplines. If discrepancies are found, bring them to the attention of the District's authorized representative for resolution.

b. Refer to the District "Guide Specifications" for materials and installations approved by the District. Unless approved in writing by the District, project specifications shall utilize the District "Guide Specifications" provided and approved by the District to specify materials, equipment and installations. The District "Guide Specifications" shall be edited to reflect the conditions and requirements of each specific project. Refer to section 1.2, Submittal Requirements, J, General Drawings and Specifications Requirements.

2. Other Design Disciplines

a. There are requirements in this section that affect the requirements for the other design disciplines. The architectural discipline is responsible for the compliance and coordination of all work, the architectural personnel must assure the full communication of design conditions and requirements to the other disciplines and be certain the other disciplines are in compliance. (Examples include requirements for insulation, monolithic single glazing, and room-surface reflectances.) In return, the architectural personnel must be familiar with the requirements for the other disciplines to be certain their needs are incorporated into the design. (Examples include amply sized relief air openings at each classroom, fire-protection measures where ducts or raceways penetrate fire-resistive walls, protective enclosures for exposed valve assemblies or control devices, and location of large noise-generating equipment remotely from classrooms.)

3. Seismic Bracing and Anchorage

a. Assure provision of seismic restraints, anchorage or bracing, for all casework, display cases, equipment, signage, or special finish materials (e.g., suspended ceilings), including Owner Furnished items, in accordance with requirements of the California Building Code.

B. MATERIALS AND FINISHES

1. General

a. Materials shall be sustainable, affordable, durable, aesthetically pleasing, and require minimal cleaning and maintenance.

b. Avoid complicated special details.

c. Use standard systems and materials in standard sizes produced and readily available from manufacturers based in the United States.

d. Use vandal-resistant and graffiti-resistant materials and finishes.

e. Provide non-slip surfaces for all exterior paths of travel and for interior floor areas specifically subject to wetting.

f. Building features (such as grilles, pipes, ducts, or similar elements) that are accessible to vandalism shall be finished to blend with the building exterior to avoid creating attractive targets.

g. When more than one item of material or equipment are specified (as in "three or more manufacturers"), provide adequate facilities and coordination to assure that all spaces are sized to accommodate any item specified and that structural, mechanical and electrical elements will provide adequate support to any of the items.

h. Avoid materials and details with sharp, jagged edges and rough textures, especially near entrances and circulation pathways. Finishes of surfaces within vandalism reach shall be paintable.

i. Intumescent paint may not be used unless approved by the District. Do not use Intumescent paint where it is accessible or susceptible to vandalism. Vandalism such as scraping, graffiti, etc. can compromise integrity of Intumescent paint and become a maintenance problem.

j. EIFS (Exterior Insulation and Finish Systems) may not be used unless approved by the District. If approved, high impact products must be used where accessible or susceptible to vandalism.

2. Site Elements

a. Provide one 35'-0" high flagpole at each school, with one-story buildings or 50'-0" high flagpole at each school with two-story buildings or higher.

b. Show location and provide details for school signage and electronic display marquee. Keep signs above Students' reach.

c. If flag pole is located in the landscaped area, a concrete pad around the pole and access to it shall be provided.

3. Concrete

a. Provide vapor barriers for slabs on grade throughout building. Refer to Guide Specification section Cast-in-Place Concrete. Concrete slabs shall be poured directly over vapor barriers, set over sand, as recommended by ACI 302.1R-04. Concrete slabs shall not be poured directly over the sand fill, since wet or saturated fill above the vapor retarder can significantly increase the time required for a slab to dry to levels required by the manufacturers of floor coverings and adhesives.

b. Provide adequate control and expansion joints for walkways, curbs, retaining walls, etc.

4. Metals

a. Typical handrails are constructed of 1-1/2 inch diameter metal pipe. Exterior handrails are to be unpainted galvanized steel pipe. Handrails may be powder coated provided they are designed in a manner that will not require field welding installation. Interior handrails may be powder coated steel. Handrails shall be designed in such a way or have skate deterrent devices installed to deter skateboarders or students from sliding down them while maintaining ADA handrail requirements.

b. Use 12- to 14- gage galvanized steel or extruded aluminum for exterior louvers, 16-gage for interior.

c. Use galvanized chain link fencing and gates for all fencing except for main entries, or special public exposures where more decorative fencing would be appropriate (with District approval).

d. Do not use metal siding in areas less than ten feet above grade where it might be vandalized by graffiti, damaged by impact, or subject to heat gain that could cause injury to students or staff.

e. Guardrails:

1) The California Building Code requires guardrails at unenclosed floor and roof openings, open and glazed sides of stairways and ramps, balconies or porches, which are more than 30 inches above grade or floor below. Roofs used for other than service of the building shall be protected by guardrails.

2) The Code states that the top of the guardrails shall not be less than 42 inches in height. However, the architect should determine the appropriate height necessary to provide security for the students particularly in high traffic areas such as stair landings that serve a large volume of students or where a turn in direction is required.

3) Roof areas, service areas or other buildings areas that would be accessible to students by climbing over a guard, must be protected by an appropriate barrier that will prevent students from accessing these areas.

4) Typical guardrails are constructed of 1-1/2 inch diameter galvanized metal pipe (as describe in the CBC). Flat top rails wider than 2 inches that might encourage sitting or placement of books or other objects should not be used. Guardrails that are placed on curbs must be designed so that the curb cannot be used as a step by students.

5) Guardrails must be designed to resist kicking and other abuse. Open guardrails shall have intermediate rails or an ornamental pattern such that a sphere 4 inches in diameter cannot pass through. Intermediate rails and ornamental patterns should be designed so that they do not provide a "ladder" for students to climb on. Vertical pickets spaced 4 inches on center, a metal mesh material that complies with the CBC, or a low wall should be installed.

f. All exterior exposed steel, including structural members, shall be galvanized.

g. Refer to 3.3, Structural Engineering, for finishes of structural steel.

5. Wood

a. Do not use wood trims, fascias, moldings, etc. except for Existing Facilities projects where it is necessary to match existing.

b. Specify grade and finish for all exposed wood to minimize maintenance where wood is being specified.

c. For additional information on finish carpentry and architectural woodwork, see, Guide Specifications.

6. Thermal & Moisture Protection

a. Slope roofs at a minimum of 1/2" per foot to roof drains. Clearly show drainage patterns and elevations on roof and discharge areas.

b. Use roofing material meeting UL requirements for Class "A" fire rating.

c. The roof system shall meet the FM 1-90 wind uplifting rating.

d. Roof system shall meet the "Cool Roof" criteria, as outlined in the California Energy Code Section 118.

e. Avoid the use of pitch pans for roof penetration flashing. All roof types have specific details for all types of roof penetrations. Consult with manufacturer for specific details.

f. All roof penetrations including, but not limited to; equipment platforms plumbing vents and base flashings are to be a minimum of 8" above the finished roof level.

g. At concrete floor slabs on grade provide, as a minimum quality standard, a vapor barrier of Polyolefin based 15 mils minimum thickness, meeting or exceeding ASTM E1745, 10 feet minimum width with taped or sealed joints, 2 inches of sand below, over 4" of select gravel drainage fill.

h. Do not use interior downspouts and gutters without District authorization.

i. Do not project downspouts into pedestrian areas.

j. Direct downspouts into planting areas or other site elements that will reduce or slow storm-water runoff from the site. Special attention shall be given to planter details to divert the water away from the building and the building's foundation.

k. On structures with sloped roofs, provide gutters, downspouts and other associated accessories as required to facilitate efficient water runoff and ensure adequate drainage.

l. Avoid running conduit and piping on the roof. Where it is unavoidable, the length shall be minimized and shall be detailed appropriately to accommodate roof replacement. All conduits on roof should be braced on lightweight blocks. Do not use wood blocks since they hold moisture, which will seep to roof membrane.

7. Doors and Entryways

a. Door swings shall not overlap, conflict or otherwise interfere with use of adjacent doors or other areas requiring access.

b. Door stops shall be provided for all doors. Doors and stops (within 4" of wall face) shall be located at least half of the door width away from the hinges in order to prevent racking of the door frame.

c. Locate doors to accommodate swing, however, if the door swing is less than 180°, a wing wall or other architectural element shall be designed to eliminate trip hazards created by the door stop.

d. Exterior doors shall be out-swinging and protected by a covered walk or canopy with appropriate roof drainage.

e. All exterior entrances shall be designed to allow safe access during stormy weather (rain, hail, ice, etc.) by providing a non-slip, code-compliant, sloped-for-drainage walking surface.

f. Exterior balcony entryways:

1) Provide security at entries to balconies to prevent unauthorized access when school is closed.

2) Provide slopes and drainage means for washing down of balconies.

g. At all major or frequently used entries, including doorways directly from the outdoors to any habitable school room, provide walk-off mats to reduce the amount of dirt, dust, pollen and other particles entering the building. Walk-off mats shall be securely adhered to the floor.

h. Configure major entry approaches to channel foot traffic away from dirt and grass areas for at least the last fifteen to twenty feet prior to entering the building.

i. Do not provide glazed openings in exterior doors, unless glass light is adequately protected with a security screen.

j. Provide concrete slab or equivalent surfacing outside of all exterior doors, of width sufficient to take doorstop when door is opened 180 degrees against building wall.

k. Door frames and cased openings shall be hollow metal.

l. Use solid-core wood doors at interior and overhead-protected exterior openings, except where fire-ratings require hollow-metal doors. Do not use hollow-metal doors for classroom doors in one-hour fire-rated walls.

m. Use insulated hollow-metal steel doors at unprotected or minimally protected exterior openings, and where fire-protection rating requires them.

n. Use paint-grade doors, except in areas of low abuse with special design conditions (administration areas, for example) where stain-grade may be used.

o. Double doors at building exteriors shall have a removable center jamb for more secure engagement of the locking mechanism.

p. Interior double doors should not have a removable center jamb.

q. Panic hardware on wood doors shall be surface mounted with no bottom rod.

r. Plan doors to avoid interference with drinking fountains, downspouts, light fixtures, walk ramps, and other components or equipment.

s. Do not locate exterior doors adjacent to windows or window areas that can be broken to provide access to door hardware.

t. Provide bug sweeps on doors to food preparation areas.

u. Do not use electric door openers for ADA accessibility without prior District approval in writing.

v. The District "Guide Specification" for finish hardware is extremely comprehensive and must be edited carefully by an experienced hardware specifier for each project. Contact the District authorized representative to obtain the manufacturer of the lockset cylinder that will be furnished by the District for each project.

w. For parking structure doors see Section 2.3 - D "Parking Structure Security".

8. Windows and Openings

a. Windows shall be aluminum or steel.

b. Use of Hollow-Metal (HM) windows is not acceptable for exterior use due to districts experience with HM window leaks. HM windows are acceptable in interior applications only.

c. Windows preferably shall be double-hung, single-hung, or projection type.

d. Projection and casement windows shall not intrude into circulation areas to cause a hazard.

e. Provide a minimum of one operable 30"-wide window in each classroom that can be used both for emergency ventilation and for emergency egress. This window shall have a minimum clearance opening of 6 square feet. Maximum sill height for egress window shall be 44 inches above interior finish floor. Emergency exit windows shall not be projecting type. Where security grille is not required, emergency windows could be a breakable or removable tempered glass identified as emergency egress window, provided the ventilation requirements are met. Refer to Guide Specification section 10 1400, for signage requirements.

f. Provide roof-top anchors to support window-washing equipment for washing of windows above the second floor, unless it can be demonstrated that windows can be safely washed from inside or via an extension ladder. They must be provided for buildings higher than four stories or 48 feet above exterior grade (Title 8, General Industrial Safety Order).

g. In all schools, the minimum window sill height shall be 3'-0" above floor for classrooms located above first floor.

h. Do not use large glazed openings. Whenever glazed openings are used the maximum thickness shall be ¼" insulation glass and shall not exceed 48"x72", and 150 pounds for a single piece of glass.

i. Security: All windows accessible from the exterior shall have special security measures to prevent building access by breaking glass and entering through the window or by reaching door or window hardware. Accessible windows include any windows with bottom sills less than ten feet above grade, balconies, roofs with any portion lower than ten feet, or other access points.

1) All panels of security screen shall be operable to allow window cleaning. One of the security screen panels should coincide with the window emergency egress.

2) Operable windows with latching mechanism shall be protected to prevent vandalism and entering.

j. Do not locate windows or sidelights within reach of door hardware.

k. Glazing: To optimize both daylighting and energy conservation, use monolithic ¼ -inch glass with a Visible Light Transmittance (VLT) of approximately 65% and a Solar Heat Gain Coefficient (SHGC) of approximately 0.50. (These glasses typically have a blue-green tint.) Other glazing combinations may be considered by the District if they can be justified with life-cycle cost and energy savings. Glass color is limited to: arctic blue, solex, light gray 14, light gray 31, solar cool bronze, and standard gray.

l. Storefronts: Avoid the use of storefront type window systems where they are susceptible to vandalism. Consider in the design locations for required signage.

m. Do not use insulating glass (dual- or triple-glazed) without life-cycle-cost and energy-saving justification and District approval. The maintenance cost for replacement is excessive.

n. If justified by acoustic considerations, laminated glass may be used. Do not use thermal insulating dual glazing for noise abatement – it doesn't work. Special acoustical glazing may be used where needed and must be designed by an Acoustical Consultant.

o. For daylight factor required in classrooms see Section 2.4, "Environment and Sustainability" of this guide. To achieve specified daylight factor, it may require both high windows and interior and/or exterior light shelves (to reflect daylight onto the ceiling and to block direct sunlight on desktops). Exterior light shelves must be designed to prevent bird roosting.

p. Stops shall be removable only from interior using vandal proof screws. Exterior stops shall be integral with frame.

q. Insect screens must be installed on all operable windows in food preparation areas.

r. For light control, provide room-darkening venetian blinds on all classroom windows, multi-purpose, library and other spaces with windows to be used for video presentations Provide motor operated blinds or shades for high windows and clerestory windows.

s. For most classroom HVAC systems, a large, louvered air-relief opening must be provided in the exterior wall of each classroom (and sometimes a smaller outside air intake opening). These openings must be recognized, and incorporated into the design of the façade. (Ducting classroom air relief to exhaust fans is not acceptable, both for energy efficiency and acoustical reasons.)

9. Acoustical Ceilings

a. Sound absorption provided by ceilings is the major provider of reverberation control in classrooms and other spaces. In addition, ceilings provide a major part of the illumination in classrooms and other spaces with indirect lighting. These factors influenced the selection of the following criteria, and must be recognized in the design of instructional spaces.

b. In most classrooms, 90% to 100% of the area has a suspended acoustical ceiling. The ceiling tiles in classroom ceilings shall have the following characteristics:

1) Noise Reduction Coefficient (NRC): 0.70.

2) Light Reflectance: 0.83.

c. In classrooms that do not have suspended acoustical ceilings, provide equivalent sound absorption by other means.

d. Suspended Ceiling Construction:

1) Provide seismic bracing for all suspended ceiling grid components and lighting fixtures.

2) Provide adequate clearance for all beams, piping, cable trays, ducts, and fixtures located above suspended ceilings.

3) Provide adequate clearance for maintenance and repair of utility system components and support elements located above suspended ceilings.

4) Ceiling tiles that provide access to serviceable equipment shall be appropriately marked with a tab or other indicator.

5) All wiring above ceilings must be in raceways, except that low-voltage wiring may be supported by hangers in an organized manner – not on the ceiling grid.

10. Finishes

a. Exterior stucco, concrete block, or similar finishes that are accessible from grade or are otherwise graffiti-susceptible shall be painted to match integrally colored stucco and separated by control joints so that each area does not exceed 144 s.f., per the Plastering Institute's, Technical Services Information Bureau recommendation. Also, so that each area can be easily repainted to cover graffiti and that slight differences in paint color will not look patched. Plaster finish shall not be heavily textured. Light to medium dash or fine sand float are preferred. Very smooth, steel trowelled finish is not permitted. CBC accessibility regulations require that wall surface adjacent to handrails be free of sharp or abrasive elements.

b. Integral color and split face block shall not be located in vandalism prone areas.

c. Exposed, painted or stained concrete is not allowed as floor finish in classrooms or kitchen areas.

d. Provide carpet appropriately only at administration and library areas.

e. Provide ceramic tile floors and wainscots at student's restrooms. Ceramic tiles shall be extended up to the ceiling in Middle School and High School boys and girls restrooms. In Elementary Schools the wainscot shall be extended to the top of partitions. Staff restrooms shall have a 6" tile base.

f. Provide quarry tile floors set on mortar bed and base throughout food service areas. Thin set quarry tile is acceptable for kitchen modernizations.

g. In corridors finished with drywall, provide abuse and impact resistant gypsum board.

h. For ceilings over 10'-0" in height, lay-in acoustical panel tiles shall be limited in size to 4 square feet (2' x 2').

i. Provide clips for acoustical ceiling panels. Do not use acoustical tile in restrooms, locker rooms and stairways.

j. For flooring in instructional areas and corridors, use medium color and tone (light colors are difficult to maintain).

k. To comply with the District's lighting standards, provide reflectance values of 83% for ceilings, 60% for walls, and 20% for floors.

l. Provide gypsum panel sheathing substrate for installation of exterior Portland Cement Plaster, except where plywood sheathing is being used for structural reasons.

m. Provide 4'-0" high ceramic tile wainscot on walls adjacent to the sink in the hopper room.

n. Ceramic floor tiles shall be set on mortar bed. Thin set ceramic floor tile is acceptable for modernization of restrooms at existing buildings. Ceramic tiles in restroom walls may be installed on cementitious backer board, however, in wet areas (such as showers) the ceramic tile walls shall be installed on mortar bed.

o. Shower Rooms – Walls shall be ceramic tile over full grout bed. Ceiling shall be ceramic tile or cement plaster with smooth finish.

p. Locker Rooms – Walls shall be CMU, cement plaster, ceramic tile or high impact / abuse resistant gypsum board. High impact / abuse resistant gypsum board only needs to be in exposed areas and not behind lockers.

q. Locker Rooms - Floor shall be concrete with non-slip, non abrasive finish with hardening, sealing and dustproofing compound.

11. Colors

a. Color selection needs to take into consideration community sensitivities, gang presence, etc.

b. Because the classroom becomes a background for the display of students' work, color schemes should be simple and minimal.

c. In general, limit the number of interior paint colors to six for smaller schools. In individual classrooms, limit the number of different paint colors to two, and the number of different classroom color schemes to two or three.

d. When using bold colors, limit them to trim or accent features.

e. In selecting colors of factory-finished items, such as folding partitions, folding tables, benches, lockers, etc., use reasonably neutral colors to allow flexibility for future color-scheme changes.

f. Ceilings, in general, shall be white, and especially in classrooms, restrooms, and similar rooms.

g. Paint color changes should utilize natural breaks such as reveals.

h. Use gloss paint for bathrooms and kitchen areas, and semi-gloss for classrooms and corridors.

12. Specialties

a. Casework shall conform to the Architectural Woodwork Standards adopted by Woodwork Institute (WI).

b. In display cases, avoid large glass sizes at hazardous locations, or glass below 3'-0". Display case doors shall be laminated glass without frames and provided with locks. Provide illumination of display cases.

c. Ensure that mirror heights are proper height for various areas and grade levels.

d. Provide a large directory board with map at or near main entry. Show layout of buildings, offices and special facilities in order to orient school visitors.

e. At all building entries provide walk-off mats as Indoor Air Quality (IAQ) measure to reduce source pollution. Walk-off mats shall be securely adhered to the floor.

f. Provide full height stainless steel corner guards to protect corner edges of interior corridors, stairways and high abuse areas.

g. Dimensions for knee clearance in counter-mounted sinks with cabinet doors concealing the accessible knee space must account for protrusions of surface mounted hinges and cabinet latches, where they occur.

h. Provide locks on all cabinet doors and drawers.

13. Roof Access

a. Unless accessible by stair, provide ladder to roof from interior spaces such as mechanical, custodial or other spaces not accessible to students. Ladder shall not interfere with operation of space or reduce its required square footage. Exterior ladders are not acceptable.

14. Conveying Systems

a. Elevators shall comply with Access Compliance requirements and be located centrally and adjacent to main building entry, as practical, to minimize the travel distance to disabled persons.

b. Except as required for the elevator itself, no electrical, plumbing, or mechanical items shall be housed in elevator shaft, pit, or machine room or pass through these spaces to serve any other part of the building.. No hatches or access panels to reach or serve other areas of the building shall be located in the elevator shaft, pit or machine room.

c. Design pit to prevent water from entering through walls or floor.

d. In pits over 36" in depth, a permanently installed galvanized steel ladder is required per ASME A17-1.

e. Machine room-less elevators should not be used since they can only be serviced by the installing company.

f. Holeless elevators should not be used. If water table is high use traction elevators. At locations where an in-ground ram cannot be installed use a rope-hydraulic or traction elevators for 4 stops or less.

g. Provide an access card reader at each hoistway opening per Guide Specification section 28 1343, Access Control Identification Management System. Hoistway access switches are not acceptable.

15. Fall Protection

a. Design fall protection systems as required by code and CAL OSHA to eliminate fall hazard.

b. Protection system shall include but not limited to stair floor openings, ladder floor opening, roof hatch, skylights, etc.

c. Consider solutions for normal maintenance tasks on canopies, lunch shelters, covered walks, and the like.

C. MODERNIZATIONS AND ALTERATIONS

1. General

a. In all work at existing facilities, it is critical to visit the Site and to assess existing conditions. Field verify accuracy of any Record Documents or As-Built Documents, to the extent possible, prior to commencing the work.

b. Refer to the asbestos and/or lead reports. When planning work at existing sites the architect shall be aware of the potential presence of asbestos and lead. Work in such areas require coordination with the District's authorized representative.

2. One Hour Corridor Requirements

a. In major alteration projects to existing schools, exit corridors must be brought into compliance with current code requirements for one-hour construction.

b. Existing wood door frames may remain in corridors with automatic fire sprinkler systems. If fire sprinklers are not used, replace wood frames with hollow metal frames designed so that rough opening does not have to be reframed. Door opening may have to be widened to meet ADA requirements.

3. Exit Stairs

a. Interior stairways serving three or more floors shall be enclosed in one-hour fire rated construction.

b. Existing open exterior stairs shall be reviewed with DSA to develop acceptable methods of compliance.

c. Fire sprinkler systems for the entire building may be an acceptable substitute for stair enclosure.

4. New Suspended Ceilings

a. Where new suspended ceilings are provided in existing corridors or classrooms, the method of installation must be clearly detailed and acceptable to DSA.

b. If the existing ceiling is part of one-hour fire resistive construction, penetrations or partial removal must maintain one-hour construction.

c. Verify that existing construction will support new ceiling and lighting fixtures.

d. Provide structural support for all new ducts, piping and air conditioning equipment.

5. Coring or Saw-Cutting Existing Concrete and Masonry

a. Responsible structural engineer shall approve locations of core holes or saw-cut openings in walls or floors of existing concrete or masonry structures for alteration work, air conditioning ducts, fire sprinkler piping, or other work.

6. Air Conditioning Units Above New Ceilings

a. Where air conditioning units are concealed above new ceilings, provide service access.

b. Coordinate size, location and type of access panel with location and requirements of air conditioning unit specified.

c. Access for filter replacement or other frequent service, should be hinged panels or lay-in material less subject to damage than acoustical ceiling panels, such as perforated metal panels. (Occasional access may be through acoustical lay-in panels in a suspended T-bar grid ceiling.)

D. HISTORIC PRESERVATION

1. General

a. Retain and preserve the historic character of a building, structure or site.

b. b. Distinctive architectural features or examples of skilled craftsmanship that characterize a building shall be treated with sensitivity.

c. c. Reinforcement required for structural stability or the installation of life safety or mechanical systems shall be concealed.

d. Surface cleaning of historic structures shall be undertaken with the gentlest means possible. Avoid sandblasting and chemical treatments.

e. Copy of the report identifying historical sites can be found at: http://www.laschools.org/employee/design/fs-studies-and-reports/file?file_id=1895944

3.2 CIVIL ENGINEERING

A. GENERAL REQUIREMENTS

B. DEMOLITION

C. GRADING

D. PAVING

E. STORM AND SANITARY DRAINAGE

F. WATER DISTRIBUTION

G. OFF-SITE CHECKLIST

3.2 CIVIL ENGINEERING

A. GENERAL REQUIREMENTS

1. The civil-engineering site design and documents must realistically implement the provisions of the overall site design, integrating the requirements of buildings, walls and fences; grading and paving; storm-water management; utilities (including gas, electrical and communication network distribution locations); earth and soil requirements (including compaction, modification, topsoil, and mitigation of hazardous ground conditions); as well as all offsite work related to the project, including streets, driveways, walks, utilities connections, and other off-site development.

2. All such work shall be clearly delineated, located and dimensioned (horizontally and vertically) to the appropriate site reference, as part of the work of this discipline, and all utilities points-of-connection (POC) clearly shown and located..

3. Work shall be performed and systems installed in accordance with the current California Building Code (CBC – part of California Code of Regulations, Title 24), California Plumbing Code, District "Guide Specifications," other chapters of this "School Design Guide," and District Standard Technical Drawings. Coordinate especially with utilities criteria of chapter "3.4 Plumbing."

4. The District will provide the Architect-Engineer with a current site boundary and topographic survey, with encroachments, and including adjoining streets and properties and on-site and public utilities line locations, sizes and elevations. Other site plans or site information that may exist is available in the District office for consultants' research. The Architect must visit the site to verify the indicated information and to obtain information not indicated on the drawings.

5. Off-site work or work within easements shall be designed in accordance with the requirements of the agency having jurisdiction. The work shall be shown as part of the construction documentation and shall include all project-related off-site improvements, such as curb cuts, turnout lanes, signage, utilities connections, and all other such work.

6. Refer also to sections of this "School Design Guide" on Plumbing, Fire Protection, and Planting and Irrigation.

7. Do not locate any abrupt grade changes, manholes, meters, yard boxes, etc. on or near playfields and playgrounds to avoid any potential hazard to students.

8. For fencing and gates refer to section 2.2, Site Design.

B. DEMOLITION

1. Demolition work for new sites must be documented as a separate contract item, with a separate and complete package of bidding and contract documents.

2. Coordinate any demolition or relocation of existing improvements, such as fences, walls, structures, etc., that are encroaching into the District property, with the District representative who will request the Real Estate Section to obtain necessary permits from adjacent property owners.

3. Provide temporary fencing to secure property boundaries wherever work might breach closure of adjacent property.

4. Investigate existing conditions to assure that full extent of demolition work is included, especially with regard to sub-surface conditions such as concrete paving overlain with asphalt, building basements, foundations of demolished buildings, and utilities lines. If existing data is insufficient, request pot-holing, underground utility survey, or other investigation from the District.

5. Clearly identify and define in the demolition documents all existing site features (structures, walls, fencing, walks, pavements, site utilities, plants, terrain, etc.) that are (1) to remain, with defined protection measures, and (2) to be removed, with the required disposition and responsibilities for removal and/or relocation.

C. GRADING

1. For ease in staking and construction, grade with uniform planes (not warped surfaces) and minimize grade changes.

2. Slope all areas for drainage. Slope walks, stairways, ramps, and other surfaces away from buildings.

3. Slope planes for drainage typically between 1% and 2% with 1.5% considered optimum.

4. Other slope standards are:

a. Between building areas, 1.5% - 2.0%.

b. Within play areas, 2% maximum, with 1% considered optimum.

c. Entrance walks and ramps (along accessible route): Do not design to maximum allowable slope requirements, thus risking potential non-compliant as built conditions. However, if the space allows, reduce slope as much as possible, or design grading and slope to avoid the need for ramp.

1) Handrails with landing extensions are required at ramps.

d. Driveways: 15%, with vertical curves of 10 feet at top and 5 feet at bottom of ramp.

e. Slope along sliding gate: 2% maximum, for chain link gates. Steel and wrought iron gates shall be set no more than 1/2% slope.

f. Walks, porches, study terraces, etc.: Cross fall of 1% to 2% maximum.

g. Door landings, paved lunch areas, and similar areas: ½% to 2% maximum. Shape planes to accommodate tables and benches.

h. Agricultural Areas: 1/2 % minimum.

i. Asphalt paving flow lines: 0.75%. If less, use concrete gutter flow line with minimum slope of 0.4% (do not use in striped play areas).

5. Slope play fields and play areas as follows (see also District standards for playfields):

a. Turf or lawn areas: 1/2% minimum, 2% maximum, 3/4% optimum.

b. Concrete tennis courts: 0.83% to 1% maximum, in one plane only, preferably from side to side.

c. Handball courts: 0.5% to 1% maximum, in one plane only (when necessary).

d. Infield of High School baseball and softball diamonds: 1/2% maximum. Baseball pitcher's mound: 10" above home plate.

e. Track and Field Areas: Maximum inclination for tracks, runways, circles, and landing areas for throwing events: not over 1:100 in a lateral direction and 1:1000 in the running or throwing direction. For high jump: not over 1:250 in the direction of the center of the crossbar. See IAAF Rules for other track dimensions and information.

6. Slope banks as follows:

a. Planted banks 2H to 1V (50%) maximum.

b. Paved and gunite banks 2 to 1 (50%) maximum with special exceptions permitted.

c. Lawn areas 15% maximum.

7. At playground areas provide protective fencing and an 18-inch minimum shoulder at tops of banks sloping steeper than 10%.

D. PAVING

1. Provide paving, base and sub-base preparation as recommended by the Geotechnical Engineer. Refer to District "Technical Standard Drawings."

2. Paving minimum standards include:

a. Playgrounds (new construction): 2 inches asphaltic concrete over 4 inches select base course.

b. Playgrounds (resurfacing): 2 inches asphaltic concrete over 3 inches select base.

c. Service Roads: 4 inches asphaltic concrete over 4 inches select base.

d. Parking Area: 3 inches asphaltic concrete over 4 inches select base.

e. Trash Pick-up Area: 6 inches reinforced concrete over 4 inches select base.

f. Sidewalks: 4 inches unreinforced concrete.

g. Banks: 2 inches asphaltic concrete over compacted sub-grade.

3. Provide for the special paving requirements of bus-loading zones, truck loading and dock areas, trash pick-up areas, and fire lanes.

4. Pave parkways and narrow strips adjacent to sidewalks at property lines as concrete sidewalks.

5. Separate asphalt paving from planting or turf areas with a reinforced concrete mowing strip minimum 6" by 8."

6. Provide driveway approaches in accordance with commercial driveway requirements of the local governing jurisdiction, with minimum width of 20 feet.

7. Provide integral curb and 2'-0" gutter on service roads within bus unloading area.

8. Provide paving of full width and turning area needed for all delivery trucks and trash pick-up vehicles. Also, check width of drive aprons providing access to these areas. Provide turn around area for vehicles, if required.

9. Provide 4-inch wide striping for parking stalls and other roadway markings. Mark fire lanes in accordance with the local Fire Marshal's requirements. See District's "Standard Technical Drawings" for parking layouts.

10. Provide ramps for sweepers and mowers to reach raised areas.

11. Lunch shelter area and arcade shall be concrete.

12. Walkways shall be concrete, interlocking concrete pavers or interlocking permeable concrete pavers (where soils are suitable to percolation per Geotechnical Report).

13. Pervious concrete paving is acceptable at parking stalls areas only, not driveways, and provided soils are suitable to percolation and parking is not adjacent to dirt areas that can cause plugging of surface.

E. STORM AND SANITARY DRAINAGE

1. Design

a. Design site for maximum retention of storm water run-off, within the general limits of other design guidelines, code requirements and Technical Manual (http://www.laschools.org/employee/design/fs-studies-and-reports/?folder_id=2452126). Use surface drainage to the maximum extent reasonable. See District's Post Construction Storm Water Management Plan (BMP Selection White Paper) and accompanying Check List for guidance. See "Section 3.4, Plumbing" of this School Design Guide for additional criteria.

2. Standard Urban Storm Water Mitigation Plan (SUSMP)

a. Areas with disturbed soil over 1 acre, parking lots of 5,000 square feet or more, or with 25 or more parking spaces, and exposed to storm water runoff, shall be designed to meet the intent of the Standard Urban Storm Water Mitigation Plan (SUSMP) for Los Angeles County. SUSMP mitigation measures include infiltration of runoff before it reaches the storm drain system, treatment of runoff to remove oil and petroleum hydrocarbons before it enters the storm drain system, and control of peak flow discharge to provide stream channel protection. For provision of these measures plans, calculations, maintenance requirements must be included in the Design Development phase, and details of the mitigation facilities included in the Construction Documents including the documents needed for SWPPP sections (e.g. section 500.6)..

3. Sanitary Sewers

a. For sanitary sewers show fixture units at building and street points of connection. Size sewer lines per code prescriptions, or provide hydraulic calculations.

4. Surface Drainage:

a. Direct sheet flow from paved areas onto planted areas.

b. Direct roof downspouts into planting areas (via splash blocks) where feasible, onto paved surfaces only when the flow does not adversely affect pedestrian traffic.

c. Locate flow lines to avoid concentrations on pedestrian walks.

d. Locate flow lines to avoid sand boxes, tree wells, playground equipment and other objects that might obstruct drainage flow and cause ponding.

e. Do not drain from planting areas across paved areas.

f. Do not drain over public sidewalks. Avoid concentrated flow over driveways and pedestrian walkways.

g. Do not drain over planted or unpaved banks.

h. Do not drain through or over roofed areas, electric or communication vaults, walk-off mats, or other similar functional areas.

i. Intercept off-site drainage to prevent it from flowing across site.

j. At interior courts or sump areas near buildings, provide for surface overflow from the court that is 3 inches or more below finished floor elevations to avoid flooding if catch basins are blocked.

5. Catch Basins, Floor Drains and Culverts:

a. Select catch basin grate to withstand the load to which it will be subjected; otherwise use lightweight grates and frames. Grate openings: Minimum opening ¼" to ½ inch maximum.

b. Offset a catch basin from main storm drain line to minimize its size and depth, and to minimize blockage of system (i.e., no in-line "flow-thru" type catch basins).

c. Use cast-in-place or precast concrete catch basins.

d. Maximum depth of catch basin: 30 inches, unless specific project approval given in writing by the District.

e. Use rectangular cast-iron or fiber-cement pipe culverts under walks in place of formed concrete structures. Provide minimum 4-inch thick concrete encasement, but with 2 ½ inch cover under walks. Calculate size for flow.

f. Do not locate catch basins in the middle of play yards, pedestrian pathways, close to playground equipment or large trees.

g. Use trench drains only when required; for example, at parking structure entrances.

h. In trash-disposal areas and open lunch areas, provide floor drain and sediment buckets to collect storm and wash-down water. Locate drain next to hose bibb and provide dual drainage, with a diverter valve to flush wash-down water to sanitary drain and storm water to storm drain. (See District "Standard Technical Drawing.")

i. In covered lunch shelters, provide floor drains with no trap primers.

j. Avoid locating drains and swales in the accessible parking areas and path of travel. If this is unavoidable, the grates shall be oriented 90 degrees to the direction of travel, or should be multi-directional if there is no predominant direction of travel.

6. Underground Drainage:

a. Storm drain pipe shall be concrete (CP), reinforced concrete (RCP), ductile iron (DIP), cast iron (CIP), or high-density polyethylene (HDPEP).

b. Design drainage structures and piping systems based on hydrologic and hydraulic calculations, with minimum flow velocity of 3 feet per second.

c. Provide capped stub-outs for drains in new construction to accommodate future construction based on the Master Plan.

d. With less than 1'-0" of cover over top of pipe encase pipe in concrete or use iron pipe.

e. With less than 1'-0" of cover over top of pipe in vehicular traffic areas and in asphalt paved areas encase pipe in concrete, reinforced as necessary to support imposed loads.

f. Food waste drainage from wash-down in lunch shelters must flow into sanitary sewer. Rainwater from roof covering lunch shelter must flow into storm drain system. Site drainage shall be designed such that, the flowing site drainage water does not run through the lunch shelter and the outdoor eating areas.

g. Drain trash enclosure through pipe to storm drain system and to sanitary sewer (using dual drainage valve system described above).

h. Install cleanouts at maximum spacing of 100 feet in straight runs and at each aggregate change of direction exceeding 135 degrees. A catch basin may substitute. Install cleanouts in yard boxes.

i. Where transition is made from round pipe to rectangular pipe, provide cleanout hand hole or manhole for maintenance purposes.

j. Depths of sanitary sewer lines below finished grade shall be not less than 12 inches and not less than 6 feet at property lines, or as required by agency having jurisdiction. (Use greater depth if service to future buildings should require it.)

F. WATER DISTRIBUTION

1. Meter Protection

a. An approved reduced pressure principal backflow assembly shall be installed at service connection to any domestic, fire, or irrigation services.

b. All schools located in Los Angeles Water & Power service area shall comply with the requirements of water service rule 16-D.

2. Water Service:

a. At new facilities, provide one meter each for domestic water, fire-protection water, and irrigation water service. (See "Plumbing" and "Planting and Irrigation" sections of this guide book for gas piping and other related criteria.)

b. Contact water supplier for main, pressure and flow information.

c. Meter locations must be approved by the District and the water supplier. Indicate meter locations at curb.

d. For domestic water services that require any of the following component devices: Service Control (shut off) valve, strainers, pressure reducing valves, backflow prevention assemblies, etc., said devices shall be installed as follows: Group component devices into a dual (parallel) configuration to avoid service interruptions during testing and servicing of devices. Devices shall be designed and installed in an above ground, compact, low profile and serviceable valve station.

e. Meter assembly and details must conform to District "Standard Technical Drawings."

3. Piping and Design

a. Provide a water-load schedule for each meter including existing, new and future load in fixture units and gpm. Coordinate with the plumbing engineer.

b. Provide hydraulic calculations for water distribution system. Show water demand and residual pressure at building and street point of connection.

c. Where pressure-reducing valves are required, coordinate location with plumbing engineer and with the District.

d. On domestic water service provide tandem installations of pressure regulators, backflow preventers and strainers, to avoid shut-down during testing and servicing of equipment. See Standard Technical Drawings.

e. Provide thrust blocks and ties for bell-and-spigot piping.

f. Before specifying piping, review corrosivity of soil with the District's soils report to verify appropriate pipe material selection.

g. Wherever pipe-and-valve assemblies are exposed above grade, provide a secure locked enclosure to protect them from unauthorized use or vandalism. These may be walls, fences, or manufactured enclosures that are made for this purpose.

h. Reclaimed water system shall be designed per Purple Pipe Manual and comply with the local jurisdictional requirements. Approval shall be acquired from the same agency prior to installation. Refer to the following link for the Purple Pipe Manual: http://www.laschools.org/employee/design/fs-studies-and-reports/?folder_id=226546964

G. OFF-SITE CHECKLIST

1. "Checklist of Off-Site Work, Utilities & Easements" – See Section 4.5 for the list. This list is comprehensive; however, there might be other site specific issues that have to be addressed, such as "specific community plan", landscaping, etc.

3.3 STRUCTURAL

A. General Requirements

B. Design Criteria

C. Building Systems

D. Concrete and Masonry Structures

E. Foundations and Concrete or Masonry on Earth

F. Steel Structures

G. Wood Framed Structures

3.3 STRUCTURAL

A. GENERAL REQUIREMENTS

1. The design for structural safety of school buildings in California is governed by the requirements of the Field Act beginning in Section 17280 of the Education Code and the California Building Code, Title 24.

2. The structural engineer shall be responsible for the design, or review of designs, 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.

3. Testing and Inspection (T&I) shall meet the requirements of Title 24. After plans are approved by DSA, submit one copy of the DSA Tests and Inspection List to the District's authorized representative.

4. Assure that provisions are made for seismic anchorage or bracing of all building elements and equipment, including Owner Furnished equipment.

B. DESIGN CRITERIA

1. Codes:

a. The governing building code for structural design is 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 Architect/ Structural Safety Section (DSA/SS) for school design and construction.

2. Design Criteria:

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

b. Deflection: Maximum allowable deflection for structural members shall be that defined in the CBC, except as follows:

1) To reduce long-term deflection and cracking of finished surfaces, where floor members of engineered-wood support floor finishes of ceramic tile, terrazzo, or similar materials, maximum deflection shall be limited to l/540.

c. 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.

d. Indicate on plans key design criteria used, including Code edition, seismic design factors, and soil profile type.

C. BUILDING SYSTEMS

1. The following criteria and suggestions reflect policies and preferences of the District derived from experience with economy and durability. Exceptions may be made with justification and specific authorization of the District's Project Manager.

2. The structures of all buildings, including non-bearing partitions, shall be of incombustible materials. Wood structures may be acceptable for one-and two-story primary and elementary schools and additions, but with special permission in writing from the District.

3. Three-story and higher school buildings, and all middle and high school buildings, shall be steel framed with floors of concrete on metal deck supported by composite beams, or of reinforced concrete. The lateral force resisting system should be the most effective structural systems allowed by code.

4. Gyms and auditoriums preferably should have masonry or concrete walls and steel-framed roofs with steel decking without concrete fill.

D. CONCRETE AND MASONRY STRUCTURES

1. Use a minimum concrete ultimate compressive strength of 3000 psi at 28 days.

2. Concrete mix design must comply with CBC and ACI 318.

3. Specify size of aggregate and slump. Use 1-inch or ¾-inch minimum aggregate size, with smaller sizes only in very special cases.

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

5. Avoid thin sections or projections that may crack off when forms are removed. Chamfer column corners, exposed corners and edges.

6. Provide typical construction joint locations for concrete beams, joists, and slabs.

7. Provide expansion joints, control joints and seismic-movement joints as required by the design, indicate their locations and details on drawings, and coordinate with architectural enclosures and finishes.

8. Joints must be weather tight and provide lateral stability across the joint.

9. Where a concrete beam is monolithic with a concrete wall and negative beam reinforcing steel is embedded in the wall, include a detail that shows the preferred pour line and alerts the contractor not to pour wall without negative reinforcing in place.

10. Indicate openings, depressions and curbs on structural floor and roof plans. Curbs must be a minimum of 5" wide if located under walls. Coordinate depressions in slab for wheelchair lifts, if in the scope of project.

11. Maintain a full depth of slab under depressions for ceramic tile, electric ducts, or other construction.

12. Provide a typical column drawing indicating bar maximum slopes, locations of splices, and reglets for shear-wall reinforcing.

13. When setting a rail post use non-shrink grout or equivalent ("Por-Rok" but not sulfur). Provide a #4 bar on each side of post in concrete.

14. If wood or steel studs are used in concrete buildings, indicate clear relationship between "face of concrete" and "face of studs".

15. In masonry walls, base dimensions on modular size of the unit.

16. In concrete masonry walls, fill all cells except on free-standing site walls retaining no earth. Avoid bars larger than #8.

17. Clearly show the minimum concrete cover required for the intended fire protection rating.

E. FOUNDATIONS AND CONCRETE OR MASONRY ON EARTH

1. The structural engineer shall visit the site and visually confirm the existing conditions as represented on the survey and geotechnical report. (Include the geotechnical engineer's name and report date on drawings.).

2. Provide special recommendations for dealing with expansive soils beneath the structure.

3. Foundations of buildings must not be partly on fill and partly on natural grade. Make clear on drawings all areas of fill.

4. Show bottom of footing elevations on foundation plan, including building walls, columns, flagpoles, lighting structures, retaining walls, etc.

5. Provide structural elevations and details of all retaining walls and site walls over 3'-6" high showing bottoms of footings, steps, joints, sleeves and drainage. Footings may be sloped 5% maximum to avoid steps.

6. For building walls that retain earth, use a minimum thickness of 10 inches and provide waterproofing and drainage outside the walls. Coordinate structural design with waterproofing and sub-drain design to assure water resistance.

7. Retaining walls higher than 12 feet as measured from the top of the foundation shall be designed to resist the additional earth pressure caused by seismic ground shaking.

8. Floor slabs on grade shall be 5-inch thick minimum reinforced with #4 bars @ 24" o.c. each way.

9. For floor slabs on grade provide a vapor barrier. See "Architectural" section for requirements.

10. Utilities trenches that impact foundations shall be recognized in design and shown on structural drawings. Backfill trenches below footings with controlled compacted fill or, if not more than three-feet deep, with lean concrete.

11. Requirements of the paragraphs on "Concrete and Masonry Structures" also apply.

F. STEEL STRUCTURES

1. Provide top-of-steel elevations at each column and change of level on structural drawings for ease of reference by steel detailers and erectors.

2. For exterior steel work specify sections with a thickness of ¼" or greater.

3. Indicate required camber on all tapered steel girders and steel trusses.

4. Keep steel floor beams to L/d equal to or less than 24.

5. Provide erection bracing for tapered girders. Web thickness for all built-up sections shall be at least 3/16". Provide flange to web welds to comply with AISC Specification. Use stiffener plate welded to top flange and to web where ridge occurs.

6. Comply with maximum width-to-thickness ratio requirements of AISC for projecting elements under compression. Apply requirements to railing parts.

7. Field weld or use cadmium plated counter-sunk flat head machine screws, to prevent warping in galvanizing bath.

8. Specify cost effective size, length and type of welds. Use standard weld symbols and consider fillet welds where adequate.

9. Make groove welds "full penetration" on structural welds such as tapered girder flanges.

10. On welded assemblies to be hot-dip galvanized, avoid shop welding large areas, such as stair platforms, to prevent warping in galvanizing bath. Field weld and retouch galvanizing, or use cadmium plated counter-sunk flat head machine screws for field assembly.

11. Do not support steel members with wood columns.

12. Provide means of leveling for base plates, such as double nuts on anchor bolts.

13. Avoid steel joists. (Because of DSA's special testing and inspection requirements, most steel joist fabricators will not bid DSA jobs.)

14. If Architecturally Exposed Structural Steel (AESS) is used, clearly identify the AESS members on the structural drawings.

15. Structural steel members shall be primed, except for:

    a. Exterior exposed surfaces, which shall be galvanized.

    b. Steel members to be fireproofed.

    c. Surfaces that will be field welded.

    d. Surfaces that will be in contact with concrete.

    e. Surfaces to be fastened with high strength bolts.

G. WOOD-FRAMED STRUCTURES

1. Provide camber in structural members in accordance with DSA requirements. Use a stiffer member in preference to using excessive camber.

2. No horizontal member depth to thickness ratio shall exceed 7.

3. Bottoms of sills on exterior foundation walls shall be not less than 12" above finished grade.

4. Standardize hold down bolt sizes.

5. Structural I plywood is preferred. Use at least CD Grade with exterior-type glue.

6. Provide drawings of wall elevations to indicate typical framing. Provide special framing elevations where large openings occur, where columns pass through wall plates, or where framing is otherwise complex.

7. Provide complete roof framing plans showing walls. Clearly indicate corner framing and slope of roof.

8. Stud walls or partitions around shower or toilet rooms with more than two fixtures, and stud walls adjacent to exterior ground or paved areas, shall bear on concrete curbs extending at least 6" above finished floor or paving level. (Curbs and sills must meet DSA's special curb requirements.)

9. On wood-joist floors, provide 2"-thick concrete fill, 6" curbs, and a floor drain on the floor of heater rooms using gas-fired boilers.

10. Use nominal 6" wide studs for walls with the exception of non-bearing walls with no piping.

11. Clearly indicate connection of vertical shear elements to diaphragms. Be sure these shear elements do not produce a high concentration of stress over a small length.

12. Where pipes pass through top plates, provide a detail on both structural and plumbing drawings.

13. Use minimum 1/2" thick plywood for roof sheathing. Indicate stagger of panels required for horizontal diaphragms.

14. Standardize on one or a few bolt sizes. Do not permit a mixture of several tie-down bolts because they can be too easily mixed on the job.

3.4 PLUMBING

A. GENERAL REQUIREMENTS

B. Sewer Systems

C. Water Systems

D. Hot Water Systems

E. Water Valves and Other Devices

F. Gas Distribution Systems

G. Seismic Restraints

3.4 PLUMBING

A. GENERAL REQUIREMENTS

1. Plumbing systems shall be installed in accordance with the current California Building Code and Plumbing Code (CBC – part of California Code of Regulations Title 24), and California Green Building Code as well as CCR Titles 19 and 8, District Guide Specifications; other chapters of this School Design Guide, and District Standard Technical Drawings.

2. Design systems to be simple, durable, easy to operate and maintain, with ready accessibility for servicing, maintenance and replacement, all in a manner that will avoid interruption of educational schedules during working hours.

3. Contact each utility supplier to determine the requirements for the most cost effective service connection. Provide separate meters for domestic, fire and irrigation water supplies. See Section 3.2 - "Civil Engineering" of this Design Guide for additional information relevant to the work of this section.

4. Fixtures must comply with State water conservation guidelines and standards, including maximum flow as follows:

a. Water Closets: 1.28 gpf.

b. Urinals: 1/8 gpf or Non-water type.

c. Lavatory Faucets: 0.5 gpm.

d. Showers: 2.0 gpm.

e. Kitchen Sink Faucets: 2.0 gpm.

5. Student Restrooms:

a. Provide in all student restrooms the following features to reduce maintenance, conserve water and minimize student tampering:

1) Shut-off valve for all fixtures in each restroom, located above the upper terminal water closet and behind a locked access panel.

2) Water-saving battery-operated infrared-sensored flush valves, with manual override on all water closets (absolutely no hardwire applications permitted). Infrared sensors must be mounted and adjusted at heights and distances appropriate to the grade level and student height to insure automatic actuation.

3) Push-button, ADA-metered, self-closing faucets on lavatories.

4) Hose-bibb with vacuum breaker in recessed box with locking cover.

5) Floor drains with trap primers with floors sloped to drain.

6) Clean-outs above all urinals, lavatories, and water closets (above upper terminal water closet when there is more than one).

b. Verify that the following are provided and coordinated with plumbing work.

1) Electric hand dryers in lieu of paper-towel dispensers (except in kindergartens and early education centers).

2) A dual GFCI outlet behind a locked access panel.

c. Architectural drawings shall clearly identify the specific age group applicable to each restroom, and at each classroom with accessible sink(s).

1) Accessible features shown on plumbing drawings shall be coordinated with age appropriate areas shown on the architectural drawings.

6. Faculty and Visitor Restrooms:

a. Provide in all faculty / adult restrooms the following features to reduce maintenance and conserve water:

1) Shut-off valve for all fixtures in each restroom, located above the upper terminal water closet and behind a locked (but not keyed) access panel.

2) Floor drains with trap primers with floors sloped to drain.

3) Clean-outs above all urinals, lavatories, and water closets (above upper terminal water closet when there is more than one).

7. Conceal and properly secure all piping behind building finishes. Exception may be made in equipment and custodial rooms and CMU or concrete construction. Where necessarily exposed in renovation projects, paint all piping and insulate hot water and condensate piping.

8. All lavatories shall be Cast Iron with acid resistant backed on enamel finish. Vitreous China units are prohibited.

9. All lavatories shall have three (3) holes 4 inches center set faucets. Single-hole configuration is not allowed.

10. Access Panel – Plumbing access panels shall have the same fire rating as the wall, ceiling, or surface they are installed upon. Identify and call out rated panels as such on construction documents.

11. Underground Cleanouts – Underground waste piping in every 100' or within a 90 degree or greater change in direction, shall provide a cleanout to grade (Within practical reason).

12. Hopper Sinks – All service and custodial sinks shall be Cast Iron with baked on enamel finish. No other type will be accepted. Faucet to be provided with an atmospheric vacuum breaker.

13. Urinals:

a. Urinals shall be non-water type and be equipped with a water supply roughed-in to the urinal location that would allow a subsequent replacement of the non-water urinal with a water supplied type Urinal. Make provisions for water distribution and fixture supply piping sized to accommodate the water supplied urinal(s). The supply shall be stubbed out of wall with a chrome plated brass flange and chrome plated brass I.P.S. cap.

b. Low flush urinals, 1/8 gallon, shall be used for urinal replacement at existing schools only.

B. SEWER SYSTEMS

1. Industrial Wastewater Permits

a. Industrial Wastewater Permits must be obtained from the City of Los Angeles Department of Public Works, Bureau of Sanitation, Industrial Waste Management Division, in accordance with the Los Angeles Industrial Waste Control Ordinance for all schools. A permit is required for each point of discharge to the City's sewer system. (For other jurisdictions the local ordinances must be addressed, but the standards required by Los Angeles shall be the minimum standard for all LAUSD schools.

2. Sewer Lines

a. Specify cast iron soil pipe at all following locations:

1) Within the building and 5'-0" outside the building line.

2) Running parallel to and within 2'-0" of any building or structure.

3) Within 20'-0" of any tree centerline.

4) Not less than 1'-0" below finished grade.

b. Provide clean-outs above all urinals, lavatories, upper terminal water closets, and sinks.

c. Provide cleanouts to grade in yard box at:

1) Upper terminal cleanout within 5 feet of building line connection.

2) Every 100 feet or change of direction over 90 degrees.

3) At property line connection.

4) Do not provide cleanouts overhead in subterranean parking lots. They are neither manageable nor accessible for use.

d. Provide uniform slope of 1/4" fall per foot whenever possible, but never less than 1/8" per foot.

e. Indicate invert elevations of new sewer lines at buildings, changes in direction, locations where sewer lines join and at property lines. Indicate sizes of existing utility lines on the plans.

3. Private Disposal Systems

a. When private disposal systems are required and programmed, verify requirements with the local health authorities and obtain written approval.

b. Clearly define the extent and locations of system elements.

4. Science Classrooms, Flexible Classrooms and Prep Room/Work Room Wastes:

a. All science, chemistry, flexible science classrooms and science prep/workrooms shall have chemical waste piping.

b. These are defined as chemical or industrial liquid wastes that are likely to damage the public sanitary sewer system or increase its maintenance cost, or detrimentally affect sewage treatment, or contaminate surface or subsurface waters. They shall be pre-treated to render them innocuous prior to discharge to the sewer system unless an approved Best Management Practices program is in effect at the school.

c. Provide an independent waste drainage system to an approved Sampling box at the exterior of the building for plumbing fixtures in laboratories and associated workrooms which could receive corrosive chemical waste.

d. Piping for this system shall be of corrosion-resistant material as specified in the Guide Specifications – either Type 316L stainless steel (Above ground Only) or Los Angeles City Test Laboratory-approved CPVC that does not require wrapping pipe in plenums or Polypropylene.

e. Based on the Guide Specifications and an approved Best Management Practice (BMP). Do not provide a pretreatment neutralizing tank for Science Laboratory waste. However, provide an easily accessible exterior sampling box, together with accommodations for future addition of a neutralization system, before connection to the public sewer.

f. No chemical vent shall interconnect with vents of other Plumbing Systems.

g. Details shall meet the requirements of the Los Angeles City Bureau of Sanitation (see "Industrial Waste Permits" above).

5. Food Service Establishments (FSE's) Waste:

a. Cafeterias shall comply with the City of Los Angeles' Fats, Oil and Grease (FOG) Control Program. Consult and obtain approval of Bureau of Sanitation's (BOS) approval.

b. Grease interceptors shall comply with the City of Los Angeles' Plumbing Code, and must be provided for all grease-producing equipment. (Three (3) compartment sinks, all hand sinks, floor drains, floor sinks, prep sinks and mop sinks within the kitchen preparation area are to be tied to the grease interceptor.)

c. Do not provide garbage disposals in any School cafeterias which are classified as FSE's (The exception would be kitchens within the learning environment).

6. Other Special Wastewater Provisions:

a. Other areas requiring special pretreatment of wastewater before discharge into the City sewer system include:

1) Auto Shop floor drains, sinks and cleaning tanks: Oil Interceptor and Clarifier.

2) Auto Wash Rack: Grease Interceptor.

3) Ceramics Room sinks: Solids Interceptor.

4) Film Processing: Neutralization, Silver Electrolytic Recovery Unit, Sample Box.

5) Potting Room sinks: Solids Interceptor.

6) Agricultural Classroom demo table drains: Solids Interceptor.

7) Subterranean Parking Garage Drains to sump pumps: Provide oil and solids interceptors, when required by Los Angeles Sanitation Bureau. Interceptors are not required in garages where hose bibs are not installed. Roof drain lines and downspouts shall not be connected to drains in subterranean structures and sump pump system.

b. Interceptors and separators must be located and installed so they are easily accessible for inspection, cleaning, and removal of intercepted material.

7. Floor Drains, Area Drains and Floor Sinks:

a. Where drains or sinks are required, slope floor to drain at 1/8" per foot.

b. Floor drains with trap primers are required at:

1) Student and Staff Restrooms. One floor drain shall be provided front and center for two or more urinals. One floor drain is required for water closets in all restrooms with an additional floor drain when a total of four or more water closets are provided.

2) Shower and locker rooms and adjacent drying rooms.

3) Custodian closet – locate floor drain near hopper sink.

4) Mechanical Room.

5) Electrical Room.

6) Lunch Shelters. Cast iron with removable basket and hinged self-closing grate. Trap primer is not required since area is washed down daily.

7) Uncovered Trash Areas. These areas are required to be provided with a special area drain system that normally drains the storm water to the storm system, but diverts the drainage to the sewer system when the trash containers are being washed, using a special valve system. See Storm and Sanitary Drainage in the Civil Engineering section.

8) Where deluge showers are installed.

c. Floor sinks with trap primers are required at the following areas for indirect waste:

1) Boiler Rooms.

2) Kitchens, at cooking areas and where preparation sinks have an indirect waste drain where a direct connection is not required by code.

3) Coffee urns.

4) Food preparation sinks (minimum 3").

5) Milk-shake machines.

6) Refrigerators of 30-cubic-foot capacity or over.

7) Walk-in cooler and freezer-box drains.

8) Water heater relief valves and hot water storage tank drains. (All water heaters shall be installed with drip pans.).

9) Wherever required by the California Plumbing Code or the Los Angeles City Plumbing Code.

d. Elevator pit drains are not required.

e. Primary condensate drains from HVAC units shall be discharged into a receptor that is approved by code and the local jurisdiction in a manner that is in compliance with the code requirements. The preferred receptors by LAUSD are floor sinks, custodial sinks and lavatory tail pieces. Drywells may be used when the above receptors do not exist in the vicinity. Draining directly into the sewer with air gap fittings is prohibited. Secondary drain pans are required under all indoor HVAC units that are installed above finished ceilings or suspended exposed above occupied spaces. These drains are required to discharge at locations where the discharge will be noticed so that service personnel could be notified to fix the clogged primary drains. The point of discharge should be above a sink if available and if not, direct the discharge away from locations where it may cause harm to students and damage to electronic equipment, and books. Also, provide high condensate level unit shut-off switches to prevent or minimize drainage from secondary pans. In addition provide freeze stats for DX equipment.

f. Provide brass union with 6" brass nipple at condensate drain pipe connection, if steel meets copper.

g. In the subterranean parking garage, provide an adequately sized emergency drain for every 4000 square feet. Within ten feet around each floor drain provide 1/8"/ foot slope of drain.

8. Combination Waste and Vent Systems

a. Combination waste and vent systems shall be used only where structural conditions preclude installation of conventional systems and when permitted by the District.

b. Use only with clear liquids and "Not on kitchen sinks, lunch shelter floor drains, or for any other contaminated wastes".

c. Provided adequate vents to ensure free circulation of air. Any branch more than 15'-0" in length shall be separately vented.

d. Waste and vent pipes shall be oversized to assure full venting.

e. Vent connection shall be downstream of last fixture.

f. No water closet or urinal shall be installed on any combination waste and vent system.

9. Waste Piping Traps

a. All parts of traps shall be Cast Brass with polished Chromium plated finish. Tubular traps are not allowed.

b. Exception: Concealed traps and 17 gauge tailpieces may have rough brass finish, unless noted otherwise.

C. WATER SYSTEMS

1. Water Service:

a. Coordinate with civil engineer to define and request water service from the utility supplier. See Section 3.2, Civil Engineering of this Design Guide.

2. Design Criteria:

a. Provide water service to all fixtures and outlets, designed in accordance with National Bureau of Standards Reports 66 and 79 with not less than 25 psi at farthest and highest fixture or the pressure required for the highest and farthest flushometer-operated water closet to operate properly.

b. Allowable water velocity shall be 5 feet per second for hot water and 5 feet per second for cold water in copper and non-metallic piping.

c. Size pipe based on the number of fixture units and demand load curves in the California Plumbing Code.

d. Outside Stem and Yoke (OS & Y) are only to be used for Fire Protection Systems. Exception: OS & Y valves may be used in equipment rooms, at seven (7) feet or higher for visual identification of Open or Closed conditions. In such cases provide a chain operator to allow for operating the valve with out a ladder.

3. Use Type L hard copper pipe inside buildings.

4. Do not run water lines under slab if at all possible.

5. Provide a shut-off valve to isolate all fixtures in each restroom, laboratory, cafeteria and any other room with multiple fixtures. Valves shall be in recessed boxes with locking covers, located above the upper terminal water closet for restrooms and above fixtures in other areas.

6. Run water lines to outside drinking fountains underground and to interior drinking fountains isolated from hot-water lines to provide cool water at the fountains. Provide separate isolation valves at each fountain.

7. Provide thrust blocks and ties for bell-and-spigot water pipe at fittings for sizes 2 ½" and larger.

8. Slope pipes up in direction of water flow to air-elimination devices, or up to a nearby expansion tank, to provide for air elimination from water lines.

9. Water hammer arrestors are required for lavatories, sinks, fountains, water closets, urinal headers, and other fixtures or devices with quick-closing valves, such as clothes washers.

10. Fixture Supply Lines – Water supplies and all potable water faucets shall be in compliance with NF61 Annex G via Iron Pipe Size (IPS) with Lead free Brass nipples and angle stops. Brass escutcheons with polished chromium finish for all fixtures. No braided stainless steel or flexible supply lines shall be used to connect water supplies to faucets.

11. All Faucets used where Human consumption is assumed should be Stainless Steel and Brass free.

12. Each faucet shall have its own angle stop. No angle stop should serve more than one faucet at a time.

13. Victaulic type mechanical butterfly valves for copper are considered a reliable method for shut off above ground and inside buildings.

D. HOT WATER SYSTEMS

1. Hot water or tempered water is required (as indicated, in addition to cold water) for the following areas, but not limited to these areas:

a. Administration and Health Offices -- Hot.

b. Cafeteria, Kitchen, Lunch Units, and other food service facilities – Hot (No tempered water)

c. Collaboration Faculty Workrooms – Hot.

d. Science Prep Room – Hot.

e. Art Instruction Rooms, Consumer Home Economics, and Automotive Labs – Hot.

f. Custodial Room Service Sink – Hot.

g. Shower Rooms for Students – Tempered for students, hot and cold for faculty, plus one therapeutic station with hot and cold.

h. Shower Rooms for Faculty plus Therapeutic Station – Hot

i. Handicapped-Accessible Showers – Tempered.

j. Restrooms adjacent to eating facilities – Tempered.

k. Faculty Restrooms – Hot

l. Early Education Centers (EEC) - Tempered

2. Provide cold water only at:

a. Student Restrooms.

b. General Classrooms.

c. Kindergarten Rooms.

3. Hot water temperature regulation:

a. To reduce the potential for bacterial contamination (see ASHRAE Standard 12-2000 – Minimizing the Risk of Legionellosis Associated with Building Water Systems) provide the following temperatures and control devices:

1) General Hot Water Outlets: 120°F at the heater and 115°F at the furthest outlet from water heater.

2) Tempered Water Outlets: 95° to 100°F mixed from 115°F to 120°F hot water from the storage tank and cold water through a tempered regulator valve. Locate the regulating valves as close to the outlet as possible. This is especially important for Special Education, Elementary Schools and Early Education Center's. Locate the valves in Custodians Rooms or similar rooms, not readily exposed in restrooms or shower rooms.

3) Cafeteria Sink Outlets: 120°F.

b. Hot Water Circulating Pumps:

1) Provide a circulating pump and insulated hot-water circulation loop (supply and return) to the furthest fixture on the following:

a) Provide circulating pump for faculty restrooms with metered faucets and nurse offices, when they are farther than 15 feet from water heater.

b) Provide pumps for runs longer than 50 feet for food service areas, Custodial sinks and other areas with high flow faucets.

c) Indicate aquastat to control pumps and to make at 100 º F and break at 108 º F.

2) Circulating hot water pumps shall be time controlled so they will operate only when building is occupied.

3) Hot water circulating pumps over 1.5 hp shall have cast iron bodies. Pumps 1.5 hp and less shall have hard bronze water chambers and impellers.

4) Size hot-water circulating pump and piping for water velocity not to exceed 5 feet per second for hot and 8 feet per second for cold.

4. Hot Water Heaters And Tanks:

a. Water heaters shall be certified by the California Energy Commission and meet Title24, AQMD Ultra Low NOx Rule 1146.2 and. 1121, Water heating boilers 1,000,000 BTU and larger shall be registered with South Coast Air Quality Management District (SCAQMD) per rule 222 to meet 1146.2 requirements.

b. Do not use multi-flue water heaters, nor booster or instantaneous type water heaters.

c. Water heaters shall heat with gas. Electric water heaters may be used as a last resort for isolated locations and in small sizes. All gas fired water heaters shall meet the flammable vapors ignition resistance requirements (FVIR).

d. Use ONLY 100-gallon, or smaller, high-recovery gas-fired domestic-type water heaters. Use in series with manifold to avoid the use of separate storage tanks.

e. Use hot water storage tank with external heater only where storage requirements exceed 200 gallons and where central-plant capacity or other conditions indicate.

f. Provide ball valve with plug at water heater drain outlet.

g. Provide seismic anchorage for all equipment. Do not bolt down the water heater legs.

h. Provide drip pans at all water heaters and drain the pan to an approved receptor.

i. Instantaneous tank-less water heaters of any kind or size are prohibited.

5. Hot-Water Piping And Utilization:

a. Provide tempered water to student showers piped in series and connected with an insulated circulating supply manifold.

1) Provide isolation valves for each battery of showers.

2) Provide push-button metered-type shower valves.

3) Specify showerheads with a maximum discharge rate of 2.0 gpm.

b. Reduction in lines connected to pumps shall be made as close as possible to the pumps.

c. Install straight length of pipe without bends or restrictions at least 10 diameters long on the suction side of all pumps unless inlet diffusers are used.

d. Insulated Return lines are required for domestic hot water systems when the length of run is over 15 feet to the furthest fixture.

e. Provide a check valve after the pump, for the hot water return line.

f. Avoid running dead-leg piping.

E. WATER VALVES AND OTHER DEVICES

1. Uninterrupted Service:

a. All domestic water supply mains shall be designed in an above-ground valve station with a minimum of two parallel branch lines – a primary and secondary – to provide for uninterrupted service to the site during maintenance of a Reduced pressure principal backflow preventor or a pressure regulating valve. Each branch shall include a Reduced pressure principal backflow preventor with strainer and when the street pressure exceeds 80 psig, a pressure regulator with strainer.

b. Separate services shall be provided for fire protection and landscape irrigation, with an above-ground valve station that includes a Reduced pressure principal backflow preventor and a pressure regulator with strainer when the street pressure exceeds manufacturer's or design suggested range but never exceed 80 psi. Two parallel branch lines are not required, but may be used to incorporate the use of two backflow assemblies and pressure reducing valves in parallel for more cost effective design. Comply with requirements of water service rule 16-D for schools located in Los Angeles Water & Power District.

c. Coordinate this design with the Civil Engineering, Fire Protection, and Planting and Irrigation sections of this "School Design Guide."

2. Pressure Regulating Valves:

a. Install pressure-regulating valves with strainers when street line pressure is over 80 psig to reduce pressure to approximately 80 psig.

b. Pressure regulating valve (PRV) stations shall include a minimum of two District-approved pilot/diaphragm actuated control valves with strainers (in lieu of a series of 2" direct acting regulators). Valves shall be flanged and sized to provide uninterrupted service to school site when valves are being serviced. Wafer-lug type butterfly valves and pre-assembled valve stations may be used to minimize space needs. (Services over 6 inches may require a third, smaller PRV for constant low-flow demands.)

c. Provide removable gages with ball valves for isolation stops on both inlet and outlet of valve stations (for inlet pressure and reduced pressure).

d. Provide an epoxy-coated wye strainer ahead of regulators.

e. Locate pressure regulating assemblies and strainer assemblies above grade in a shielded enclosure and in a service area. Where exposed to students, enclosure shall be a secure structure or cage.

3. Backflow Preventors and Vacuum Breakers:

a. Use backflow prevention valves having the lowest possible friction loss.

b. Use reduced-pressure principle backflow assemblies for domestic, irrigation, and fire services for meter service protection.

c. Provide an epoxy-coated wye strainer ahead of regulators.

d. Vacuum breakers or other required backflow prevention assemblies which are required, but not limited to, the following locations:

1) All flush valves and urinals.

2) Direct connections to boilers and tanks.

3) Water-cooled refrigerator condensers.

4) Soft drink dispensers.

5) Hose bibbs and sill cocks.

6) Demonstration tables.

7) All laboratory equipment.

8) Dark room equipment.

9) Hose bibbs for uncovered combination storm-and-sewer area drain diverter valves require a Reduced Pressure back-flow assembly.

10) Blueprint equipment.

11) Silver soak sinks.

12) Garbage can washers.

13) Most types of animal drinking water devices.

14) Various types of processing equipment (check with City).

15) Cooling towers and evaporative coolers (or provide air gap).

16) Sewage pumps.

17) Fire sprinkler systems.

18) Irrigation systems.

4. Hose Bibbs and Sill Cocks (Loose key):

a. Provide loose key sill cocks under exterior drinking fountains with isolation valves. (Sill cocks are faucets with a hose connection installed approximately at the sill line of buildings.)

b. Provide loose key hose bibbs or sill cocks at approximately 75'-0" spacing around buildings, and within 25 feet of entrances with walk-off mats. Install in recessed boxes without covers. (Coordinate desired locations with Landscape Architect.)

c. Provide sill cocks (with isolation valves) in Shower and Locker Rooms so that a 50'-0" long hose can be used to wash down entire area.

d. Hose bibbs are not recommended in kitchens or other interior areas except as noted above.

e. Provide loose key hose bibbs or sill cocks, with isolation valves, at outside eating areas, all student restrooms, in boiler rooms, on rooftops with skylights or air-cooling equipment for washdown of equipment and pads, and on rooftops for washdown of bird droppings and debris on ladders and façade projections.

5. Isolation and Shut-Off Valves:

a. All shut-off valves shall be accessible from the room in which fixtures are installed, and shall be located at approximately 3'-0", but not more than 7'0", from the floor. These valves shall control only fixtures in the room in which they are installed.

b. Provide shut-off valves for:

1) Each group of fixtures.

2) Each science laboratory or preparation room.

3) Each restroom.

4) Each floor of each building.

5) Each building, located at the entering point of building with yard box.

c. Provide a remote-control solenoid shutoff valve for Showers tempered-water; located downstream of manual shutoff valve. Locate remote control at coach's office

d. Use gate or ball valves for plumbing isolation shut-off.

6. Emergency Shower and Eye Wash:

a. Emergency shower and eye wash equipment shall be installed in the following areas where eye or skin irritants exist and must comply with California Code of Regulations (CCR),Title 8, Section 5162.

1) Science and teacher's chemistry/laboratory workrooms.

2) Pool mechanical equipment rooms.

3) Central Custodial supplies storage area. In middle and high schools install in receiving area.

b. A flip-down eye wash at sink shall be installed in the Teachers' Science Rooms Preparation Area Workroom, but only as a supplement to an approved Emergency Shower and Eyewash in the classroom, as stated in Title 8 Section 5162.

7. Drinking Fountains:

a. Drinking fountains are required by the California Plumbing Code on every floor, as well as in other specific locations.

b. Install fountains in locations, and above floor surfaces, where water falling from the fountain on to the floor does not cause a slipping hazard. (See Section 2.1 School Building Design for specific location and design requirements.)

c. Provide shut-off valve, cleanout and hammer arrestor for drinking fountains per District's standard details. If drinking fountains are located on the outside of the building. They should be Vandal resistant and have a hose bibb shall be installed underneath the fountain.

F. GAS DISTRIBUTION SYSTEMS

1. Gas Service:

a. In general, Elementary School systems are low pressure, (8" of water column), and Secondary School systems are medium pressure (3 psi at the meter and 1 psi maximum drop to most remote outlet) but medium pressure systems are allowable for site gas distribution for elementary schools with multiple buildings when the gas company permits A properly vented pressure regulator with approved accessible gas shut-off valve must be provided.

b. Locate gas meters:

1) Where a straight service run from the street can be made by the gas company.

2) Where it is accessible by truck for service and replacement.

3) As central as possible to the major gas loads (main boiler rooms, relocatable classrooms groups, etc.) to minimize size and length of main pipe runs.

c. Meter locations must be approved by the District and the gas company.

d. Meter enclosure and assembly must conform to District Standard Drawing and should have asphalt or gravel flooring (not concrete) with meter, valves and PRV above grade.

e. Use of medium-pressure gas requires design with "Polyflo Calculator" for gas-company approval.

f. Provide on plans a gas-load schedule for each meter including existing, new and future load in cfh.

2. Gas Piping:

a. Gas pipe:

1) In buildings or above ground at least 6 inches: Steel

2) Underground (30" minimum cover): Polyethylene, fusion welded, embedded in 6 inches of sand all around (per District Standard Drawings). Include tracer wire (yellow insulated No. 18 AWG). Connect to steel pipe with Central Plastics Company prefabricated transition fitting or equivalent.

b. Gas line locations:

1) Above grade within the building and underground to each building whenever possible.

2) Through attic spaces, within covered walkways, and in ventilated crawl spaces.

3) Avoid lengthy horizontal rooftop mounted piping wherever possible.

4) Avoid running gas lines through one building to serve another.

5) In isolated cases such as Kitchens and Science Rooms where gas branch lines must penetrate a concrete slab, run pipes in a concrete trench with steel checkered plate cover and frame.

c. Gas Service Stop

1) Provide a gas service stop in an accessible location outside each building at the point where a gas line enters the building.

2) For permanent buildings, locate on the riser with swing joint at point of entry.

3) For portable buildings, locate in yard boxes.

4) Provide only one entry per building unless unusual circumstances exist.

d. Gas Valves:

1) Provide an accessible shut-off valve for each gas outlet or group of outlets within a room.

   a) Use an approved gas cock when valve is readily accessible.

   b) An approved ball valve may be used when it is not accessible to students.

2) Provide individual check valves for gas outlets or turrets adjacent to air or water outlets, such as for laboratory stations.

3) Provide a master shut-off valve for science labs in a secure area not accessible by students.

4) All laboratory gas valves shall be protected by an "accessible"/Serviceable electrically operated, normally closed gas solenoid valve and remotely operated by emergency push button controller. Locate as close as possible to the teachers work station, at 48" height (ADA reach height).

5) Provide an isolation valve for each floor in each building.

6) Provide isolation valves at each regulator.

7) Provide DSA-approved seismic gas shut-off valves properly strapped to avoid student tampering.

8) Provide a shutoff valve on each gas line entering a building immediately outside point it enters the building. Do not install gas valves below grade.

9) All shut-off valves must be secured from student or public tampering.

e. Provide DSA approved Earthquake Shut-Off valve for each gas meter.

G. SEISMIC RESTRAINTS

1. Provide seismic restraints for mechanical equipment and piping systems in accordance with applicable codes and guidelines.

2. For liquid filled steel pipe, use the following guidelines:

a. SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping" latest edition.

b. Hanger spacing as specified in "Guide Specifications".

3.5 FIRE PROTECTION

A. General Requirements

B. Local Fire Authority review

C. Fire Sprinkler Systems

D. Standpipes

E. Fire Extinguishers

F. Key Safes or Knox Boxes

3.5 FIRE PROTECTION

A. GENERAL REQUIREMENTS

1. Guidelines

a. This section contains criteria and information for local fire authorities' review procedures, fire-sprinkler systems, fire extinguishers, and related fire- and life-safety requirements. Other criteria and guidelines include applicable portions of the California Fire Code, NFPA Standards, and the District Guide Specifications and Standard Details.

b. A separate service shall be provided for fire protection; refer to 3.4 Plumbing, E, Water Valves and Other Devices.

c. Fire protection for range hoods is provided by an approved UL 300 fire suppression system that is integral with the hoods.

d. All Fire Department connections shall face the street and be free of any obstructions.

e. Hydraulic calculations for fire flow by a California Licensed Professional Fire Protection Engineer shall be provided as part of the 50% CD Submittal. If a fire sprinkler pump is required, provisions for pump housing, tank and electrical requirements shall be provided.

B. LOCAL FIRE AUTHORITY REVIEW

1. Local Approvals Requirements

a. Access from the public street to each new building within the site (CCR Title 19, Section 3.05, "Access Roads").

b. Perimeter fencing and gated entrances (CCR Title 19, Section 3.16, "Gate Entrances to School Grounds").

c. Fire hydrants, if required.

d. Standpipe locations.

e. Emergency Assembly Area (EAA) and Evacuation Plan.

f. Fire Department connections to automatic fire sprinkler systems.

g. For local review, provide a full site plan indicating all buildings, both existing and proposed, fences, drive gates, retaining walls, EAA, and other construction affecting Fire Department access. Indicate approved unobstructed fire lanes for access to buildings on the site plan.

h. The local Fire Department must signify approval on drawings and sign a standard approval form furnished by DSA.

i. Principal agencies for Los Angeles schools are:

1) Los Angeles City Fire Department
Fire Prevention Bureau, Access & Hydrants Unit
213-485-5964

2) Los Angeles County Fire Department
Fire Prevention Engineering
213-720-5141

C. FIRE SPRINKLER SYSTEMS

1. Requirements

a. An automatic system shall be installed in every new school building in accordance with the current California Building Code (CBC – part of California Code of Regulations, Title 24), NFPA 72, NFPA 13, LAUSD's Guide Specifications Section 15300, and requirements of the Division of the State Architect (DSA).

b. The fire sprinkler system must be interconnected with the school fire alarm system.

c. On fire mains, provide a reduced pressure principle backflow assembly upstream of the fire-department connection.

d. All valves controlling the water supply to automatic sprinkler systems and water flow switches for automatic sprinkler systems shall be electrically supervised.

e. Fire sprinkler systems shall be designed and installed so that they are readily serviceable. Every building shall have a fire sprinkler control valve located 5'-0" above the floor. Every riser assembly shall have a check valve. In multi-story buildings, every floor shall have a separate shut-off valve, check valve, tamper switch, and flow switch at an accessible location, with an Inspector's Test Valve at the opposite end of the building.

Exception: If each floor has an independent shut-off valve located at the riser assembly, then a main building shut-off valve will not be required.

f. Fire sprinkler main drain valve discharge line shall be piped into a sump pit or to a storm drain. Main drain lines shall never discharge into a sanitary plumbing fixture, not even into a floor sink or floor drain.

g. The Fire Department Connection (FDC) shall be located upstream of the fire sprinkler riser assembly, not downstream of the riser assembly. A secondary FDC may be located on the address side of the building, down stream of the riser assembly provided it is only a secondary FDC provision, with a sign above it clearly stating what FDC serves.

h. A shut-off valve on a fire main backflow prevention assembly shall not be considered the building's main shut-off valve. Each building shall have its own separate shut-off valve as part of the riser assembly.

i. Post indicator valves are not required to be provided along with backflow prevention assemblies on fire mains. Fire mains are required to have sectional controlling valves at appropriate points per latest edition of NFPA 13, 8.16.1.5. The shut-off valve on the backflow preventor provides a reliable method of system shut-off. The Outside Stem and Yoke (OS & Y) valves provide a visual indication of those valves being in the open or closed position.

j. Post indicator valves (PIV) are required, outside the building, where a fire sprinkler main passes through the building foundation.

k. If a fire pump is required. Provide calculations on drawings and specifications.

l. Stages: All stages greater than 1,000 square feet in area shall be equipped with 1 ½ -inch hose connections located in recessed valve cabinets on each side of the stage per latest edition of CFC 905.3.4. Hose connections shall be installed in accordance with the latest edition of NFPA 13 and shall not require hose.

m. Provide a separate fire sprinkler meter for new schools and when adding a new system for existing schools.

D. STANDPIPES

1. Type of Systems

a. Standpipe systems shall be provided in buildings and areas per latest edition CFC Section 905 and installed in accordance with latest edition of NFPA 14, summarized as follows:

1) Class I Wet Manual Standpipes without hoses and without hose cabinets shall be installed in buildings where the floor level of the highest story is located more than 30 feet above the lowest level of fire department vehicle access.

2) Class I Wet Automatic Standpipes without hose and without hose cabinets shall be installed in buildings where the floor of an occupiable story is greater than 75 feet above the lowest level of fire department vehicle access.

b. Standpipe hose connections shall be unobstructed and readily accessible to the Fire Department, and all connections shall conform to Code and fire authority's requirements. All hose valve connections shall be in recessed cabinets wherever possible.

E. FIRE EXTINGUISHERS

1. Criteria

a. All areas of all buildings must have portable fire extinguishers within 75 feet of any point. Provide fire extinguishers in accordance with CCR Title 19 and the District Guide Specifications.

b. Extinguishers shall not be located on the exterior of buildings. Extinguishers in corridors, stairs or other unsupervised areas shall be avoided. All extinguishers shall be secured in a recessed, locked, UL listed fire extinguisher cabinet. Locate fire extinguishers in classrooms within 75 feet of each other. Make

provisions for indicating decals to be installed on each side of doors of classrooms where extinguishers are to be installed.

c. Portable fire extinguishers and notification signs shall be supplied as part of the contract for construction. They shall meet minimum requirements for acceptance by the State Fire Marshal and local fire authority.

F. KEY SAFES OR KNOX BOXES

1. General Criteria

a. For installation of all key safe (Knox Boxes), follow City of Los Angeles Fire Department Requirement 75. To standardize District's procedures, Requirement 75 shall be followed for Los Angeles County Fire Department sites with the exception that the box must be ordered for the Authority Having Jurisdiction (AHJ), so that the factory installed lock matches the Master Key of the appropriate jurisdiction. Typical mounting height shall be 8'-0" min. to 10'-0" above ground.

b. A key safe Knox Box is only to be provided and installed for Central Station Monitored site.

c. Architect/Engineer shall confirm the need for Knox Box, its location and mounting height with the local Fire Authority. Mounting height could be min. 8'-0" above finished floor (AF F), preferred mounting height shall be 10'-0" AFF.

3.6 HVAC SYSTEMS

A. GENERAL REQUIREMENTS

B. SYSTEM DESIGN CRITERIA

C. HVAC SYSTEM SELECTION

D. CONTROLS AND ZONING

E. AIR DISTRIBUTION

F. COILS AND PIPING

G. COOLING SOURCES

H. HEATING SOURCES

I. SOUND AND VIBRATION CONTROL

J. SPECIAL CONSIDERATIONS

3.6 HVAC SYSTEMS

A. INTRODUCTION

1. General Requirements

a. The HVAC system shall comply with the current California Code of Regulations, Title 24, the standards of ASHRAE, SMACNA, and NFPA, as well as the requirements of the local authorities having jurisdiction and LAUSD's Design Guide.

b. All interior spaces shall be air conditioned unless specifically excluded in this Guide or in writing by the District.

c. HVAC design shall comply with Title-24 energy efficiency requirements for all construction and exceed Title-24 energy efficiency requirements by a minimum of 15% or more, in conjunction with envelope and lighting design for new construction. Consult with utility suppliers to take full advantage of incentives for higher energy efficiency such as the Savings by Design Program of Southern California Edison and The Gas Company. Indicate the required equipment energy efficiencies clearly in the equipment schedules in a separate column.

d. Refer to The Collaborative for High Performance Schools "Best Practices Manual" (available at http://www.chps.net) for additional criteria that may be appropriate to the project. Appropriateness of the criteria will be as determined by the District.

e. Refer to chapter 2.4, "Environment and Sustainability," for additional requirements and specific requirements for commissioning.

f. Systems and equipment shall conform to District's Guide Specifications, Division 23

g. Assure maintenance and accessibility provisions for servicing and replacement.

1) Where practical, all equipment shall be housed on the roof or in Mechanical Rooms within the building.

2) Provide adequate working area around equipment for service.

h. Where HVAC units are roof mounted or require roof openings, verify that all structural provisions are made to assure adequate capacity for load bearing and diaphragm capacity.

B. SYSTEM DESIGN CRITERIA

1. Calculations and Load Criteria

a. Provide design criteria and calculations as follows:

1) Heating and cooling load calculations shall be performed on an industrially recognized computer program such as Trace 700, HAP or Energy Pro that will demonstrate compliance with Title 24. The calculations shall be done for each room and each system.

2) Indoor and outdoor design conditions and other relevant data shall be in accordance with current ASHRAE publications.

3) Provisions for internal heat gain from occupants and equipment within a space shall be as determined by LAUSD.

4) A field survey of actual field conditions and assessment of current demand is required for existing facility projects such as modernization and equipment replacement. Submittal of an existing condition assessment report is required.

b. When requested by the District, also submit calculations for equipment and system selection criteria such as life-cycle cost and energy analysis, duct friction and pipe friction loss calculations, fan and pump selection curves, heating and cooling coil selection data, chiller and cooling tower selection data, etc...

c. The California Energy Commission's (CEC) Certificate of Compliance for Non-Residential Buildings with the necessary backup forms shall be completed for submittal to the Division of the State Architect (DSA) and for review by the District. The Title-24 Compliance calculations shall be performed on the performance basis using the whole building approach, and integrating the building envelope, mechanical and electrical systems as designed, on a CEC approved program such as Energy Pro or Perform.

2. Ventilation and Outside Air Control

a. Provide outside air to each room through the HVAC system in compliance with current CEC Standards and ASHRAE recommendations.

b. Clearly indicate how outside-air is provided and how much for each HVAC unit. Also indicate with calculations how air is relieved from the building, on regular cycle and economizer cycle, to balance the fresh outside air make-up and maintain building pressures to assure compliance with CBC door closer settings for accessibility.

c. Provide ventilation for electrical rooms with transformers.

3. Air filtration

a. Provide air filters with a minimum efficiency of Merv 8. HVAC systems for new and existing schools constructed in areas with low outdoor air quality such as near freeways shall be provided with enhanced air filtration systems.

b. Refer to the District's Office of Environmental Health and Safety to obtain a "priority list of schools most at risk from air pollution". The design of HVAC systems at schools on this list must provide enhanced filtration.

c. For new school facilities, requirements outlined in the project's CEQA documents must be followed.

C. HVAC SYSTEM SELECTION

1. Criteria

a. HVAC systems shall be selected based on the following considerations:

1) Project Characteristics that includes but not limited to the following:

   a) New building vs. modernization project.

   b) Construction Materials: Wood frame, concrete, steel or masonry construction.

   c) Single story vs. multi-story.

   d) Roof type: Flat vs. pitched.

   e) Building size and configuration.

   f) Building a new plant vs. building on an existing school site.

   g) Single building projects vs. multiple building projects.

   h) Operating Schedules.

   i) Location on site with regard to adjacent buildings and uses.

2) Easy to install.

3) Easy to operate and maintain.

4) Most efficient.

5) Proven reliability.

6) Designed upon well established principles, explicit approval shall be obtained from the district for experimental designs before commencement.

7) Constructed of standard, use-proven materials.

8) Acceptable procurement lead time.

9) As low an initial cost as practical.

10) Low Operating cost.

11) Low Maintenance cost.

12) Lowest life cycle cost for highly energy efficient installations that incur a higher initial cost. The life cycle cost calculations shall be performed on an industrial standard program such as Trace 700 or DOE-2. The calculations complete with all input and supporting data shall be submitted to the district for review. The life cycle cost shall consider the incremental cost of building enclosure, structure, electrical service and other utilities as well as the HVAC systems. Cost estimates shall be made in an industry-recognized format and using manufacturer's cost data or data from a nationally recognized source such as Means. Utility costs shall be as obtained from the utility providers and shall include historical cost escalation trends. Maintenance cost shall include a breakdown of labor and materials for each piece of equipment or system component based on nationally recognized references.

13) Environmentally friendly.

14) Acoustically compatible with occupied spaces.

15) Susceptibility to vandalism.

16) Degree of disruption of occupants during modernization.

b. Submit a system selection report (Design Intent Narrative) that addresses all the considerations above, based on the guidelines of Chapter 1, HVAC System Analysis and Selection, of the 2004 ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Handbook.

2. Overview of HVAC Systems

a. Decentralized Systems: Decentralized systems are systems where the primary source of cooling, heating or supply air is provided from independent sources scattered throughout a building or a campus. Decentralized systems may consist of the following:

1) Small Single Zone Type Unitary Systems:

a) Packaged Rooftop Heat Pumps, Packaged Rooftop Air conditioning Units with gas heating, split system heat pumps, split system air conditioning units and wall mounted heat pumps or air conditioning units of less than 25 Tons capacity normally fall under the category of Small Single Zone Type unitary systems. Small Single Zone Type Unitary systems are usually controlled by a dedicated thermostat, but means of providing multiple zone controls for unitary systems, such as Carrier's VVT controls systems, are available. Such systems are categorized under Small Single Zone Type Unitary Systems because they cannot heat and cool simultaneously.

b) When single zone type unitary systems are provided for classrooms, one dedicated unit shall be provided for each classroom.

c) Positive means for fresh air make-up and sufficient means of relief to maintain door opening and closing pressures that comply with CBC accessibility requirements must be provided for classroom units.

d) VVT type controls may be used for administrative and support areas. With VVT type controls, rooms of dissimilar thermal profiles such as interior and exterior zones, north and south exposures, etc. shall not be served by a common unit.

e) Window- or wall-mounted units shall not be used for classrooms.

f) Rooftop packaged units are preferred over split systems, except for small unoccupied spaces like electrical, data, or phone rooms.

g) Gas heating is preferred over air-cooled heat pumps.

h) Do not use heat pumps where 24 hours operation is required or where the ASHRAE Bin weather data indicates heating design temperatures below 40 degrees for more than an hour at a time during the normal hours of school operation.

2) Multi-Zone Type Unitary Systems:

a) Roof-mounted, self-contained triple-deck multi-zone unit systems are categorized under

Multi-Zone Type Unitary Systems.

b) These systems are normally provided only for replacements.

b. Centralized Systems: Centralized systems are systems where the primary source of cooling and heating is provided from a central source for a building or a campus. Centralized systems may consist of the following:

1) Central chilled water plants:

a) Central chilled water plants may be air cooled or water cooled.

b) Water cooled systems are preferred over air cooled systems due to higher energy efficiency.

c) Air cooled systems shall be used only where practical limitations exist for a cooling tower.

d) Evaporative condensers are not allowed due to the tendency to lose efficiency rapidly from scale formation on the wetted tubes from hard water.

e) Modular chillers are not allowed.

f) A minimum of two independent chillers, working on lead lag, and associated accessories shall be provided for a campus wide central chilled water system. When only two chillers are provided, each chiller shall be sized to carry 75% of the load.

g) Campus wide central chilled water system shall be designed as variable flow constant temperature systems for energy savings and dehumidification effectiveness.

h) The location of the central plant shall not be so remote that the energy savings of the water cooled chiller system is offset by the additional energy consumption of the pumps.

i) Cooling towers shall be located away from HVAC outdoor air intakes, openings into buildings and areas normally occupied by students.

j) The air delivery energy consumption can also offset the energy savings of the water cooled chiller system. Air delivery energy consumption is usually the largest energy consumption component of the building air conditioning system. Design the air delivery systems to limit energy consumption due to excessive duct friction. Also analyze the feasibility of using low temperature supply air systems to reduce energy consumption.

k) Do not use variable air volume systems for classrooms unless a means for ensuring that each classroom is adequately ventilated and that indoor air quality is maintained -- for example, by use of carbon dioxide monitors that are interfaced with the air-handling-unit controls to modulate the outdoor air intake dampers. (VAV boxes should be located outside the classroom area to reduce noise.).

2) Central boiler plants that provide heating hot water or steam.

a) Hot water boilers are preferred over steam boilers. Steam boilers are normally provided only for replacements.

b) A minimum of two independent boilers and associated accessories shall be provided for a campus wide central hot water system for redundancy. `

c. Hybrid Systems: Hybrid systems are systems where a common water loop for heating, condensing or

heat exchange is provided from a central source for a building or a campus whereas primary cold or heat generators may be scattered throughout. Hybrid systems may consist of the following:

1) Water source heat pumps:

   a) Follow guidelines regarding location of cooling towers.

   b) A minimum of two independent cooling towers, two boilers and associated accessories shall be provided for a campus wide central condenser water system for redundancy.

2) Geothermal heat pumps:

   a) Obtain approval from the LAUSD's Office of Environmental Health and Safety before using geothermal heat pumps.

3) Large packaged roof top variable-air-volume units with heating hot water from a central boiler plant.

   a) In general, VAV units shall be limited to administrative or support areas and preferably not used for classrooms. If needed, review application with the District.

3. Unitary vs. Central Systems Comparison

a. Although central systems frequently offer many advantages over unitary systems, when all factors have been weighted and evaluated, unitary systems are usually chosen for schools because of their lower initial cost.

b. Advantages of a Central System include:

1) Central system equipment often has more technical advantages and capabilities

2) The total installed cooling or heating capacity of a central plant is normally less than that of unitary equipment.

3) The central cooling equipment offers better operating efficiency than unitary equipment.

4) Longer life.

5) Better temperature control.

6) Lower noise levels.

7) Better indoor air quality due to better air filtration flexibility.

c. Disadvantages of a Central System include:

1) High initial cost.

2) Need for more highly skilled maintenance and repair personnel.

3) Larger space requirements.

4) Entire system would be affected by the failure of one component. Larger areas would be shut down due to the failure of one large air handling unit. The failure of one chiller or boiler could reduce the cooling and heating capacity by half.

5) Multiple source responsibilities for installation.

6) Long lead times for obtaining equipment and replacement parts.

7) After-hour or off-schedule operation is not usually convenient or efficient. The energy consumption and cost operating a cooling tower, a chiller and associated pumps to service a few hours of the after hours or holiday operation of a few classrooms could offset the annual energy and cost savings of the entire system.

8) Even though the cooling (refrigeration) energy of a central plant is more efficient, the air moving energy is usually twice that of cooling energy in a typical school building. Some central systems are less efficient than unitary systems because the air distribution systems are not designed to be energy efficient.

d. For modernization or expansion of existing school plants, the addition of central systems is rarely cost effective. And, in modernization projects, carefully chosen and designed unitary systems can be installed with minimum disruption to the ongoing educational process.

D. CONTROLS AND ZONING

1. General

a. Provide an automatic system of temperature control for all systems.

b. Each classroom shall be a separate air-conditioned zone.

c. Small rooms such as adjacent offices on the same exposure and other small spaces of similar thermal profile may be combined under one control zone. Zone control shall be located at the most representative space temperature location.

d. A common air handling system shall not serve areas that are not on similar operating schedules.

e. Thermostats shall not be located in areas that are accessible to unsupervised students after schools hours such as classroom building hallways, corridors and lobbies.

f. Thermostats in Gymnasiums shall be protected from possible damage from the impact of balls etc. or provide remotely located thermostats with temperature sensors in the conditioned space or return air ducts.

g. All thermostats shall be provided with lockable vandal -resistant covers.

h. Wireless controls are not allowed.

i. For existing facility projects such as modernization and equipment replacement, replace existing pneumatic control systems with direct digital controls.

j. Kitchen MAU Sequence of Operations:

1) When kitchen is occupied, supply fan shall be turned on to low speed, return air dampers open to 100% and outside air dampers open to minimum set position.

2) Thermostats shall determine heating and cooling mode depending on indoor temperature and set points. This will activate heating and mechanical cooling. Evaporative cooling shall be locked out on this mode.

3) Exhaust fan shall be energized when kitchen hood venting is required. The supply fan shall be turned on to high speed, return air damper closed to 0%, and outside air damper open to 100%. Mechanical cooling shall be locked out on this mode.

4) Kitchen MAU shall be stand alone and not part of ECEMS.

2. Environmental Control and Energy Management System

a. Provide a fully automated, integrated and programmable Direct Digital Environmental Control and Energy Management System (ECEMS) for HVAC systems (Central and/or Unitary) control and energy management functions.

b. Integrate the ECEMS system with the Information Technology System when it is beneficial in cost or security measures. The ECEMS system shall be designed to be monitored and controlled from a remote location.

c. The specified ECEMS shall be open protocol BACNET system that is capable of interfacing with systems by other manufacturers.

d. Control system and equipment shall be fully presented in the contract documents. The ECEMS manufacturer shall furnish and install the complete system.

e. An override must be provided to by-pass the system in order to provide continuous service, if service on the system is required during school hours.

f. User interface workstation shall be located in the MDF room and shall be hardwired to the network.

g. The ECEMS shall provide the following controls, diagnostic, or trending points:

1) General:

a) Indicate a system that utilizes a screen display for control operations.

b) The system shall be accessible remotely. Indicate that the system shall be provided with all necessary software and configuration for remote users to open, read, and revise the screen display data.

c) Digital data shall be stored and saved at 4 hour intervals and analog data at appropriate intervals for an effective operation. Analog power inputs shall be stored at 15 minutes intervals.

d) The system shall be able to offload historical data onto a DVDs yearly. A user alert shall sound at this time. Reset shall be done manually.

e) Historical data stored in DVD shall be accessible via a display screen instantaneously by date and time, and in trends and graphs.

f) Indicate that the system shall be equipped with a UPS capable of providing power to the ECEMS for at least 30 minutes during power downtimes.

g) Coordinate with Mechanical Engineer to specify AC units or dampers with end limit switches, or analog position feedback for connection to unitary controller.

h) Design shall provide for continuous network operation.

i) Design shall indicate but not be limited to pathways and conduit routing, equipment location, component parts, and cables. Provide catalog numbers for all components.

j) All exterior mounted system components shall be NEMA 3R rated.

2) Air Conditioning Units (2 Tons – 25 Tons):

a) Supply air temperature.

b) Return air temperature.

c) Space temperature.

d) Outdoor air temperature. (one per site)

e) Filter status.

f) Fan status.

g) Compressor status.

h) Economizer damper current position.

i) Any other diagnostic points required by current T-24, automated fault detection and diagnostics (FDD).

3) Fan Coil Units and Condensing Units:

a) Supply air temperature.

b) Return air temperature.

c) Space temperature.

d) Filter status.

e) Fan status.

f) Compressor Status

g) Any other diagnostic points required by current T-24, automated fault detection and diagnostics (FDD).

4) Heat Pump and Fan Coil Units:

a) Supply air temperature.

b) Return air temperature.

c) Space temperature.

d) Filter status.

e) Fan status.

f) Compressor status.

g) Any other diagnostic points required by current T-24, automated fault detection and diagnostics (FDD).

5) Lighting: Provide monitoring for the lighting control system. The EMS shall communicate with the lighting control system via BACnet protocol.

6) Power System: Provide for the monitoring of power consumption as follows:

a) Monitor KWh, KW, KVA, KVAR, Power Factor, Amps at the main electrical service.

b) Monitor KWh, KW, KVA, KVAR, and Power Factor at each permanent building, and bungalow clusters.

c) Design shall indicate a unitary controller for connection to the main electrical service power meter.

d) The system shall be able to integrate analog signals form power meters. Power meter outputs shall be totalized for each building, designated area(s), or power panels. Each output shall be treated as one item

E. AIR DISTRIBUTION

1. Ventilation and Outside Air

a. Provide outside air to each room through the HVAC system in compliance with current CEC Standards.

b. Clearly indicate outside-air provisions and flow rates for each HVAC unit, and relief provisions to balance the fresh outside air make-up and to relieve exhaust air in all operating cycles.

c. Fresh Air Intakes:

1) Locate fresh air intakes to prevent contamination from kitchen exhaust, garage exhaust, or any process exhaust by locating the intakes on the upstream (prevailing wind) side of exhaust openings, as distant as possible.

2) Limit intake velocity to 750 FPM through net free louver area at 100 percent fresh air quantities to keep noise, pressure drop and rain carryover to a minimum.

3) Provide a floor drain at the fresh air intake into larger air handling unit rooms.

2. Ducts

a. Comply with current code and SMACNA Guidelines for duct construction. Thicker metal gauges for ducts and hanger straps, as specified in the Guide Specifications, must be used for exposed ductwork and other special considerations.

b. Size ductwork for conditioned air on equal-friction method based on 0.08" WC per 100 feet with a high velocity limit of 1,000 FPM above occupied areas (850 FPM for unitary equipment above classrooms) and 1,500 FPM inside shafts, or as directed otherwise by the Project Acoustical Consultant. Changes in sizes at every branch or every interval are not warranted economically unless branch represents a substantial percentage.

c. Size return-air and exhaust air ducts on equal-friction method based on 0.08" WC per 100 feet with a high velocity limit of 1,000 FPM above occupied areas (850 FPM for unitary equipment above classrooms) and 1,500 FPM inside shafts or as directed otherwise by the Project Acoustical Consultant.

d. Allowable air velocities for ducts above acoustically sensitive areas shall be determined by an Acoustical Engineer.

e. Duct return air, Ceiling-plenum return is not allowed, in order to improve indoor air quality.

f. Ducts shall be designed to achieve required sound attenuation without the use of sound attenuators; when this is not feasible, sound attenuators or lined ducts should be installed on inlet.

g. Fire dampers or combination smoke-fire dampers must be installed in all ductwork as required by the State Fire Marshal. Indicate damper locations clearly on drawings. Provide disconnect switches for automatic fire dampers.

h. If used Indicate the location of duct smoke detectors used for shut down of larger HVAC units and combination smoke-fire dampers clearly on the floor plans. Coordinate with the project Electrical Engineer to take advantage of total coverage smoke detection systems and save the duplicate cost of installing smoke detectors separately for the HVAC system.

3. Air Inlets and Outlets

a. Select and layout supply-air outlets and exhaust and return-air inlets in accordance with current ASHRAE Guidelines and acoustical requirements.

4. Fans

a. Select fans to minimize noise and to meet noise level criteria in occupied spaces.

b. Provide direct drive centrifugal roof exhaust fans, ceiling, inline or cabinet type on design below 3500CFM.

c. Special Exhaust Fans: Exhaust from kitchen hoods, fume hoods, kiln hoods, spray booths, and dust and sawdust collection systems require special attention to construction details, explosion hazards, noise and location.

1) Roof fans handling exhaust from kitchen hoods require a shaft seal and a special insulated plate to separate fan from motor compartment.

2) Fans exhausting fume hoods require spark resistant construction, and special coatings to prevent chemical action on fan and housing. The motor shall be explosion proof and located outside of the air stream.

3) Fans exhausting paint spray booths require spark resistant construction. The motor shall be explosion proof and located outside of the air stream.

d. Pre-fabricated duct collection systems shall be used for removal of saw dust in wood shops.

e. Exhaust from kiln hoods requires special fans with force-vented motor compartment and special construction to withstand high temperature.

5. Economizers for Outside Air

a. General:

1) The California Energy Commission prescribes 100% outside-air economizers for equipment with supply-air capacities over 2,500 cfm or 6.25 tons cooling capacity. That is the usual low limit for satisfactory payback at locations where weather conditions are least conducive to 100% outdoor air economizer operation with fan-assisted relief. For units of 7 ½ tons capacity and higher, which are usually used for administrative areas, multi-purpose rooms and gymnasiums, the District requires outside-air economizers and recommends power-exhaust systems.

2) Provide 100% outdoor-air economizers for classroom small rooftop unitary systems (3, 4 & 5 Ton capacities) to achieve energy savings and to comply with CHPS Energy Prerequisite 1 and IEQ Credit 4.2 (both for the ability to more effectively flush out the building prior to occupancy and for the increase in fresh air during the economizer cycle). Compliance with CHPS is mandatory, but the use of economizers shall be considered only if the cost is justified by benefits and school location. When economizers are utilized they are to be used with gravity relief of exhaust air, not with power exhaust systems. Small split systems are not required to be provided with 100% outdoor air economizer systems. Do not provide 100% outdoor air economizers when the outdoor air quality is low.

b. Design Criteria for Economizers and Gravity Relief Systems:

1) For small rooftop unitary systems, provide units with downward duct discharge, and with manufacturer-installed and warranted economizer equipment.

2) The total pressure drop through the relief system shall not exceed 0.075" water gauge.

3) Relief Louver size: The pressure loss through the louvers should not exceed 0.02" water gauge static pressure. Catalog data indicates that the majority of the commercially available louvers will have about 0.02" water gauge static pressure drop at about 250 feet per minute free area velocity.

4) Ceiling Grille size: The pressure loss through the grilles should not exceed 0.02" water gauge static pressure. Catalog data indicates that the majority of the commercially available registers will have about 0.02" water gauge static pressure drop at about 300 feet per minute free area velocity.

5) Duct size: The relief duct should be sized for 0.01" water gauge static pressure loss per 100' of ductwork maximum for 100% of the unit capacity. The relief duct pressure loss should not exceed 0.01" water gauge static pressure.

6) Backdraft dampers. Provide the counter-balanced type that opens at about 0.01" water gauge static pressure. Check if they are opening properly and not stuck in the closed position. The total pressure loss through the damper should not exceed 0.02" static pressure.

7) The pressure loss through each component of the system is required to be adjusted so that the total does not exceed 0.075" water gauge static pressure.

c. Commissioning Measures

1) Air Balance: Systems must be balanced for both the regular and economizer modes.

a) Most unitary systems are specified with a safety factor in the static pressure. The Contractor must be required by the specifications to replace the drive sheaves and slow the fan down to achieve the required air balance and prevent energy waste and noise. If this is not done, the air flow is left higher creating higher static pressure and noise levels, as well as excessive pressure on doors and door closers.

b) If the system is not also balanced for the economizer mode, when the outdoor air dampers open fully much more air is delivered than the design capacity.

2) Corridor pressure: If the corridor HVAC unit is off, or the corridor unit is not in the 100% economizer mode when the classroom is operating on the economizer cycle, the corridor pressure will be lower than normal operating conditions, further contributing to the door-closing difficulty. Design system to prevent this occurrence.

3) Door closer pressure: During testing and balancing, door closer pressures must be set properly and not too low just to more easily achieve access compliance.

4) Remedial Measures for Incorrect Design:

a) If gravity relief is not sufficient during the 100% outdoor air economizer operation after the above commissioning is done, the maximum operation of the return and relief dampers in the economizer system should be adjusted to reduce the amount of outdoor air and return some air to the unit. An 80% outdoor air system is still more energy efficient and conducive to fresher indoor air than a minimum outdoor air system with 30% outdoor air. If this is not possible, the economizer operation is required to be deactivated.

F. COILS AND PIPING

1. Cooling Coils and Piping

a. Use maximum 550- FPM face velocity for the calculated quantity of air passing through direct-expansion cooling coils and chilled-water cooling coils.

b. Pipe all cooling coils for counter flow of refrigerant against direction of airflow for most effective heat transfer. Chilled water or refrigerant shall enter on the airflow downstream side of coil and work through rows opposite the airflow. Design for water to enter at bottom and exit through top connection of the coil to relieve possible air binding. Install air vents at top of return riser.

c. Use 2-way control valves to provide a variable-flow chilled water system. Provide variable-speed drives at the pumps to save energy where economically feasible. Provide 3-way valves at the end of each pipe

loop for continuous water circulation. Provide a sufficient number of 3-way valves to maintain the minimum flow requirements of chillers. Provide multiple chillers so that they may be staged.

d. Variable speed drives must be provided for the secondary pumps in primary - secondary chilled water systems.

e. Provide all coil sections with thermometers, a 3/4" globe drain valve piped to floor drain at system low point, a water strainer ahead of control valve, and gate valves in main chilled water supply and return for shutoff and repair of control valves.

f. All valves, fittings, strainers and pipes (up to the coil) shall be the same size, except for control valves which shall have reducers at valve inlets and outlets. Provide flexible connections at inlets and outlets to coils.

g. Provide Griswold Flow Control valves or equivalent at the inlet side all cooling coils downstream of the shut-off valves. Clearly emboss flow rating on a metal plate fixed on valve housing.

h. Provide a venturi flow measurement device, Barco-aeroquip or equivalent, on main chilled water line. Clearly emboss flow requirement on a metal plate fixed to venturi housing. Show direction of air flow through coils on diagrams.

i. Size chilled water coils on a basis of 12°F to 16°F water temperature rise.

j. Use direct expansion (DX) coils where close temperature control is not required; otherwise, use chilled water coils. DX coils make control of cold plenum temperature erratic and present operational difficulties.

1) Provide as many steps of capacity with solenoid valves as possible and use individual suction risers with oil traps.

2) Pipe liquid lines with stop valves, strainers, solenoid valves, and external equalizing thermal expansion valves.

3) Install sight glasses ahead of thermal expansion valve to observe a premature flashing condition.

2. Heating Coils and Piping

a. Size heating coils at 700 FPM maximum.

b. Use hot water as the preferred heating medium rather than steam because of relatively poor heat distribution across face of a steam coil, particularly on low heat demand.

c. Use 2-way control valves to provide a variable-flow hot water system. Provide variable-speed drives at the pumps to save energy where economically feasible. Provide 3-way valves at the end of each pipe loop for continuous water circulation. Provide a sufficient number of 3-way valves to maintain the minimum flow requirements of boilers. Provide multiple boilers so that they may be staged.

d. Arrange heating coils for counter flow and upward flow for best heat transfer and natural venting. Tailor coils for each project with sufficient allowance for warm-up and fresh-air load.

e. Size water coils for 20°F minimum water temperature difference, and entering water temperature of 180° F. Piping to hot water coils shall be the same as that required for the chilled water coils.

G. COOLING SOURCES

1. Refrigeration Systems

a. Direct Expansion (DX) Systems, because it is difficult to obtain modulating control of capacity, should be used only for single-zone units and other applications where modulation is not necessary.

b. Chilled Water Systems should be used for most multi-zone units and larger systems, where more precise control and better modulating capacity control is needed.

c. Package-type units with compressor, chiller, condenser, and controls all provided as a unit should be used when possible to simplify installation.

d. An absorption type machine may be considered only if steam is available from a central plant that will be operating during summer or special gas incentives are available.

e. Machines should be piped for parallel flow.

f. Size piping at a friction loss of 5 feet of water per 100 feet of pipe maximum with maximum velocity not to exceed 8 feet per second.

g. Select evaporators and condensers so water velocity through tubes is 9 feet per second maximum.

h. Thermal energy storage systems and co-generation systems shall be considered only when substantial incentives are offered by the utility providers to offset the additional cost.

2. Chilled Water Pumps:

a. Size pumps for the total pressure drop through the system, including piping, chiller evaporator, coil, three-way control valve and "Griswold" flow control valve.

b. For primary secondary system, provide two redundant secondary system pumps. Size each pump for 100% of system capacity, so one functions as 100% standby. Both pumps shall be designed with variable speed drives and automatic alternating controls. Where primary secondary system is not used, provide a dedicated pump for each chiller that is sized for full capacity of the chiller.

c. Use end-suction, pedestal-mounted pumps with mechanical seals and flexible couplings for all except very large systems, where it may be necessary to use double suction pumps.

d. Install a gate valve and strainer on the suction side and a balancing cock on the discharge side of each pump, and a chemical feeder from the supply to return line.

e. Bolt pumps directly to a concrete base unless located over or under a critical occupied space, when they should be mounted on inertia anti-vibration bases. Install flexible connections in piping to pumps.

3. Cooling Towers

a. Size cooling towers at minimum of 2ºF above current ASHRAE design wet bulb temperature to get 120% to 150% of required capacity, to guarantee full capacity from chiller at any wet bulb conditions

and to allow for fouling of tower.

b. Provide a bleed-off system and a chemical feeder to prevent mineral build-up and to maintain water quality.

c. Provide for make-up water to replace evaporation and bleed.

d. Locate cooling towers to avoid unsightly conditions and so that noise generated by fan will not be objectionable in adjoining buildings. Provide louvered screens, masonry walls, or planting for concealment.

e. Locate cooling towers so that the discharge air from the cooling towers will not contaminate air handling unit outdoor air intakes, openings into the building and pedestrian or student occupied areas to minimize the possibility of Legionnaires' Disease.

4. Condenser Water Pumps

a. Use two system pumps with variable speed drives. Size each pump for 100% of system capacity so one pump can function as 100% standby. Provide automatic alternating controls.

b. Size pumps for the actual capacity of the chiller requirements -- approximately 3 gpm per ton of refrigeration.

c. Design condenser water piping the same as for chilled-water piping. Make sure that cooling tower elevation or suction pipe sizes are adequate to provide a positive suction head at the pump.

H. HEATING SOURCES

1. Boilers

a. Use Low Nox hot-water boilers to avoid expense of heat exchangers.

b. Use two or more gas fired package-type boilers, cast-iron or steel water-tube with burner and controls all mounted as a unit, for larger systems and one for smaller systems.

c. Operate at 180°F to 200°F minimum with a temperature drop of 30°F maximum to prevent condensation of flue gases in breeching and stack.

d. Provide a combination low-water-cutoff and boiler-feed control with alarm mounted above centerline of boiler relief valve discharge. Connect boiler feed to full domestic cold water line pressure, taking care to see that CW pressure is greater than boiler operating pressure.

e. Pipe blowdown from low-water control and feeder to a hopper drain located adjacent to boiler.

2. Central Boiler Plant

a. Hot water from a Central Plant should be used if available.

3. Hot Water Heating System

a. Pumps:

1) Use two system pumps in parallel provide one system pump as standby. Size boiler primary recirculating pump as recommended by boiler manufacturer.

2) If close temperature control is required, select circulating pumps first and size piping to fit available pump head. In most cases, this will permit use of pipeline-mounted pumps for all secondary circuits. Close temperature control is usually not required and secondary circuit pumps are usually not necessary.

3) Use end-suction, pedestal-mounted pumps with mechanical seals and flexible couplings for all except very large systems, where it may be necessary to use double suction pumps.

4) Bolt pumps directly to a concrete base unless located over or under a critical occupied space, when they should be mounted on inertia anti-vibration bases. Install flexible connections in piping to pumps.

b. Piping:

1) Design for water velocity of 8 feet per second maximum, with pressure drop 5 feet per 100 feet of pipe maximum.

2) Arrange piping so heat source, expansion tank and cold-water make-up are on suction side of pump as indicated in latest ASHRAE handbook, Systems Volume.

3) Install a small chemical feeder on each system.

c. Expansion Tanks:

1) Size expansion tanks in accordance ASHRAE Guidelines, for 100 psi ASME Code working pressure. Expansion tanks shall be of the bladder or diaphragm type.

d. Relief Valves:

1) Provide ASME Code-rated relief for maximum heat input to hot water boiler.

2) Relief setting is limited to boiler working pressure or working pressure of weakest component in system.

3) Pipe discharge to 12" maximum above floor.

e. Air-Vent Valves:

1) Provide auto air vent valves at all high points in system or wherever air might be trapped in system. Locate valves on drawings.

4. Cold Water Make-Up

a. Cold water make-up to boilers, hot-water, chilled-water, and condenser-water systems should be made from a common line which has a reduced pressure backflow-prevention device installed under plumbing work.

b. Install a gate valve, strainer and check valve at make-up connections to closed systems, except that make-up to combination boiler-water feeder and low water cut-off on boilers should be full line pressure.

c. Provide water treatment for all closed heating and cooling systems and at all cooling towers.

I. SOUND AND VIBRATION CONTROL

1. Criteria

a. Because mechanical systems and equipment are a major source of disturbing noise within buildings, sound and vibration control measures must be incorporated to the maximum extent economically practical. In general, refer to current ASHRAE guidelines, District Guide Specifications, chapter 2.4 "Environment and Sustainability" of this Guide, and the following recommendations.

b. Since the District desires to achieve noise levels from HVAC systems better than 45 dBA, especially in instructional spaces, plan and describe in the "Basis of Design" narrative how this improved acoustical quality will be achieved together with the associated cost impacts.

2. Equipment Sound Levels

a. Schedule the sound level of the design base HVAC equipment on the drawings. These sound levels must be at the design conditions and tested per applicable current standards such as ARI Standards 260, 270, 370 and AMCA 300.

3. Duct and Fan Noise

a. Ductwork:

1) Use ducts of thicker sheet metal gauge with sufficient bends to reduce fan and equipment noise. Lined ductwork and/or attenuators may be used when recommended by the Project Acoustical Engineer. Duct lining, acoustical panels in ductwork and sound attenuator media when used shall be of the type that inhibits the growth of mold, mildew and fungi and shall not contain harmful VOC's or contain glass fiber.

2) Provide flexible connectors for ducts at fan connections

3) Do not locate sound attenuators above spaces where the self generated noise of the attenuator will increase the space sound level above requirements.

b. Fans:

1) Fan-noise in occupied spaces is typically caused by poorly constructed roof fans, roof fans operating at too great a tip speed, fan noise traveling through air intake louvers and then into adjoining spaces, and fan noise traveling to occupied spaces through inadequately treated return systems. Fan noise also comes from rooms without sound-attenuating walls or from roof-top units with inadequate sealing of roof openings and duct chases.

2) Locate fan and equipment rooms away from classrooms and other noise-sensitive spaces.

3) Make fan and equipment room walls of dense material, poured concrete or concrete block with all voids filled where feasible – or sound-attenuating walls of studs and gypsum board.

4) Provide details to assure adequate sealing of duct penetrations through roof or mechanical equipment room walls.

5) At roof fans exhausting from ceiling plenums over occupied areas, provide a sound attenuator installed at fan inlet.

4. Equipment Mounting and Isolation

a. For roof-top HVAC units, no roof penetrations are allowed except the minimum necessary for ducts and electrical conduit. All such openings shall be acoustically sealed with acoustical sealant. In addition, beneath the units provide a sound-isolation barrier of a close-fitting layer of ¾" waterproof plywood or cement board, sealed with acoustical tape to the curb.

b. For fans over 24" provide inertia type concrete bases with spring isolators. For smaller fans provide spring-type vibration isolator rails under fan and motor.

c. Floor-mounted pumps shall be bolted directly to concrete bases and shall have flexible pipe connections, except when located over or under an occupied area where noise could be transmitted by piping or building structure to occupied space. In this case, they shall be mounted on inertia type concrete bases with spring-type vibration isolators and shall have flexible connections rigidly anchored and braced to prevent elongation of the flexible connections.

d. Air compressors shall be mounted on spring-type vibration isolators, except larger sizes shall also have concrete inertia bases and flexible pipe connections.

5. Pipe, Conduit and Duct Connections to HVAC Equipment

a. Pipe, duct and electrical conduit connections to HVAC equipment with rotating or reciprocating components shall be provided with flexible connectors.

b. Provide spring, neoprene or rubber in shear type hangers as required for pipes and ducts near connections to HVAC equipment that are located near or serve acoustically sensitive spaces as directed by an acoustical engineer.

6. Classroom HVAC Sound Control:

a. To meet District standards, HVAC systems must be designed so that noise from the system does not cause the ambient noise in a classroom to exceed the level of 45 dBA as measured in accordance with ANSI Standard 12-60. Make design recommendations to the District to achieve a lower sound level, within reasonable economic limits

b. ASHRAE recommended design criteria for classroom HVAC sound control is Noise Criteria (NC) Curve NC-35. An HVAC system will probably meet the District 45 dBA criteria when no portion of octave-band spectrum of noise lies above NC-35 curve. (This is approximately equivalent to a sound level of 45 dBA from a standard sound level meter reading.)

c. Refer also to chapter 2.4 "Environment and Sustainability" of this Design Guide for additional standards and reference to CHPS Best Practices.

J. SPECIAL CONSIDERATIONS

1. HVAC and Refrigeration for Food Service:

a. Kitchen ventilation systems shall comply with the current CMC requirements.

b. The basic design concept of the Kitchen Ventilation Systems shall be in accordance with the District Standard Design. Drawings for these standards are available from the Design Manager upon request.

c. The kitchen ventilation system shall be capable of maintaining the kitchen temperature above 68 degrees F during heating and below 80 degrees F during cooling.

d. The kitchen ventilation system shall operate at a lower speed to deliver less air (only the amount necessary to maintain the room temperature) in order to conserve energy when the kitchen hood exhaust fans are off.

e. Locate control switches for HVAC equipment to prevent unauthorized use.

f. Kitchen Hoods:

1) Provide U.L. listed stainless steel hoods of the 100% exhaust type. Short circuit hoods where make up air is introduced directly into the hood are not allowed.

2) Provide a State Fire Marshal approved fire protection system inside hood.

g. Refrigeration Equipment For Walk-In Refrigerators:

1) The District does not provide standby refrigeration equipment for walk-in boxes, so accessibility is critical for repairs.

2) Do not locate in areas difficult to reach or service. Best location is a shaded area outside at grade level.

2. HVAC for Science Classrooms

a. Science classrooms include chemistry, physics, biology, physiology, physical earth, and earth science study facilities, flexible science labs, preparation/workrooms next to labs.

b. Where hazardous or toxic substances are used in the classrooms, special precautions must be taken, including the following:

1) Direction of airflow must be controlled to prevent spread of airborne contaminants and to protect personnel from exposure to toxic and hazardous substances.

2) Exhaust 100% of air supplied with no re-circulation.

3) Maintain constant airflow volume with exhaust operating at full capacity.

4) Air supply system must satisfy thermal requirements and provide necessary air balance.

c. Exhaust system:

1) Exhaust fans must remove a fixed air quantity from each hood. Hoods that have doors must have individual bypasses for air volume and face velocity regulation.

2) Exhaust system may consist of an individual fan for each hood or a fan serving a group of hoods.

3) Determine if there is a need for off-hour operation of hood exhaust system, and design the system accordingly.

4) Locate exhaust fans near the point of discharge to atmosphere so ducts will be under negative pressure and any leakage will be into duct.

5) Locate discharge openings with respect to fresh air intakes to avoid re-circulation.

6) Exhaust ducts for fume hoods and fans must be of non-corrosive construction. Motor shall be explosion proof. In all cases, follow the hood manufacturer's recommendations for exhaust fan sizing and system design.

7) Provide fire rated enclosure or fire wrap around fume hood duct, as required by applicable codes, when duct crosses other areas.

3. HVAC for Computer Rooms

a. Provide HVAC to MDF, IDF, and any other computer rooms having special requirements for temperature and air-quality control.

b. The computer room HVAC units shall be for 24 hours operation, independent from the central system.

4. HVAC for Arts Classrooms

a. Photography Classrooms: Supply dark rooms with 100% outdoor air for control of odor. Since air must be extremely clean to avoid spotty film, use high-efficiency filters. Duct systems into dark rooms must be light tight.

b. Art Classrooms: Provide 100% exhaust system, minimum six air changes to remove fumes from solvents, etc.

c. Ceramic Classrooms: For kiln, products of combustion must be removed, and a source of combustion air provided for indoor, gas-fired models. Since they emit large quantities of heat, that load must be considered in HVAC design. Provide 100% exhaust system, with a minimum of six air changes.

5. HVAC for Industrial Arts Classrooms

a. General:

1) Industrial Arts Classrooms are spaces provided for instruction in construction, maintenance, and repair of industrial products. In addition to California Code of Regulations, Title 24, refer to CCR, Title 8 - "Industrial Relations" for additional design criteria.

b. Power Energy Technology:

1) Power Energy Technology shops require large amounts of heat to replace losses through large and frequently opened doors.

2) Since work is often done underneath the automobile or other equipment, floors should be kept warm by radiant heaters or other devices.

3) Provide an under-floor carbon monoxide exhaust system to remove engine exhaust gases.

4) If a paint spray booth is installed, it must be exhausted in a safe manner. Makeup air to spray booth must be tempered for best painting results.

5) If a steam cleaning area is provided, it must be exhausted.

c. Construction Technology Shops:

1) Dust produced in wood working operations is both a health and fire hazard. In smaller installations, a packaged dust collector using a vacuum cleaner principle may be provided. Large groups of wood working machines will require a ducted, central collection system with a centrifugal separator. In either case, collection equipment must be located so that disposal of collected dust is easy and economical. Dust collection system should include the following:

a) Exhaust pipe system including dust collector and skimmer are covered in Guide Specifications for use in Senior and Junior High Schools.

b) Avoid under-floor piping, if possible.

c) Keep flexible exhaust piping to a minimum. Where flexible piping is used, a non-collapsible type of piping should be installed.

d) Drop exhaust piping along columns or walls.

e) Note minimum height of hopper outlet for placement of 55-gallon drums.

f) Note maximum height of exhaust piping inlet to dust collector on existing building where exhaust piping may penetrate existing building window.

g) Coordinate exhaust piping with suspended light fixtures which are free to swing a minimum of 45 degrees from vertical in all directions.

h) Provide seismic restraints for exhaust piping per provisions of NFPA pamphlet 13.

i) Refer to standards and requirements of ACGIH Industrial Ventilation - A Manual of Recommended Practices -- AMCA, and SCAQMD, as applicable.

2) If spray painting is to be done, a bench type or floor type spray booth should be installed.

3) Heating system must be large enough to accommodate outdoor air introduced to equal exhaust.

d. General Manufacturing Shops:

1) General manufacturing shops may contain high-heat producing equipment such as furnaces and ovens. These must be shielded or ventilation must be provided to control local environment.

2) Welding and soldering operations produce toxic fumes which must be removed through hoods or other local exhaust.

3) Dip tanks and plating tanks must be hooded to prevent spread of toxic vapors.

6. Underground Parking Ventilation

a. Ventilate underground parking areas continuously by forced air exhaust systems in compliance with current codes.

b. Provide carbon monoxide monitors to control the exhaust fans and to annunciate an alarm on high CO levels as required by code.

c. Do not provide exhaust ducts outside garage fan room, unless garage is very large and odd in shape, thus requiring some ducts. Locate fan in fan room or enclose fan with chain link fence for vandal protection.

d. Assure that exposed ducts or equipment are protected by bollards or other enclosure.

e. Coordinate location of ducts, piping and equipment to avoid overhead obstructions into the minimum vertical clearance (8'-0") along the vehicular route connecting the parking garage entrance to the accessible spaces, and at the accessible spaces themselves. Coordinate location of ducts, piping, and equipment to avoid obstructing the accessible route, and to avoid protrusions >4" into the protected zones that are not cane detectable by visually impaired persons.

7. Restroom Ventilation

a. Provide a minimum of 10 air exchanges per hour in restrooms.

b. Provide conditioned air to multi-occupant restrooms utilizing relief air from large adjacent classrooms with backdraft damper.

c. Toilet exhaust duct shall be routed to the roof. Sidewall toilet exhaust is prohibited.

d. Toilet's exhaust fans smaller than 3500 CFM are to be direct drive.

3.7 ELECTRICAL POWER AND LIGHTING

A. **Power Systems General Requirements**

B. **Lighting Systems Requirements**

C. **Electrical Power Systems**

D. **Emergency Power System**

E. **Photovoltaic (PV) Systems**

3.7 ELECTRICAL POWER AND LIGHTING

A. POWER SYSTEMS GENERAL REQUIREMENTS

Life safety and preservation of property are two critical factors in the design of the Electrical Systems. Safety to personnel and protection of property cannot be compromised and only the safest systems must be considered.

1. General Guidelines.

a. For existing facilities the Architect-Engineer shall procure all available electrical drawings and underground utility plans from the District's Vault; Other site plans or site information, and related drawings are also available for consultants' research.

b. The Architect-Engineer must visit the site to verify record drawings and/or existing as-builts information against site conditions to reflect them in the proposed design and construction documents.

c. Designs for modernization projects, expansions or additions, as well as new construction in existing campuses shall reflect existing conditions, and applicable modifications made to meet the project's requirements.

d. Off-site work or work within easements shall be designed in accordance with the requirements of the agency having jurisdiction.

e. Special requirements from local municipalities shall be addressed in the design documents.

f. All power wiring shall be in conduit or raceways. Refer to applicable specification division 26 specification sections for additional requirements.

g. Low-voltage communication or signal wiring shall be continuous without splices between devices, and shall be in conduits or raceways. Refer to section 3.8 – Electrical Communication AV systems for additional requirements.

h. Electrical receptacles and light switches shall be located to allow easy access by users, reflect probable area(s) usage, and equipment locations. Receptacles or switches serving equipment must be accessible, and located in compliance with CEC and California Administrative Code -Title 24 requirements.

i. Provisions shall be made for wire management of power cords accessing the receptacles and shall be coordinated with the work surfaces, counters, cabinetry, storage units, etc.

j. All panels and control equipment must be readily accessible.

k. Avoid running conduit on the roof unless it is absolutely necessary, the length of conduit run shall be minimized, and the design shall clearly indicate all requirements to accommodate roof replacement if necessary.

Prior to designing a system with roof mounted conduits the Architect-Engineer shall obtain approval from the OAR or Design Manager.

B. LIGHTING SYSTEMS REQUIREMENTS

1. General Guidelines

a. Lighting design shall conform to California Energy Commission Energy Efficiency Standards for nonresidential buildings, and shall achieve greater efficiency in accordance with the requirements described below.

b. Lighting design shall comply with guidelines and follow recommendations and procedures of the Illuminating Engineering Society of North America (IESNA) in its "Lighting Handbook" and "Recommended Practice on Lighting for Educational Facilities, ANSI/IESNA RP-3-00," as well as other documents referenced herein.

c. Refer also to alternative design approaches and daylighting requirements presented in the "Environment and Sustainability" section of the "School Design Guide."

d. For other guidelines, refer to The Collaborative for High Performance Schools "CHPS Best Practices Manual, Volume II," sections on "Electric Lighting and Controls" and "Appendix" (available at http://www.chps.net/).

e. Provide uniform light distribution in all learning and working spaces. Interior lighting systems shall provide illumination without discomfort caused by glare. Consider reflectance of room surfaces and coordinate with architectural finishes.

f. Avoid harsh or extremely bright lighting. Minimize veiling reflections in task details.

g. Utilize daylight harvesting to the maximum extent feasible in all spaces, integrated with electric lighting, photo sensors, and dimmer controls to reduce electricity use.

h. Utilize high color-rendering source in which appearance of people and spaces is enhanced.

i. Consider maintainability of lighting system, including susceptibility to dirt collection, ease of cleaning and relamping.

j. Provide in all display cases lighting to illuminate each shelf and back individually.

k. All lighting circuits shall have a power factor equal or greater than 0.95.

l. The lighting controls in Theatrical applications shall be interfaced with the Fire Alarm System to cause house lighting to be forced on during alarm conditions, regardless of manual control settings. In addition the lighting control system shall also interface with the central public address and autonomous public address system.

m. Wall mounted light fixtures shall be located in compliance with ADA requirements.

2. Illumination Criteria

Design to achieve the following maintained average foot-candle levels on the task plane at levels not lower than those indicated below, unless alternative lighting designs are submitted and approved by the District that demonstrate compliance with these criteria.

Interior Spaces:	Foot Candles	Light Source
General Classrooms (See special section covering all classrooms.)	30-50	Linear Suspended Fluorescent
Science and Technology Classrooms	30-50	Linear Suspended Fluorescent
Shops and Drafting Classrooms	50	Linear Suspended Fluorescent
Library	30	Linear Suspended Fluorescent
Auditorium (higher level is for lecture/testing uses)	30	Halogen/ Fluorescent
Multi-Purpose Room:	30-50	Fluorescent
Gymnasium (see special section)	50	Fluorescent
Locker, Exercise and Weight Rooms:	10	Fluorescent
Dining Areas (on dimmers)	30	Fluorescent
Food Preparation Area	50	Fluorescent
Custodial Rooms	20	Fluorescent
Offices	30-50	Fluorescent
Corridor/Stairways (1 FC min. Emergency Exit Lighting)	10	Fluorescent
Restrooms	10	Fluorescent
Parking Garage	5	Fluorescent
Parking Garage Entry Zone (Daytime Only)	50	Fluorescent
Machinery and Equipment Rooms:	50	Fluorescent
Exterior Spaces		
Building Exterior (Walks, General Areas)	2	
Exterior Corridors (Covered Walks)	10	
Parking Lots	1 min.	
Athletic Fields: Refer to IESNA		

3. Specific Lighting Criteria

a. Classroom Lighting Systems

1) Follow the recommendations of the Southern California Edison's "Classroom Lighting Guidelines," except as modified herein.

2) Classroom lighting shall be an integrated combination of daylighting and electric lighting providing energy conservation through lighting controls. Refer to the "Environmental and

Sustainability" section of these guidelines for more information.

3) The typical classroom model to meet or exceed the criteria will consist of two rows of continuous suspended indirect or indirect/direct fluorescent lighting fixtures parallel to the window wall. (Do not use three rows.) Each row 20 feet long, plus a 12-foot white board lighting fixture. (Preferred system in order to provide greater illuminance of the white board area)

4) Lamps in each row for general illumination shall be two high-output T8 lamps or one dimmable T5HO lamp with matching ballasts. Ballasts will usually have a normal ballast factor and characteristics in compliance with applicable lighting and lighting controls in specifications sections in Division 26..

5) Align suspended rows and supporting cables with the ceiling grid. In a typical classroom rows will be spaced 14 feet apart; however, vary the length and spacing of the two continuous rows of lighting fixtures to suit the size and shape of the classrooms and their specific functional needs.

6) For larger science, technical and art classrooms, use a similar model, but use longer rows. Since these rooms sometimes have perimeter work counters, and the illuminance should be greater over the counters, adjust the spacing to adequately illuminate the counters. Use a higher ballast factor if necessary to increase the illumination.

7) In High and Middle School Science Classrooms use the suspended dual-mode fixture with two high-output T8 indirect lamps for general illumination and one dimmable T8 downlight for AV presentations, switched so that both lamp sets cannot be on at the same time. Use a whiteboard lighting fixture in these classrooms.

8) Lighting fixtures must illuminate the ceilings and walls as well as the task plane (desktop).

9) Uniformity of illuminance on the desktop is important – especially on the core desk space, beginning four feet from walls. Generally, a max: min ratio of 2.5: 1.0 should not be exceeded.

10) Provide ceiling illuminance equal to or greater than the desktop illuminance. Uniformity of ceiling illuminance is important, and the maximum to minimum ratio should not exceed 12:1. Provide wall illuminance (opposite the window wall) approximately 50% or more of ceiling illuminance.

11) Provide teaching wall and white board illuminance at 20 fc minimum. When using wall-washing whiteboard lighting fixtures, illumination of the instructional wall (whiteboards, maps, etc.) should be 30 fc minimum to 40 fc maximum.

12) Wall-washing whiteboard luminaries shall be provided in accordance with IESNA recommendations, to avoid reflections in the board to the nearest viewer, to avoid a bright patch above the board, and to evenly illuminate the board without a steep fall-off toward the bottom.

13) During the design development phase provide point to point lighting calculations to graphically demonstrate the light levels on all room surfaces. Use the input data presented in the SCE "Classroom Lighting Guidelines," except for any modifications in this Guide. (Note that the "Architecture" section of this Guide calls for the following minimum surface reflectances: Ceilings – 83%; Walls – 60%; Floors – 30 %.)

b. Gymnasium Lighting

1) Illuminate gyms with top daylighting for daytime use (not side lighting through windows), using skylights or tubular daylighting devices.

2) Using average lumen output of the daylight device for the brightest 2,400 hours of the year

(based on TMY2 weather data), design daylighting to provide 30 to 35 fc average on the floor with a max./min. ratio of 2:1 (all within reasonable tolerances).

3) Provide electric lighting for nighttime use and daytime supplementary lighting using high-bay or high-output fluorescent lighting fixtures (T5HO lamps), accompanied by daylight sensors to selectively switch or dim the lamps in response to the daylight illuminance. Lamps shall be switchable to four (or three minimum) different levels (including "OFF"). The Architect/Engineer of Record may propose fixtures with alternative light sources, justification and approval in writing from the District will be required.

c. Site Lighting

1) Campus and parking areas and building perimeters must be lighted to provide for the safety of people and the security of property. Provide adequate light, properly distributed to reveal such hazards as curbs and steps, and to illuminate dark and potentially dangerous areas. Preferred light sources are Metal Halide and High Pressure Sodium.

2) Provide safety and security lighting on exterior walls of buildings, building entrances, parking lots, covered walks, and where needed to meet specific project requirements.

3) Provide lighting for parking lots using pole-mounted full cut-off light fixtures.

4) Lighting fixtures must be installed in such a manner as to minimize glare for pedestrians and drivers, and to avoid light spilling onto adjacent properties.

5) Exterior lighting fixtures and controls, including those located in stairwells open to the exterior, shall be weather and vandal resistant. Locate lighting fixtures and sensors at 10 feet or more above grade wherever feasible, or otherwise as high and out-of-reach as possible.

d. Sports Fields

1) For sports fields the luminance must satisfy the requirements of players and spectators. Uniformity of horizontal and vertical illumination over the entire playing field is especially important for such high-speed sports as baseball, football, and tennis.

2) Important factors include glare, luminance contrast, color contrast, flicker and spill light.

3) Lighting fixtures must provide spill and glare controls to minimize offsite illuminance and glare and sky glare.

4) Refer to IESNA standards for specific requirements of each sport activity.

e. Stages, Auditorium, and Multi-Purpose Rooms in Middle Schools and High Schools

1) A Theatrical Lighting and Sound Consultant must be engaged for the design of these systems; particularly for Middle Schools and High Schools.

2) Lighting and controls are required for stages and platforms, house lights, work lights, and orchestra pit lights.

3) All stage, auditorium, and multi-purpose rooms lighting must be easily and safely accessible for relamping and servicing. Such provisions must be clearly indicated on the drawings. For elementary schools multi-purpose room stage lighting requirements refer to f below.

4) Proscenium stages and platforms require lighting from the front, side and back.

5) Stage lighting equipment should not be visible to the audience; however, in cases where existing conditions makes it necessary the Architect/Engineer shall obtain approval from Design Manager prior to proceeding with the design. If the equipment is mounted in visible locations, consider instrument spill light, glare and nearby reflective surfaces in the design.

6) The most common stage front lighting in the auditorium and multi-purpose room ceiling is commonly referred to as the ceiling cove or beam position. This is plotted on a 45-degree angle from head height at approximately 5 feet of an actor standing at the proscenium line to the auditorium or multi-purpose ceiling. Lights located in this position provide the basic illumination for the downstage acting area. In a large auditorium or multi-purpose room, several ceiling slots may be required to provide adequate lighting on the forestage or apron, and the area immediately behind the front curtain.

7) Side lighting supplements the front lighting to give three-dimensional properties to the performers and setting. This lighting equipment consists of ellipsoidal spotlights mounted on a pipe frame secured to the wall, at each side of the auditorium or multi-purpose room. These positions are called box booms and the lighting is intended for the apron area only or cross lighting for deeper into the stage.

8) Side light for the remaining acting area (behind the proscenium arch) can either be from positions on the end of electrical battens in the air or on separate movable boom poles in between each wing (this low side light is most commonly utilized in dance).

9) On-stage lighting provides front, upstage, top, high side, back lighting, scenery and cyclorama lighting. The lighting equipment for on stage lighting consists of rows of PARs, ellipsoidal spotlights, fresnels, and cyclorama lighting on overhead electric battens. The number of rows and lighting equipment depends on the size of the stage. Typically, one electric batten is supplied for each 8 feet of acting area depth for front lighting fixtures. At a minimum one additional electric batten is needed for the last row of acting area back and side light fixtures. If there is a cyclorama, or background scenery, another electric batten will be needed for those light fixtures.

10) In the on-stage area, 2 and 3 circuit wall pockets need to be provided for low side lighting. Typically, for a medium size stage, provide approximately 8 wall pockets distributed along the side and backstage areas. In addition, floor plates or movable booms with weighted bases and side arms should be provided.

11) Coordinate stage lighting with curtains, draperies, grid beams, counter-weight suspension, and light battens to assure that border lights and cables are concealed and properly supported.

12) In addition to the stage lights, dimmable house lights and switchable stage work lights must be provided for general illumination during rehearsals and other activities outside performance.

    a) Auditorium and Multi-Purpose Room lighting controls shall be interfaced with the Fire Alarm System to cause house lighting to be full on regardless of manual settings.

13) Every space with a stage should include front lighting with dimming controls. The following elements can be included as the program and budget allows, in order of priority as follows:

    a) Back light.

    b) Background scenery light.

    c) High side light.

    d) Box boom.

e) Low side light .

14) For a larger auditorium or multi-purpose room, every effort should be taken to include as many elements above as possible, working down the list to insure that the highest priority takes precedent. The smaller the space gets (along with the budget), the more elements can be taken off the list.

15) For auditoria and multi-purpose rooms to be also used for lectures and testing, provide supplemental fluorescent lighting. (Pulse-start metal halide may be considered.) The supplemental lighting shall be turned off automatically by dimmer bank controls during performance.

16) Provide orchestra-pit lighting and receptacles for pit lights when pits are provided.

17) If campus does not have an emergency generator, provide normally off emergency lighting that will automatically be forced on without human intervention during a power failure, the power could be supplied from central battery/inverter system to provide a minimum one foot candle throughout the area. The designer can utilize a portion of the normal lighting fixtures or separately normally off luminaries for the emergency lighting functions. In existing facilities, perform emergency power load analysis to make sure the existing generator or central battery inverter system is capable of handling the emergency lighting load addition.

a) Provide overhead fixtures (some of the non-dimmed house or supplemental fixtures), which are normally off, and only turned on automatically in case of loss of power.

b) Provide LED aisle lighting at stairs and aisles in Auditoria.

18) Each theatrical fixture should be hung by theatrical c-clamp onto a schedule 40 black pipe. This shall allow the re-location of each fixture depending on the performance or designer's needs.

19) Provide each hanging fixture with a theatrical safety cable.

20) Provide each fixture with a cord and theatrical plug. (NEMA L5-20 twistlock connectors)

21) Provide each fixture with gel frame for color.

22) Provide a variety of accessories such as barn doors or pattern holders.

23) Near each position pipe or attached to each pipe, provide distributed electrically housed outlets provided by the supplier of the theatrical lighting and control system. Each theatrical raceway should house enough circuits and receptacles to plug in each fixture located there separately, with a minimum of 1 or 2 spares. Raceways can be provided with pigtails (if not seen by the audience) or with flush receptacles.

24) All circuits should be clearly labeled. Circuit numbers for stage lighting should begin at the front of the stage and increase sequentially as they progress from stage left to stage right. The next row moving towards the rear of the stage again must be numbered from left to right, and so on to the rear of the stage. Next should be the ante proscenium lighting fixtures from house right to house left, then the side wall mounted lighting fixtures, start numbering them from the right side from top to bottom, and proceed to the left side, again from top to bottom. Next should be the wall packets which should be numbered from stage left to stage right; then the ceiling mounted orchestra pit lighting fixtures from house right to left, and then the house lighting fixtures from the front to the rear of the house. Circuit numbers should correlate one –to-one with the dimmer that they are connected to.

25) Provide at least a single dimmer for each circuit. Common dimmer rack sizes are 96, 48, 24 and

12, or any combination thereof. Typically, they consist of 3-phase power and accept a 40-200amp feed depending on size and load.

26) To control the operation of the lighting equipment, a dimming system and control system must be provided. The dimming system typically consists of dimmer racks that include dimmer modules and control modules; a lighting control console, and stage manager's panels.

a) Locate dimmer racks in a locked, well ventilated room with thermostatically controlled ventilation where the ambient temperature does not exceed 30°C (86°F).

b) Locate the control console receptacles in a control room at the rear of the auditorium seating area.

c) Locate a stage manager's panel in a lockable enclosure that can control the stage related lighting fixtures, and independently with momentary switches mounted adjacent to the enclosure the on/off control of the orchestra and house lighting; these controls shall be preferably located within the stage area, hidden from view of the audience, and in the control booth.

d) Provide a portable lighting control console with flat screen monitor to set up and control cues and lighting scenes. Provide control receptacles located in the house and on the stage so that the lighting console can be moved to those areas if needed.

e) In addition to the control receptacles, a 120V, 20-amp duplex receptacle must be provided near the control receptacles.

f) Provide momentary non-proprietary key operated switches as part of the entrance stations at auditorium main entrances for the on-off controls of the orchestra and house lighting fixtures.

27) The dimming system must be interlocked with the fire alarm system. In the event of a fire emergency the house lights shall be forced on at full brightness automatically.

28) If there is an attic over Multi-Purpose Rooms and Auditoria, provide top access lighting fixtures, catwalks and attic lighting.

f. Elementary schools Auditorium or Multi-Purpose Room (MPR) stage lighting shall consist of:

1) A minimum of 12 feet two circuits power track consisting of (3) 4 feet power track segments, with a minimum of two light fixtures with (1) 200 watts PAR lamps in each four feet power track segment. Locate power tracks on stage ceiling area two feet away from main curtain. In addition, provide (1) two feet single circuit power track with (1) 200 watts PAR lamps on each side of the stage.

2) A minimum of (5) 500 watts Fresnel theatrical lights. Provide one electrical 20 amp, 120 volts receptacle for each fixture, place receptacle directly above fixture location. Fixtures shall be clamped on a pendant mounted pipe batten; locate pipe batten approximately 12'-15' from proscenium opening over MPR seating area to illuminate forestage and curtain. Each fixture shall be dimmed individually.

3) Provide a dimmer panel and relay cabinet with a minimum of twelve 1000 watts dimmer circuits. Panel shall be recessed mounted in new construction, and surface mounted in existing facilities renovation projects.

4) Provide interface between theatrical lighting and fire alarm systems. In case of fire alarm, the lighting controls must automatically force on the house lighting regardless of manual settings.

5) Refer to Elementary School Multi-Purpose Room Educational Specifications for additional information.

4. Lighting Controls

a. Refer to Specifications Section 26 0923 for technical requirements. Provide a Central Lighting Control System that covers all areas designated and/or rooms in the school. Provide a pathway from the "main" lighting control panel to the site's local area network (LAN) for remote management, and a pathway between all lighting control panels for interconnections.

1) The lighting control system shall "sweep off" all controlled interior lights and selected exterior lights that are not controlled with an occupancy sensor at pre-determined programmable Intervals during unoccupied times.

2) Time-clock programs shall allow seven-day programming functions, summer and holiday schedules and special events.

3) Lighting control equipment shall be locked, located, or otherwise made secure against vandalism.

4) Provide lock type, vandal resistant key operated switches that are part of the lighting control system in public areas such as, but not limited to hallways, restrooms, audience spaces and entry areas of gymnasiums, auditoriums, and similar locations.

5) Lighting control panels shall be equipped with control relays for normal and emergency circuits as needed.

6) The centralized lighting control system shall be connected to the site's LAN system to allow remote access for programming and maintenance.

7) Interior photo sensors for day lighting control shall be located and wired per manufacturer recommendations. The Designer is required to coordinate with the manufacturer to determine the best location for the sensors and the most appropriate wiring approach, which could be open or close loop.

a) Open loop wiring: utilize open loop photo sensor placement for large open areas, areas where people are moving through, and in areas where precise lighting levels are not critical; these areas include but are not limited to large open office spaces with several occupants, lecture halls, auditorium and multipurpose rooms, and similar spaces.

b) Close Loop Wiring: Utilize close loop photo sensor placement for areas where precise task-based lighting levels are required, and in areas where occupants remain in the space for talking; these areas include but are not limited to classrooms, laboratories, small offices and conference rooms, and similar spaces.

8) The lighting control system shall cause the lights to "blink" at pre-determined but programmable intervals prior to sweeping the lights off.

b. The centralized lighting control system shall include but not be limited to the following areas:

1) Corridors and Stairs. Refer to 4.d below.

2) Locker Rooms. Provide ceiling-mounted occupancy sensor(s) as required for full coverage. Occupancy sensors shall turn off all lights in the room via a pre-set but programmable interval after the room is vacated.

3) Gymnasium. Provide lock type, vandal resistant key operated switches for general lighting On/Off.

4) Auditoria and Multi-Purpose Rooms. Provide lock type, vandal resistant key operated switches for On/Off control of general lighting. If this or any other area or room is intended for general assembly, and utilized in a manner that requires dimming or turning off the lighting, the house lighting shall be interfaced with the Fire Alarm System, which in case of a fire emergency will force the lighting fully on regardless of the manual control settings. (standalone control)

5) Cafeteria/ Kitchen. Provide ceiling mounted occupancy sensor(s) with automatic on-off switch as well as by-pass lock type, vandal resistance key operated switches. Motion sensor(s) shall turn off all lights in the room after a pre-set but programmable interval after the room has been vacated. Quantity and placement of occupancy sensors shall allow detection of persons located throughout the room.

6) Laboratories and Shops with controls similar to classrooms.

7) Staff restrooms lights and exhaust fans (fans interlocked with lights). Restroom lights and fans shall be controlled from the lighting control panel via assigned relays. Provide ceiling mounted occupancy sensors, and by-pass toggle switches for system override adjacent to the door. The sensor shall turn off the lights in the room via a pre-set but programmable interval after the room has been vacated.

8) Student's restrooms lights and exhaust fans (fans interlocked with lights). Restroom lights and fans shall be controlled from the lighting control panel via assigned relays. Provide by-pass lock type, vandal resistance key operated switch adjacent to the door, and ceiling mounted occupancy sensors for on/off controls. The sensor shall turn off the lights in the room via a pre-set but programmable interval after the room has been vacated.

9) Main Office, Attendance Office, and other offices where clerks are always present. Provide non-locking local switching for manual operation. In addition, use light sensor(s) to reduce electric lighting levels in areas where natural lighting contribution is significant.

10) Private Offices and conference rooms, supply and storage rooms. Provide a wall-mounted occupancy sensor with automatic on-off capability in addition to manual switches. Provide a daylight sensor to reduce the electric lighting levels in larger windowed offices. The lighting level reduction shall be commensurate to the natural lighting entering the room to maintain predetermined foot-candle levels uniformly throughout the room.

    a) The motion sensor shall be programmed to turn off lights in no more than ten minutes after the area has been vacated.

11) Custodial and Equipment Rooms, and unsupervised rooms. Provide occupancy sensor with automatic on-off capability in addition to manual switches. The sensor shall turn off the lights in the room via a pre-set but programmable interval after the room has been vacated.

12) Covered walks. Lighting fixtures that are part of the security lighting shall be controlled via photo-sensor, and combination photo-sensor and time clock for lighting fixtures that are not part of the security lighting. Provide labeled zoned key operated override switches with indicator lights at Main Office clerical area to turn lights either on or off for non-recurring, or off schedule events.

13) Parking lot and parking garage lights. Controls for these areas shall be equipped with labeled zoned key operated override switches with indicator lights at the garage area and Main Office clerical area to turn lights either on or off during off scheduled hours.

c. Classroom Lighting Controls

1) Provide low-voltage lighting controls for each classroom. Two banks of switches are required, one at the entrance of the room and another in the vicinity of the teacher's desk. The switch banks shall include: white board light(s), quiet time, and AV switches, and dimming or selective-switching controls.

   a) Lighting shall be configured for on/off/dimming-day light harvesting control with occupancy sensors to turn off the lights after the room has been vacated.

   b) Classroom lighting shall come on via switch only.

   c) Motion sensor shall turn off all lights after the room has been vacated for a period of 5 minutes

   d) Wall-mounted dimmer switches shall provide for manual light reduction when day lighting is adequate, or for darkening of the room for AV presentations. Locate dimmer switches as part of the teacher's switch bank at the teaching wall, easily accessible to the teacher.

2) Provide dual technology occupancy sensors (infrared and passive sonic) with auto-on-off capability. Occupancy sensor(s) shall turn off all lights in the room after a pre-set but programmable interval after room has been vacated. Occupancy sensors shall be wired in closed loop format.

3) Provide photo sensor(s) with necessary interconnections to the classroom lighting dimming controls. Amperage changes in light fixtures shall be proportional to external light changes. In addition to manual dimming the fixtures shall automatically dim at a rate that is slow enough to not bother occupants. Locate photo sensors in an optimal place for the lights to be controlled. Photo sensors shall not be positioned where the device will be affected by direct sun light, room lighting fixtures or obstructions.

4) Light fixtures within 15'-0" of windows shall be separately dimmed and shall also be controlled by a ceiling-mounted daylight photo sensor to adjust the light intensity in the classroom to a uniform level.

5) Provide for classroom lighting controls to be connected to the Central Lighting Control System in the future, or initially if specifically authorized by the District.

6) Provide a separate switch to control the white board light. Locate switch together with other switches on teaching wall.

d. Corridor and Stairs lighting

1) Corridor and Stairs lighting shall be controlled by dual technology occupancy sensors and on/off switches.

   a) Corridor lights shall turn on only when end of corridor switches are activated.

   b) End of corridor switches shall operate lighting control relay(s) to turn on or off a nominal amount of light fixtures to provide 1 foot-candle for egress illumination, the remaining light fixtures in the corridor shall be controlled via occupancy sensors after being enabled by the end of corridor switch (es).

   c) Fixtures controlled by occupancy sensor shall turn off automatically five minutes after the area has been vacated.

d) Lighting controls shall be programmed to sweet off corridor lights at 9:15 PM, seven days a week; additional sweep times shall be scheduled at 12:00 AM and 3:00 AM seven days a week.

e) Emergency lighting in corridors and Stairs shall be switched together with normal lighting via appropriate emergency lighting control.

(1). Upon failure of normal power, emergency lighting fixtures shall automatically turn on regardless of switch or occupancy controls.

(2). Upon return of normal power all emergency fixtures shall return to their prior state.

e. Building Exteriors and outdoor lighting

1) Building exterior lighting fixtures that are part of the security lighting shall be controlled via photo-sensor, or combination photo-sensor and time clock for lighting fixtures that are not part of the security lighting.

a) Non Security Exterior Lighting

SCHEDULE	START TIME	DATES
Time On	5:45 AM	Monday through Friday Only
Time Off	Sunrise via Photocell	Monday through Friday Only
Time On	Sunrise via Photocell	Monday through Friday Only
Time Off	9:15 PM	Monday through Friday Only

b) For non-scheduled dates or times provide a by-pass switch to override program

(1). Switch shall be capable of manually turning off lights and/or be swept off five hours after turn on time.

c) Security Lighting

SCHEDULE	START TIME	DATES
Time On	Sunrise via Photocell	Seven Days a Week
Time Off	Sunrise via Photocell	Seven Days a Week

(1). Outdoor security lighting shall operate from dusk until dawn, seven days per week.

(2). All lights designated for security shall be labeled "SL".

d) Night Lights

(1). All lights designated for night lighting shall be labeled "NL".

(2). Outdoor non-security night lights shall operate from dusk until pre-determined but programmable time to accommodate night staff and special school functions. Provide override switches as described in 4.b.12 above.

2) Provide labeled zoned key operated switches with indicator lights at Main Office clerical area to turn lights either on or off schedule events.

f. Emergency Lighting

1) Emergency lighting controls shall be equipped with bypass circuitry that will bypass all manually operated switches, lighting control systems, dimmers and occupancy sensors during power failure situations, design shall comply with applicable codes and regulations. Each area of luminaries or groups of luminaries shall be equipped with and controlled by a UL listed emergency lighting control unit to allow the detection of localized power failures.

a) Emergency lights that will also be used for general lighting shall be switched together with the general lighting for the same area, but shall turn on (at full brightness for dimmable fixtures) upon loss of general power.

2) LED exit sign luminaries shall operate continuously. All other emergency lighting luminaries shall either be switched with its associated general lighting luminaries or be normally off and only operate during a power failure. Continuously operating luminaries other than LED exit luminaries is not permitted.

3) All emergency lights shall be powered by the emergency power source, and may be controlled by the lighting control panel.

4) Areas such as Gymnasiums that utilize HID lighting and also require emergency lighting shall be equipped with normally off emergency luminaries. These luminaries shall remain on after the restoration of utility power for a period long enough to allow a majority of the HID luminaries to cool down and restrike (20 to 30 minutes). The use of the quartz restrike option within the HID luminaries shall not be specified or used.

5) All emergency system luminaries shall be labeled as being part of the emergency lighting system with labeling similar to that required for fire alarm devices located above ceilings. The labels shall be placed directly onto or adjacent to the luminaries and be visible from the floor. The labels shall read "EMERGENCY LIGHTING FIXTURE".

6) Provide connection details for each style of control for the emergency lighting on the drawings. Also indicate on the drawings adjacent to the luminaries or groups of luminaries the style of control that is required for the luminary.

5. Lighting Power

a. Lighting branch circuits shall be 20 ampere, unless otherwise required by the system.

b. Branch circuit and panel loads shall be balanced on all phases for panels and distribution equipment.

c. Lighting panel boards shall be 480/277-volt, 3-phase, and 4-wire, with thermal-magnetic bolt-on type branch circuit breakers. (Small sites or smaller buildings at large sites may use 208/120-volt, 3-phase, and 4-wire panels.)

d. Provide approximately 30% spare capacity in all new panels installations.

e. The energy budget for all connected lighting loads in all buildings shall not exceed California Energy Commission maximum lighting power density allowance.

6. Luminaires

a. Selection of lighting fixtures shall be made on the basis of lighting characteristics (including uniform distribution and glare), appearance, cost, maintainability, energy efficiency, and resistance to vandalism.

b. Each lighting fixture shall be fully specified and correlated with the Fixture Schedule. Provide at least three manufacturers' products for each application. On the Schedule, provide full data for each lighting fixture on lamps, ballasts, input wattage, and mounting type.

c. All installed lighting fixtures shall meet the requirements of the CBC for seismic anchorage.

d. Applications.

1) Classrooms, Science and Technology Classrooms, Libraries: Linear Suspended Indirect or Indirect/Direct Fluorescent Lighting fixture.

2) Shops: Same as classrooms, or industrial surface-mounted, or suspended open fluorescent lighting fixture if appropriate to the architectural design. Specify appropriate fixtures to eliminate dust collection in high dust concentration areas; such areas may include wood and metal shops.

3) Wall-Washer (Whiteboard Light): Single-tube linear fluorescent lighting fixture, with characteristics described above.

4) Offices: Same as classrooms, or recessed 2'x4' recessed troffer fluorescent lighting fixture.

5) Teachers Workrooms: Same as classrooms, or recessed 2'x4' recessed troffer fluorescent lighting fixture.

6) Gymnasium: Suspended or ceiling-mounted fluorescent troffer with protective cage and six T8, or T5HO lamps, switched in pairs. (Lighting fixtures with alternative light sources will be considered.)

7) Shower Rooms, Locker Rooms, Other Damp Locations: Fluorescent lighting fixture with acrylic lens, vandal-resistant, with IP ("Ingress Prevention") Rating of IP 64.

8) Multi-purpose Room: Suspended indirect/direct fluorescent lighting fixture or recessed fluorescent lighting fixture with lens, as appropriate to architectural design.

9) Auditorium House Lights: Fluorescent lighting fixture for general illumination, plus dimmable halogen house lights for performances.

10) Corridors/Stairways: Wall or ceiling-mounted fluorescent lighting fixture with polycarbonate lens.

11) Lobbies: Wall or ceiling-mounted fluorescent lighting fixture with polycarbonate lens.

12) Student Restrooms: Fluorescent lighting fixture with polycarbonate lens, vandal-resistant, with IP ("Ingress Prevention") Rating of IP 64.

13) Equipment Rooms, Custodial Closets: Fluorescent lighting fixture equipped with wireguard and occupancy sensor.

14) Elevator Pits: Fluorescent lighting fixture with guard, and with IP ("Ingress Prevention") Rating of IP 64.

15) Display Cases: LED strip lighting.

16) Darkrooms: Darkroom Lights.

17) Hazardous Classified Areas (flammable liquids, others): Lighting fixture with suitable classification.

18) Exterior Canopies, Arcades, Overhangs: Recessed or surface-mounted fluorescent lighting fixture with polycarbonate lens, vandal-resistant, with IP ("Ingress Prevention") Rating of IP 64.

19) Lunch Shelter: Vandal-proof recessed or surface-mounted ceiling- or wall-mounted compact fluorescent lighting fixture with lens and two 13-watt twin-tube lamps.

20) Parking Garages: Ceiling-mounted Parking Garage fluorescent lighting fixture with wire guard.

21) Building Exterior: Surface-mounted or recessed vandal-resistant metal halide lighting fixture with polycarbonate lens.

22) Exterior Stair and Wall Lighting: Low-mount step light fluorescent lighting fixture with clear tempered glass lens.

23) Parking Areas: Pole-mounted full cut-off metal halide luminarie (maximum 30' high poles).

24) Swimming Pools: Recessed Swimming Pool Lighting fixture.

25) Exit Signs: LED type. Due to the high rate of vandalism, specify only wall mount vandal resistant exit sign luminaries. Canopy or pendant mount exit luminaries are not acceptable. When a wall is not available and a sign is needed at a particular location, utilize a flag mount luminary with additional support from the ceiling or wall.

26) Low-level Exit Signs: Remote vandal resistant LED low level exit sign.

27) Low-level directional markers: provide as required by code.

28) Sign Fixtures: Fluorescent sign.

C. ELECTRICAL POWER SYSTEMS

1. Design Principles

a. Basic design concerns include life safety, protection of property, reliability, voltage regulation, maintainability, and flexibility for future expansion (including changes in service voltage).

b. Preventive maintenance requirements must include accessibility and availability for inspection and repair with safety. Provide clean, well-lighted, temperature-controlled space with working spaces and access doors in front of all electrical equipment.

c. All electrical equipment and components shall be designed for exposure to the elements, or protected from them, including flooding. Floor standing electrical distribution equipment and control panels shall not be located in subterranean areas. Where design constraints do not allow for this equipment to be installed outside subterranean areas, the designer shall obtain approval from design management to

locate equipment in subterranean areas; in such cases, sump pumps shall be equipped with normal and emergency power sources (only transfer switch and generator will be acceptable as the emergency power source). Refer to article 2.3.D.f for additional requirements.

d. All electrical equipment and components shall meet requirements for seismic anchorage and bracing.

e. Each building shall include a main power distribution panel.

f. Should concentration of electrical load in administration building office area exceed 50% of the administration building power panel capacity, a dedicated panel for that area should be included in the design.

g. The use of K-rated transformers shall be substantiated with a harmonic content study of the designed system.

h. In areas where computers and similar electronic loads exceed nominal 20%, computer and non-computer loads shall be fed from separate circuit breaker panelboards. The computer panelboard shall be equipped with integral Transient Voltage Surge Suppression (TVSS) protection and double capacity neutral at panel and feeder if necessary.

i. In areas where computer and similar electronic loads are less than nominal 20% of the total load in the area, TVSS protection may be provided via outlets equipped with integral transient voltage surge suppression.

j. If computer and similar electronic loads connected to a distribution transformer exceed nominal 20% of the load, consider the use of a K-4 rated transformer, and double capacity neutrals.

k. Computer equipment design loads shall be based on codes and industry standard practices. A 20 amp branch circuit feeding computer loads shall be limited to a maximum of 5 computers.

2. Electrical Service

a. When designing the electrical service for existing facilities, the Architect/Engineer shall coordinate with the District's Design Manager for the project to determine current and future power needs requirements for the site.

b. Removal of utility poles and their guy wire may be necessary whenever new property is acquired. If poles serve other private properties then utilities must be re-routed. Coordinate the relocation of all utilities on the poles (power, telephone, cable television) and provide for the relocation of power poles from the school site as directed by the utility. (Rerouting will be designed by the utility provider.)

c. Provide electrical meters in compliance with utility company requirements.

1) Meters shall be capable of communicating with building energy management system via BACnet protocols.

2) Meters shall be provided at each permanent building and bungalows power distribution centers, and areas designated by LAUSD Project Design Manager.

3. Electromagnetic Fields

a. Locate equipment in dedicated spaces that are not normally occupied: equipment rooms, storage rooms

and supply rooms.

b. Locate the service transformer and main switchboard as close as possible and practical to the main service street connection.

c. Locate transformers, switchgear, and large panels remote from occupied spaces in outdoors or in parking structures, be sure they are separated with walls or fences and are well drained to prevent flooding. Provide required clearances and work space according to code and utility company requirements.

d. Transformers specified shall comply with the Department of Energy Policy Act of 2005.

e. Locate equipment and equipment rooms so not to be adjacent to, or directly above or below, classrooms, offices, libraries, and similar spaces.

f. Designs incorporating branch circuits with double neutrals shall be provided with a harmonic content study to substantiate the need for double neutrals.

g. Do not install underground feeders beneath occupied spaces; where underground feeder(s) has to pass underneath the concrete slab to terminate at the distribution panel inside the building, install conduits 24 inches below finished floor.

h. Reduce current by using higher voltages where practical.

i. Utilize balanced three-phase systems.

4. Planning Criteria

a. The preferred main power distribution system is 480/277-volt, 3-phase, 4-wire grounded WYE.

1) In very large campuses two 480/277-volt, 3-phase, 4-wire grounded WYE services may be installed if approved by the serving utility company.

2) In very large campuses with the buildings spread over 1000ft apart, and requiring a total design load of over 2000 amps, a 5 KV medium voltage switchgear and power distribution may be used.

3) In campuses requiring no more than 600 amps, a 208/120-Volt, 3-phase, 4-wire, grounded WYE service and power distribution may be used.

b. All loads (in KVA) must be identified during design, such shall include, but not limited to lighting, elevators and pumps, equipment for HVAC, kitchen and food facilities, shops and industrial arts, computers, and general receptacle load. When the loads have not been identified, the Designer may use the following loads for estimating purposes and preliminary design preparation only:

1) Lighting:

a)	Classrooms and Offices	3.0 VA/ft²
b)	Cafeteria	2.0 VA/ft²
c)	Auditorium/Multi-Purpose RM	6.0 VA/ft²
d)	Kitchen	2.2 VA/ft²

e)	Gymnasiums	2.5 VA/ft²
f)	Toilets, Storage, Equipment	1.0 VA/ft²
g)	Corridors	1.0 VA/ft²
h)	Locker Rooms	1.0 VA/ft²
i)	Laboratories	3.0 VA/ft²
j)	Shops	3.0 VA/ft²

2) Air Conditioning:

a)	HVAC Refrigeration	Tons x 2.5= KVA
b)	Ventilation Fans	1.0 W/ft²

3) Small Appliance/Computer/General Purpose Receptacle:

a)	Auditorium	1.0 VA/ft²
b)	Cafeteria	1.0 VA/ft²
c)	Gymnasiums	1.0 VA/ft²
d)	Offices	5.0 VA/ft²
e)	Classrooms	6.0 VA/ft²
f)	Shops	6.0 VA/ft²

4) Food Preparation:

a)	Kitchen	20 VA/ft²
b)	Cafeteria	10 VA/ft²

5) Shop Buildings:

a)	Shop Buildings-(Machines):	20 VA/ft²

c. Distribution Concept: For most schools, a radial distribution system is adequate. Depending on critical load requirements, other system types may be considered, such as primary selective or secondary selective systems.

d. The maximum voltage drop in each power feeder shall be no more than 3%, and the total drop including feeders and branch circuits shall be no more than 5% overall.

1) Length and voltage drop percentages must be indicated for all feeders on the single line diagram, or in a feeder schedule.

e. Short circuit calculations shall be made for all system components. Indicate results on the single line diagram, or in a feeder schedule.

f. Design distribution to minimize the generation of, and exposure to, magnetic fields. Appropriate magnetic field management techniques shall be considered for all new and/or retrofit installations.

g. Load Calculations: Provide calculations for the main electrical service, and all distribution boards and panelboards.

1) Load calculation shall take into consideration code permitted demand and diversity factors, and non-coincident loads.

2) Identify KVA values for each factor taken into consideration.

h. Plan future system expansion during design. Do not design the system so that it is difficult or impossible to expand its capacity. Be sure future capacity is clearly identified on diagrams, plans, and in the narrative "Basis of Design."

1) Architect shall provide electrical room layouts depicting equipment foot prints, working clearances around equipment, and space for future expansion.

2) For new campuses allocate minimum 30% spare capacity over calculated demand and diversified connected load to size main service equipment.

3) Provide 20% minimum spare space and spare ampacity above calculated loads for distribution boards and panelboards.

5. Computer Network Power Requirements

a. Provide electronic grade panelboards to supply power to computer loads. In new construction installations utilize properly sized K-4 rated transformer to feed all the 120/208V in the school or building.

1) Provide a duplex receptacle within 12 inches of each LAN Outlet. A double duplex receptacle shall serve two workstations where installed side by side.

2) Provide a dedicated 120-volt, 20 amp circuit and receptacle for each network or stand alone printer, this circuit shall originate in an electronic grade panelboard if feasible.

3) For each branch circuit serving computers, use a dedicated neutral. Refer to item 3.f above for additional requirements.

b. In MDF and IDF rooms, as well as LDF locations, the number and type of electrical outlets will depend upon and must be designed to the specific size, type of equipment, and UPS equipment required. The following criteria are applicable to most cases: A minimum of one dedicated, 20 ampere, 120 Volt circuit and a rack mounted receptacle outlet of the same rating is required for in each IDF and LDF cabinet for the rack mounted UPS system. Additionally, a dedicated 208 Volt, 1 phase, 30A circuit terminated in a NEMA L6-30P rack mounted receptacle is required in each MDF for the rack mounted UPS system.

c. Provide a double duplex receptacle in every classroom Limited Distribution Cabinet (LDC).

d. All receptacles for computers and electronic equipment shall be standard type, and blue in color. Except for outlets serving computer loads that are not fed from an electronic grade panel board with integral TVSS protection, in these cases the outlet shall be blue in color and be equipped with integral TVSS protection.

6. Grounding

a. Cold water or other utility piping systems shall not be used as grounding electrodes; Grounding electrodes shall be "made" electrodes, either concrete-enclosed-electrode type (UFER) or ground rod type.

1) The UFER ground system shall be the primary grounding electrode for new campuses. Architect/Engineer shall provide a complete grounding block diagram of the facility, including but not limited to peripheral systems such as Public Address, Computer Network, Television, etc.

2) Ground rod(s) installed in concrete box(es) as described in the guide specification shall be the primary grounding electrode for existing campuses that do not have a UFER system.

b. All metallic objects that enclose electrical conductors or that might be energized by electrical currents, including all metal equipment parts such as enclosures, raceways, building metal structure, and equipment grounding conductors, must be effectively grounded.

1) Short sections of metal enclosures or raceways used to provide support or protection of low voltage (less than 70V) cable assemblies from physical damage shall not be required to be grounded. Provide ground continuity when and as required by current applicable codes.

c. All earth grounding electrodes must be solidly joined together into a continuous electrically conductive system connected to the main grounding electrode system. Individual building grounding systems must be interconnected to the campus grounding system.

d. Provide "made" electrodes (as described in paragraph "a." above) at each individual building. The grounding systems of remote buildings must be interconnected to main campus grounding system thru the equipment grounding conductor(s) of the feeders serving the remote buildings. Bond all enclosure and metallic objects to the building ground system (as described in paragraph "b" above).

e. Bond the grounded conductor (Neutral) of the main service and the secondary of all step-down transformers to the building ground system. The bonding of the neutral conductor to ground must ONLY BE DONE AT ONE LOCATION at each voltage level to avoid creating grounding loops.

f. All electrical conducting surfaces must be effectively grounded.

7. Conductors

a. Select conductors based on the ampacity tables in the California Electrical Code for low and medium voltage cables. Consider the temperature rating of the conductor, future load growth, voltage drop, short-circuit heating, number of conductors within the raceway and ambient conditions.

b. Ambient temperature ratings for conductor selection:

1) Indoors, within air-conditioned spaces, 30° C. ambient temperature may be used without temperature derating the conductor.

2) Indoor areas, such as equipment rooms, where the ambient temperature will exceed 30° C., conductors must be derated to the worst possible ambient temperature condition.

3) Outdoors, for low voltage conductors in metallic raceways in the shade, use a derating factor for an ambient temperature of 45° C; in the sun, use a derating factor for an ambient temperature of 50° C.

4) For Medium Voltage Power Distribution underground applications, the ambient temperature used for conductors within a raceway shall be 30° C. This means the appropriate ampacity from the tables in the California Electrical Code must be derated to this temperature. The thermal characteristics of the medium surrounding the conductors are important to determine the current carrying capacity of the conductors. Factors that will affect the current carrying capacity of the conductor include the following:

a) The type of soil in which the duct bank is buried and its thermal resistivity.

b) The moisture content of the soil. In dry sections the conductors must be derated to compensate for the increase in thermal resistance that is due to the lack of moisture.

c) The type and number of raceways and number of conductors per raceway within an overall concrete duct bank.

c. Derating of the conductors may be necessary under high fault currents. Thermal and mechanical stresses can result in permanent damage to the insulation and undesirable cable movement. The minimum conductor size requirement shall be determined based on the maximum available short-circuit current and the type of overcurrent protective device used.

8. Conduit

a. Install conductors in metallic conduit above ground and in schedule 40 PVC underground, and comply with the following additional requirements:

1) Use rigid steel conduit at all exterior locations and where conduit may be exposed and subjected to damage or water intrusion, including parking garages.

2) EMT is allowed for all interior concealed applications. Exposed EMT may be used in the following areas:

a) In mechanical, electrical and elevator machine rooms.

b) Above 8 feet in spaces other than offices, classrooms, libraries, and similar spaces with District approval.

c) Above 8 feet in enclosed parking garages.

3) Use flexible steel conduit only indoors and where concealed.

4) Metal Clad (MC) cable system is not allowed.

5) Use liquid-tight flexible steel conduit for final connections to motors, devices that require adjustment of locations, or equipment that require frequent interchange. Liquid-tight flexible steel conduit may not be used in place of thermal, expansion, or expansion/deflection fittings.

6) Underground conduits must be encased in concrete 3 inch thick on all sides with multiple conduits spaced 3 inch apart. Bury conduit banks not less than 24" below finished grade to top of the concrete envelope.

7) The minimum underground conduit size shall be 2 inches; except for conduits feeding a single dedicated device where future growth is not expected.

8) Conduits on arcades or roofs are not allowed without prior District approval; if approved,

Architect/Engineer shall provide structural calculations and installation details.

9. Distribution Equipment

a. In selecting distribution equipment, electrical ratings must have adequate capacity to serve the connected load, and future expansion.

b. Equipment short-circuit ratings must be selected to withstand the maximum fault current at the equipment terminals or busses. In existing facilities perform complete fault current level calculations to determine amperes interrupting capacity for new equipment. The calculation shall be based on utility company available fault current at the main service.

c. Series rated distribution switchboards and panel boards are not permitted. Specify only fully rated equipment.

d. Locate all power equipment and panels in equipment rooms that are completely separate from signal and communication equipment.

e. Review physical dimensions of the equipment to determine adequate space allocation requirements to serve connected loads and future expansion. Provide working clearances around the equipment to comply with code and working requirements.

f. Consider and plan to mitigate appropriately environmental conditions surrounding the equipment. Adequate ventilation must be provided in all cases. Locate Central Battery/Inverter systems in a thermostatically controlled fan ventilated room. Calculate and submit the heat load created by the electrical equipment to the mechanical engineer to properly size ventilating equipment serving the electrical rooms

g. Indicate infrastructure for electric utility facilities including transformer pad, underground vaults, customer stations, pull sections and metering compartments in main switchboard, underground conduits, pull boxes and grounding, as required by electric utility.

h. All equipment must be secured from unauthorized access and from vandalism, and must be protected from harmful environmental conditions, including flooding.

i. Do not install equipment in hostile/corrosive environments such as pool equipment, boiler rooms, and the like; unless it is properly listed for the application.

j. Provide floor drains within 10 feet of floor mounted equipment in subterranean locations subject to flooding.

k. Provide 4 inches high concrete housekeeping pads for floor mounted equipment in below grade or exterior installations, unless noted otherwise by the structural engineer; the pad is to extend 4 inches all around equipment. Pads for electrical services and power company equipment shall conform to the requirements of the serving utility company.

l. Electrical power service to each building shall be achieved through one feed point to a panel, or distribution panel located in the building.

10. Capacity Criteria

a. All new main and distribution switchboards, panelboards and motor control centers shall have

minimum 30% spare capacity above connected load and physical spaces for additional protective devices to be added in future.

11. Circuit Protection and Motor Controls

a. All switchboards, motor control centers, and power panel boards shall include a main circuit protective device.

b. Panel boards serving each floor in a building shall be equipped with a main circuit breaker.

c. Subpanels located in the same electrical room and within sight of its power source do not need to be provided with a main circuit breaker.

d. Provide a heavy duty fused disconnect switch at all HVAC units, including heat pumps, condensing units, chillers, package units, etc.

e. Provide combination fused switch-starters for all pump-motors, fan-motors, cooling towers, and dust collectors. Provide a control-circuit transformer with 120-volt secondary, hand-off-auto selector switch and on-off indicating lights in each starter.

f. Provide control wiring and interlocking for operation of motor loads, as required by each motor circuit.

12. General Requirements & General-purpose Receptacles and Circuits

a. All receptacles shall be wall-mounted at 15 inches above floor level unless otherwise indicated for specific purposes.

b. Do not use floor receptacles except where expressly approved in writing by the District's authorized representative. Where used, they shall be recessed.

c. Do not locate receptacles behind appliances or other equipment that must be served.

d. Corridors: At intervals of 50 feet maximum and switched with a lock-type switch in a custodial closet or workroom.

e. Building exterior walls and parking garage interior: Weather-proof GFI receptacles at 50 feet intervals on each wall; install receptacles within a lockable box or cabinet, and switched with a lock-type switch in a custodial closet or workroom. Do not provide receptacles in Kindergarten play areas.

f. Restrooms: One GFI receptacle mounted 80 inches above finished floor near the door in each student restroom. In faculty restrooms, provide a GFI receptacle next to the sink, locate receptacle 48 inches above finished floor.

g. Any room with a light fixture shall be provided with at least one receptacle.

h. Science Classrooms: General-purpose duplex receptacles (computer receptacles and circuits are already separate.) every six feet over the counter on the wall on a separate 20-amp branch circuit per counter. Use GFI receptacle within six feet of the sink(s).

i. Auditorium/Multi-Purpose Room: On walls spaced at 20 feet on center maximum.

j. Gymnasium: Eight minimum, two in each wall minimum.

k. Music, Instrumental Practice, and Choral Rooms: On walls same as classrooms.

l. In Photographic Darkrooms, provide separate circuits for special darkroom lights and for room lights, with room lights on a lock-type switch.

m. Cafeteria Window Service Area, Scramble Area, and Faculty Service Area: One, minimum.

n. Within 72 inches of a sink or in any similar conditions (such as custodial closets), use GFI receptacles.

o. Make provisions for two 1 inch conduits for marquee sign power and data, extend one conduit from nearest electrical panel, and one from MDF to the designated location for the future marquee sign. Label conduits power and data respectively. Coordinate marquee location with Architect.

13. Receptacles in Classrooms

a. Provide a separate branch circuit for general-purpose duplex receptacles in each classroom, with a minimum of five general-purpose duplex receptacles in each classroom, one in each wall and one at the teacher's desk location.

b. Provide separate receptacles or connections on a separate circuit for other electrical equipment.

c. For new construction do not use floor outlets without approval in writing from the district. (Wiremold should only be used in existing facilities, except where indicated in educational specifications)

d. Do not locate receptacles or switches in bulletin boards, tackboards, or marker boards.

e. In Kindergarten and Early Education Center Classrooms, make provisions for tamper-resistant receptacles equipped with thermoplastic dual mechanism shutter system to prevent insertion of foreign objects.

1) Outlets shall comply with the requirements of the California Department of Social Services.

14. Special-Purpose Receptacles And Separate Circuits

a. See "Electrical Communications and AV Systems," "Computer Networks and Power Systems," for power provisions for computer systems. Provide receptacles and circuits as follows:

b. Copier equipment in staff/faculty work rooms require provision of a dedicated 220-VAC circuit with 3#10 AWG and a code sized ground wire, unless advised otherwise in writing by the District Design Manager. Locate receptacle next to copier data outlet.

c. Gymnasium scoreboards. Provide for remotely controlling scoreboards from side lines with 3/4 inch empty conduit from scoreboards to floor boxes located 5 feet out from sidelines near midcourt. Provide 120V receptacle in floor box.

d. Domestic cooking electric ranges (for gas ranges provide 120-volt circuit for ignition).

e. Science Classrooms exhaust fume hoods.

f. Science Preparation/Storage Room refrigerator and freezer.

g. Industrial Education Classrooms and Shops: Conduit drops from overhead wireways to a receptacle at

each workbench and to each electrically driven machine.

h. First Aid Room: refrigerator, and receptacle and switch for eye chart.

i. DH Storage and Laundry Room washer and dryer.

j. Special Education Therapy Unit refrigerator and cooktop.

k. Kitchen equipment and exhaust hoods. All electrical equipment under kitchen hoods shall be automatically disconnected upon activation of the fire suppression systems.

l. Provide a separate branch circuit for the fire suppression Ansul System installed in kitchen hoods. If Ansul System is activated, power to all electrical appliances under kitchen hood shall be automatically disconnected. Appliance circuits shall be wired thru shunt trip circuit breakers or contactors that are interlocked with the Ansul System.

m. Automatic lawn sprinkler controllers, one each as shown by the Landscape Architect.

n. Electric drinking fountains: one each.

o. Rooftop: Provide exterior convenience outlet with lock-on cover on a pedestal approximately 18 inches above roof within 25 feet of HVAC equipment, and adjacent to any other rooftop equipment that might need servicing or repair.

p. All other appliances and special equipment where necessary.

q. Provide power and remote controls for athletic field score boards.

D. EMERGENCY POWER SYSTEMS

1. General

a. Emergency power systems must be part of the design of the electrical system for egress illumination and signage, fire alarm, security, public address and telephone systems, and computer networking system, and must provide continuity of operation for specifically identified systems or equipment.

b. Provide emergency exit illumination of one foot-candle minimum in the following areas:

1) Corridors, stairs, lobbies, and exterior paths of travel for exiting the building.

2) Administration Unit.

3) Classrooms larger than 1000 square feet.

4) Multi-Purpose/Auditorium Buildings.

5) Gymnasiums.

6) Cafeteria/Kitchen.

7) Any rooms with an occupant load of 50 or more.

8) Other occupancies required by code.

c. Exit signs connected to the emergency power system shall be provided in compliance with applicable codes. Master-Slave exit signs are required. Low level exit signs for existing facilities where master-slave is impractical shall be self-luminous type. If self luminous type is used, Architect/Engineer shall obtain approval from the District. Exit signs shall be vandal/high impact resistant.

2. Emergency Systems Requirements

a. For emergency lighting and exit illumination, in each building provide a central inverter system consisting of AC sensing equipment, automatic transfer switch, battery charger, batteries and DC to AC inverter to provide a minimum of 90 minutes continuous emergency operation. Provide a pathway to interface the inverter to the site's LAN for remote reporting and management of inverter equipment.

b. For PA/Intercom/PABX system, provide an UPS with a minimum of 90 minutes continuous emergency operation. A generator should be used where it is more cost effective than installing an inverter system. Provide a pathway to interface the generator controller to the site's LAN for remote reporting and management of emergency generator equipment.

c. Also see "Electrical Communications and AV Systems" for UPS requirements for PA systems.

d. For Fire Alarm System, provide integral emergency power supply for 24 hours minimum continuous operation.

e. For Security Alarm System, provide integral emergency power supply for 4 hours continuous operation.

f. For computer networking system, See "Electrical Communications and AV Systems" for requirements of rack mounted UPS units for Computer Networking Systems.

g. In Modernization Projects at Existing School Sites; if the building(s) that are part of the project are not currently served by an inverter or generator system, then the areas illuminated by fluorescent fixtures shall be provided with emergency exit illumination powered via power packs installed in channel of lighting fixtures. The power packs shall be sized to provide power per applicable current code requirements. If there is an inverter or generator system on site, then utilize existing inverter emergency power or generator in lieu of battery packs. Perform load analysis to make sure the existing system is adequate to support the new emergency lighting loads. UPS capabilities for PA/Intercom/PABX, Fire Alarm, Security and Computer Systems shall be same as for new school construction.

3. Emergency Generator System

a. An emergency diesel generator system is required in multi-story buildings higher than 75 feet in height and in sites as described in this design guide. In such cases:

1) Eliminate central battery/inverters and use the generator for emergency lighting.

2) Provide emergency power for all elevator cab lighting and power for selected elevator(s).

3) Provide emergency power for subterranean sump pumps (garage areas).

4) Provide emergency power for all signal headend equipment.

5) Provide emergency power for fire/ life safety systems such as fire pumps and other systems as

required by codes.

6) UPS systems as described in previous paragraphs for various systems still will be required.

7) Clearly mark all equipment being served from emergency power, Identify the power source.

8) Provide calculations for emergency power; demand calculations shall include a minimum of 20% spare capacity. Size equipment accordingly.

9) Provide diesel engine generator set(s) with battery chargers.

10) Provide a common trouble annunciator in the Plant Manager's office. Do not provide an annunciator that indicates what is wrong; only one that indicates that something is wrong with the generator.

11) Provide an emergency stop button at a location close to the main service disconnect; locate stop button in a place such as an electrical room, or similarly controlled access location. Provide a tamper cover similar to the covers required for fire alarm pull stations.

12) Provide all components, accessories, necessary parts needed to meet system expected performance.

E. PHOTOVOLTAIC (PV) SYSTEMS

1. Design and Infrastructure requirements

a. In addition to those indicated in section 2.4-Sustainability, the PV systems design of infrastructure shall include the following:

1) Note on the construction documents the area of PV installation; indicate the roof area to be kept clear of vent stacks, electrical stub-outs, and other roof penetrations as much as possible.

2) Areas determined to receive photovoltaic panels shall be structurally augmented to receive an additional dead load of 7 lbs. per sq-ft. unless noted otherwise.

3) Provide a minimum of six feet (6') wide clear perimeter around the edges of the roof. If either axis of the building is 250 feet or less; provide a minimum of four feet (4') wide clear perimeter around the edges of the roof.

4) Coordinate with the mechanical engineer to locate HVAC equipment to maximize available un-shaded roof areas for future installation of PV arrays.

5) Determine size of PV inverters assuming PV arrays will generate 10 watts/sf-ft. of PV power. Inverters shall be selected form approved manufacturers listed in LAUSD technical specifications.

6) Locate inverters in building's electrical room or District approved outdoor locations. Design shall provide adequate space for PV inverter in electrical room layouts.

7) Provide two empty sections in main switchboard. One section is for future schools electrical loads, the other for the PV system.

b. Provide power and data conduits for the PV system as follows:

1) Make provisions for power conduits from roof-mounted PV array(s) to locations of future PV inverters. Size conduits based on sizes required by conductors required by PV inverters. Take voltage drop into consideration when sizing conductors.

2) Make provisions for a minimum of one three inch (3") power conduit from each PV inverter to the Main Electrical Room. Do not stub up conduits within the footprint of main electrical switchboard, or the footprint of possible future sections that could be added to the switchboard. Provide clear space on wall above or below the conduit(s) stubs for the installation of a future pull box and conduit that will be extended to future PV system disconnects, and from utility accessible disconnect switches to main switchboard.

3) Make provisions for one two inch (2") data conduit from each PV inverter to the Main Electrical Room. Do not stub up conduits within the footprint of main electrical switchboard. Note on plans that extensions from data conduit stub-ups to future PV meters shall be provided by the PV system installer.

4) Make provisions for one two inch (2") data/telephone conduit from Main Electrical Room to MDF and Telephone MPOE. Arrange this and the above data conduit in the Main Electrical Room along an adjacent or opposite wall from the main service switchboard in a manner that will allow the installation of a plywood backboard for mounting of the PV data collection and control equipment.

3.8 ELECTRICAL COMMUNICATION & AV SYSTEMS

A. General Requirements

B. FIRE ALARM SYSTEM

C. CLOCK AND PROGRAM SYSTEM

D. COMPUTER AND NETWORKING SYSTEM DESIGN

E. TELEPHONE SYSTEM

F. PUBLIC ADDRESS/INTERCOM/CLASS CHANGE SIGNALING SYSTEM

G. SECURITY INTRUSION ALARM SYSTEM

H. CLOSED CIRCUIT TELEVISION AND AUDIO SURVEILLANCE SYSTEMS

I. GARAGE AND MAIN DOOR ENTRY SYSTEMS

J. TELEVISION DISTRIBUTION SYSTEM

K. DIGITAL OVERHEAD PROJECTORS

L. SOUND ENHANCEMENT SYSTEM

M. SCHOOL RADIO COMMUNICATION SYSTEM

N. SIGNAL SYSTEMS RACEWAYS AND TERMINAL CABINETS

O. PROXIMITY CARD ACCESS CONTROL SYSTEM

3.8 ELECTRICAL COMMUNICATIONS & AV SYSTEMS

A. GENERAL REQUIREMENTS

The District "Guide Specifications" complements the "Design Guide" and must be reviewed concurrently with these criteria.

1. General Guidelines

a. Refer also to Section 3.7, Electrical Power and Lighting.

b. All signal wiring and related power shall be in conduit or raceways except as indicated below. Conduits and raceways shall be metallic, except in underground applications where PVC conduits are encased in concrete. Low-voltage communication or signal wiring shall be continuous without splices between devices, and shall be in conduits or raceways. Refer to section B.4.F for fire alarm system raceway requirements.

c. When adding new buildings and systems to an existing campus, the Architect must, from a site visit, determine the types of existing systems on the campus, and then include in the construction documents details of the appropriate interfaces necessary to integrate the operation of the new and existing systems.

d. All panels and control equipment must be accessible from floor level, without the need for ladders or other access equipment.

B. FIRE ALARM SYSTEM

1. General

a. Fire alarm system shall be an automatic local fire detection, and addressable signaling system with central station reporting with electrically supervised signal-initiating circuits and alarm circuits, including control panel(s), remote power supplies, remote annunciator panel, manual pull stations, bells or horns, visual alarm units, sprinkler flow and tamper switches, smoke detectors, heat detectors, beam detectors, terminal cabinets and wiring. Refer to fire alarm technical specifications section 28 3100 Attachment B for a sample of the fire alarm system sequence of operations; modify or revise it according to the particular project requirements.

b. Refer to technical specifications section 28 3100 for a complete list of pre-approved fire alarm systems manufacturers. When multiple panels are specified in a single site, one of them shall serve as master; and the others will serve as network nodes. Designs shall be based on the least number of panels needed to meet all requirements.

1) Whenever more than one panel is introduced in a design, these shall be synchronized in accordance with LAUSD standard details.

2) A site under one administration shall have one fire alarm system only; the system shall be of a single manufacturer.

3) Additional buildings added to an existing site shall be provided with a fire alarm system, which shall be incorporated into the existing fire alarm system.

a) For system expansions or building additions modify specifications to reflect designs that take into consideration the existing conditions; for example, if in a school the original system was manufactured by Notifier; then, any additional panels shall also be specified to be Notifier. Panels manufactured by different companies are not acceptable.

c. Areas or additional District sites that are located on the same or adjacent property, but fenced off, adequately separated, and independently administered, such as Early Education Centers or YMCA buildings, shall be equipped with separate fire alarm systems.

d. Alarm indicating device's UL maximum current draw must be utilize in the design.

e. Facilities and classrooms designated for Autism or severely handicapped students shall be equipped with chimes or similar sounding appliances.

f. Provide 20% spare capacity per loop for future growth.

g. Where the capacity of the control panel will be exceeded including spare capacity, two or more panels must be provided. These panels must be connected in a network configuration as one complete system.

h. Fire alarm systems shall comply with NFPA, DSA Fire and Life Safety requirements, and Education Code Section, and be UL and CSFM listed, power-limited, battery backed, electrically supervised systems.

i. Fire alarm system shall be designed with addressable initiating and electrically supervised indicating (audio/visual) devices.

1) Buffer relays powered by the fire alarm system shall be supervised as indicated in District standard detail.

j. The fire alarm system shall be interfaced with the clock program controller, Central PA and Autonomous PA system(s) to deactivate program/classroom change signals during fire alarm condition. All manual, autonomous PA and automatic program signals shall be deactivated during fire alarm condition. In addition, provide interconnection and required control features between fire alarm system and chemical fire extinguishing system, Theatrical Lighting Systems (for minimum egress lighting actuation), water based fire sprinkler system, damper control or smoke management systems, ventilation systems where required for the purpose of fan shutdown, class passing signaling system, door release electromagnets power supply controls, elevator controllers, and any other systems required by code.

1) Shunt trip circuit breakers shall not be utilized to shut down any HVAC equipment by fire alarm system when actuated. Shut down of HVAC shall be designed to automatically reset upon reset of fire alarm system.

2) The use of Fail-Safe circuitry to control shut down of equipment external to the fire alarm system shall not be allowed for elevator recall or shunt trip circuitry.

3) In existing facilities the Designer shall investigate the conditions and compatibility of the existing elevator controller(s), and make any provisions to up-grade, or replace the controller to properly interface with the fire alarm system.

k. Fire alarm system shall not be interfaced to any of the following:

1) Sump warning systems.

2) Carbon monoxide detection systems.

3) Methane gas detection systems.

4) Elevator car alarm bell circuit.

5) Any other unrelated system.

l. Provide a 120-volt, 20 amps dedicated circuit and terminate in each of the following cabinets: Fire alarm control panel(s) and remote power supply (ies). Circuit breaker at panelboard shall be equipped with a handle lock-on device. Provide surge suppressor at input of control panel.

1) Provide a permanent label in all fire alarm panel(s), transponder(s), or remote power supply(ies) indicating the electrical panel and circuit designation as well as a description of the physical location of the electrical panel. All labels shall be affixed to the inside of the panel door.

m. A remote annunciator panel with LCD Display shall be provided in the Administration Building main office, and in satellite administration areas, such as Adult School Offices where they shall be accessible by office personnel only. The annunciator(s) shall be provided with an integral keyed locking switch to disable/enable the annunciator controls.

n. When replacing and existing fire alarm system, a new fully addressable system must be installed.

1) Indicate on drawings the extent of existing work to be demolished.

o. Provide automatic detection devices in accordance with codes and applicable regulations.

p. Provide a California State Fire Marshal approved voice evacuation system in assembly areas (Gymnasium, Multi-Purpose Rooms, etc.) with an occupant load of 1000 or more.

q. The fire alarm system shall incorporate the controls and interface requirements between FACP and elevator controller as required by the ASME code for elevators:

1) Show a programmable addressable relay module which will be activated by the elevator machine room and hoistway detectors. If activated, this relay module shall cause the following actions:

a) Provide a button which will signal Fire Fighters that the operation of the elevator may be compromised due to a possible fire.

2. Initiating Devices

a. Smoke detectors shall be the primary means of automatic alarm initiation. Smoke detectors shall be specifically designed for the installation area expected environmental conditions. Heat detectors shall be used in spaces where smoke detectors would not be suitable. Spaces that require fire protection where heat detectors may be utilized include areas where any of the following conditions may exist:

1) Temperature below 32° Fahrenheit (0° Centigrade).

2) Temperature above 100° Fahrenheit (38° Centigrade).

3) Relative humidity above 90 percent.

4) Air velocity greater than 300 ft/min (1.5 m/sec).

These areas may include but are not limited to: parking garages (auto exhaust), mechanical rooms (dust), Industrial Arts areas such as Metal Shops (smoke from welders), Wood Shops (saw dust), and Auto Shops (auto exhaust), custodial/hopper rooms, kitchens/food preparation and serving areas, restrooms, and shower areas.

b. Do not provide smoke detectors in areas that are exposed to the weather.

1) Smoke detectors placement shall comply with manufacturer's recommendations. Do not install smoke detectors within 3 feet of HVAC registers, or within 24" to any sources of electro magnetic interference (EMI); such as fluorescent fixtures.

2) Designs shall reflect appropriate devices for the areas of application; utilize District approved detectors to avoid nuisance tripping and false alarms when theatrical devices such as artificial smoke, fog, etc. are used.

c. Provide heat detectors above suspended ceilings of every room and in accessible attics that contain combustible materials; such as building structure, flexible ducts, exposed cables, etc. (Refer to currently enforced NFPA 72 Section 2-1.4.2.1). Heat detectors are not required when sprinklers will be provided in these areas.

1) In existing facilities non-accessible attics spaces that contain combustible materials shall be made accessible and be protected by heat detector(s).

2) Provide identification tags for devices not in field of view or above ceilings, and for devices containing end of line resistors. Tags shall conform to specification section 28 3100

d. Design and installation of automatic fire detectors shall conform to NFPA 72, as amended in Article 91 of the California Fire Code section 1006.2.4.2.2.1.1 and ADAAG.

e. Design a system that utilizes linear heat detectors in concealed or controlled access areas. The detection wire shall be indicated to be installed within 20 inches of the ceiling or underside of the building roof, or as recommended by the manufacturer. In shallow areas show the detection wire to be mounted within the upper part of the space to be protected.

1) One circuit of linear heat detection shall be utilized for areas not exceeding 4000 square feet above multiple rooms.

2) Areas above gymnasiums and Auditoriums exceeding 4000 square feet shall be considered one zone.

3) Any areas divided by a fire rated walls shall be protected separately and considered independent zones.

4) Design shall indicate all equipment necessary for a complete installation in accordance with manufacturer's recommendations.

f. Provide smoke detectors at each interior elevator lobby and elevator machine room. Smoke detectors are used to recall elevator cars to pre-assigned floor levels and to initiate a general alarm. Each elevator lobby smoke detector must report as one address to the fire alarm system. A machine room smoke/heat detector is always required.

1) A rate-of-rise/fixed temperature heat detector shall be provided in the elevator machine room and be installed within two feet of the sprinkler head to shut off power to elevator equipment. Provide an addressable relay module to interface with shunt trip circuit breaker providing power to elevator equipment. By activation of heat detector, power to elevator equipment shall be shut down. The activation temperature of the heat detector shall be lower than that of the sprinkler head. Activation of smoke detector(s) in the machine room shall cause elevator to recall to specified floor if required.

2) When required provide automatic detection device(s) in elevator hoist-way. Indicate all requirements and necessary provisions to make the detector(s) accessible without entering the elevator hoist-way. Access shall be provided through an approved enclosure with self-locking fire rated door. The detector(s) shall be so placed as to allow service to them without service personnel having to reach into the hoist-way in the path of travel of the elevator.

3) When required provide a fire alarm initiating device in the elevator pit.

4) When there is a fire sprinkler installed at the top of an elevator hoistway, a heat detector is required at the top of the elevator hoistway; in such cases an external hatch must be provided to safely access the detector and an UL approved cage must be provided. If there is no fire sprinkler at the top of the hoistway, then a detector is not required. Activation of the detector shall recall elevator and cause a general alarm. If a sprinkler head exists at the top of the hoistway, a heat detector must shut down the elevator's power. A smoke detector is always recommended for elevator recall whenever possible when a heat detector is present for shunt trip service.

5) In the sequence of operation chart, clearly indicate the alarm/recall/ power shut down requirements. All Fire Alarm detectors report to the Fire Alarm System. The Fire Alarm System shall be interfaced with the elevator controller.

g. Provide outdoor/weather rated approved heat detector at all outdoor elevator landings.

h. If combinations smoke/fire dampers or duct smoke detectors are required, this work shall be part of the fire alarm system and all components and wiring shall be indicated on Electrical Drawings. Smoke detectors may be used in lieu of duct detectors to shut down HVAC systems or to control combination smoke/fire dampers if ALL areas served by the HVAC system are protected with smoke detectors. The Fire Alarm System shall be programmed to shut down the HVAC system or close the smoke/fire damper if one or more of the area smoke detectors are activated. All detectors must be accessible for yearly testing. Provide addressable relay modules to interface with HVAC or smoke/fire damper controls in order to shut down the HVAC unit or close the smoke damper. (Coordinate this work with that of the HVAC system to avoid duplication of systems.)

i. In Existing Facilities renovation projects remove existing duct detectors; provide controls to shut down Air Conditioning units with a CFM rating of 2000 or more. Shut down of units shall be accomplished via smoke detector(s) in the area(s) being served by the air conditioning unit(s).

j. Provide flow and tamper switches at each sprinkler riser assembly. Flow and tamper switches shall be addressed individually per building and per floor level. Provide a separately addressed tamper switch at each post indicating valve (P.I.V.).

1) Provide a red outdoor 24 volt DC 10 inch bell on the street side of the building for the each sprinkler riser flow switch or groups of flow switches within each building. The sprinkler water flow bell shall be controlled by dry contacts within the flow switch and powered by 24 volts directly from an FACP or a remote NAC power supply. Proper signage should be provided adjacent to the bell indicating what action should be taken when the bell sounds.

k. Since automatic initiating devices are provided in all rooms and attics as part of Automatic Fire Alarm System, avoid installing pull stations, except in areas classified as places of assembly in accordance with applicable codes. Areas requiring manual pull stations include assembly areas such as gymnasia, auditoria, kitchen/dining areas used for assembly, and multi-purpose rooms. Install one manual pull station within five feet of each exit door.

1) Provide one manual pull station within five feet of the fire-alarm annunciator in the main office of the Administrative Unit.

2) All manual pull stations, except the manual pull station in the office by the FA annunciator, shall be provided with a protective cover.

l. Connect automatically/manually activated dry chemical fire extinguishing system such as is provided in prefabricated kitchen hood to fire alarm control panel as a separate fire alarm point/zone.

m. Provide protective covers for pull stations, smoke and heat detectors, and audible and visual devices located in areas that can be subjected to vandalism such as gyms, restrooms, locker and shower rooms, and all hallways and corridors associated with these spaces.

n. Beam smoke detectors shall be utilized in large areas with high ceilings such as auditoriums and gymnasiums in lieu of multiple smoke detectors. Do not use beam smoke detectors in small confined areas such as classrooms that have large beams that will require multiple smoke detectors to provide proper coverage.

o. When heat detectors are mounted in attics with catwalks or tall dimensions to the bottom side of the roof structure, accessibility shall be provided for testing and servicing of the detectors.

p. Smoke or heat detectors are not required in attic spaces and parking areas protected by fire sprinklers. Provide fire alarm detection in all garage(s) adjacent areas, such as hallways and corridors, elevator lobbies, equipment rooms, offices, etc.

3. Alarm (Indicating) Devices

a. Provide sufficient alarm sounding device coverage for entire plant including interior and yard areas. Avoid exterior of school site except near entrances to buildings to minimize disturbance of neighborhood.

b. Alarm sounding devices at each facility shall be of the same type. All audible alarm signals connected to an FACP shall be synchronized by an internal to the FACP coder and within the notification zone in which they are located. The use of coders within a remote NAC power supply or within an individual audible appliance shall not be acceptable. In facilities not receiving a complete new fire alarm system, the existing type of coded sounding devices if currently bells shall be changed to horns.

c. Alarm sounding devices shall be capable of sounding alarm at a level of 15 decibels above ambient noise or 75 decibel minimum, whichever is higher; measured 4 feet above floor and in the center of the room or space.

d. Provide strobes and horns as required in classrooms to meet visual and audibility requirements. When both audible and visual devices are required use combination type devices unless the audible device is a speaker used in an EVAC system.

e. In areas requiring speakers for voice evacuation systems provide a sufficient quantity of speakers to minimize reverberation and the distance between the speakers and the occupants. A gymnasium or

auditorium would typically have 9 to 12 ceiling mounted 8 inch speakers and other areas such as associated lobbies, restrooms, dressing rooms etc. shall be equipped with one or more 4 inch wall mount speakers. The speaker circuitry in the main seating area shall be configured in an alternating checkerboard pattern to split the speakers between the two amplifier outputs.

f. A sixty-second silence inhibit shall be imposed on audible and visual alarm circuits to insure that the building occupants perceive any alarm. There shall be an audible and visual fire and trouble indication at annunciator panel.

1) Provide visual alarm devices in classrooms, toilets, rooms with high ambient noise, special education rooms such as classrooms for deaf and hard of hearing, dining areas, locker rooms, shower rooms, gymnasia, auditoria, assembly areas, corridors and hallways, public areas of main office, band and music rooms, shops, and any room where ambient noise exceeds 105 decibels. Visual alarm devices belonging to different circuits, but within a single plane of view or flashes from more than two devices on different circuits shall be synchronized.

g. Install bells and horns 8'-0" above finished floor. Visual appliances shall be mounted 80" above the finished floor to the bottom of the lens or six inches below the ceiling, whichever is lower.

h. Provide magnetic door holders and dedicated 24 volt DC power supplies with addressable relay modules to close normally open fire doors upon detection of smoke in the area of the door. The wiring between the door holder power supplies and the door magnets is not power limited and shall be in separate raceway not containing the power limited fire alarm wiring. The door holder power supplies shall be controlled directly by the associated FACP or with an addressable relay module. Connections to the trigger circuit of the door holder power supply shall be configured in the fail safe mode.

i. Strobes shall be synchronized via main fire alarm control panel. Refer to standard technical detail SD-10 for additional requirements.

4. Zoning, Panels and Wiring

a. In addressable systems, each initiating device shall be one point. For example, smoke detector in Building B, Classroom No. 213, shall be considered as one point.

b. Provide a note on drawings: "The fire alarm system shall pass tests required by local fire department, including CHIEF'S REGULATION NO. 4 PROGRAM required by City of Los Angeles Department of Fire and administered by LAUSD."

c. Provide a digital Communicator at Main Fire Alarm Control Panel to report alarm conditions to a UL approved 24-hour manned certified central monitoring station. Use District UTILTY ORDER REQUEST FORM to determine Central Monitoring Station that will be used. Instruct the contractor to coordinate with the owner to arrange for the monitoring. Provide a DACT and two dedicated telephone lines for central station service. Terminate the telephone lines to the DACT. Indicate all wiring and raceway routing from Main Telephone Terminal, or telephone closet data distribution point to DACT.

d. Provide at least one terminal cabinet inside each building for termination of all fire alarm system wiring. Buildings with a walkway or arcade that divides footings of the buildings shall have a terminal cabinet in each of the buildings. Provide a main terminal cabinet in main building, near fire alarm controller, for routing all fire alarm system wiring for entire school site.

e. Fire alarm system control panel and main fire alarm terminal cabinet shall be located in LAN equipment room as first choice, other suitable locations are temperature controlled rooms, work rooms, and similar

areas. Do not locate fire alarm control panel in mechanical or electrical equipment rooms. Remote power supplies shall not be located in restrooms, multi-purpose rooms, gymnasia, auditoria, or similar areas. Installation of power supplies in classrooms shall be avoided.

f. All wiring shall be in conduit or approved raceways. Wiring shall be continuous between devices or terminal cabinets. Splicing of fire alarm system wiring is not allowed.

5. Construction Documentation Requirements:

a. Construction Drawings shall include the following information at a minimum:

1) Applicable code information, DSA, and LAUSD project numbers.

2) Site plans, floor plans and complete riser diagrams indicating all components, and required raceways and wiring. Block diagrams, in addition to the complete riser diagram are recommended but not required.

3) Show all necessary components for PIV, flow and tamper switches monitoring. Indicate all related work for a complete installation in construction documents.

4) On each floor plan, indicate the type of ceiling construction and all accessible and inaccessible ceilings and attic spaces. Provide adequate information to evaluate design conformance with applicable codes and regulations.

5) Location of required access panels and reference to construction details.

6) Complete symbol list of all components with devices' CSFM listings numbers. LAUSD standard fire alarm symbols shall be used.

7) Complete sequence of operations.

8) Required power connections for all control panels and remote power supplies.

9) Voltage drop calculations for each visual and audible circuit. Voltage drop cannot exceed 6.0% for each circuit to allow addition of future devices.

10) Mounting details for control panel(s), power supplies, terminal cabinets, and peripheral devices such as horns, strobes, detectors, and pull stations, including backing details for protective covers.

11) Provide point to point wiring diagrams and construction details for smoke detectors, heat detectors, pull stations, audible and visual devices, duct smoke detectors (both addressable and non-addressable), HVAC interface details; projected beam detectors, elevator shunt trip, recall and control, power monitoring, ansul system interface, flow and tamper switches, remote power supplies, control and annunciator panels, PA system interface, elevator recall, and other automatic extinguishing system monitoring.

12) HVAC system shut-down provisions when required by code.

13) Detail of through-penetration of fire stop systems.

14) At existing schools, disconnection and removal of existing fire alarm components and wiring that is not to be part of the new system.

15) Plans shall be stamped and signed by the responsible electrical engineer.

16) Battery calculations for each control panel and remote power supply. 30% spare capacity is required for future growth.

17) Prior to DSA approval, the Architect/Engineer shall obtain District's designated QA/QC group approval.

C. CLOCK AND PROGRAM SYSTEM

1. General

a. Clock and Program System shall be hourly supervised, minute impulse, 24-volt direct current, and multiple-wire connected system with a master time controls; the system shall once each hour automatically and individually correct each secondary clock and program time circuit.

b. Provide connections from clock system terminal cabinet to main P.A. Rack.

c. Provide a remote schedule selector switch panel (LTR_RSS) for the master clock (Lathem LTR8-512-M only). Locate remote selector in Main Office or in front panel of PA rack. See Specification 16730.

d. Provide connection to Fire Alarm Control Panel. Provide lock out for both manual and automatic tone when fire alarm system is in alarm.

e. Eight separate Program/Classroom Change zones shall be provided.

f. Provide a dedicated 120-volt, 20-amp circuit to clock controller.

g. Interior clocks shall be 12" diameter, round, semi-flush and mounted at 8'-0" above floor unless shown otherwise.

h. Provide interior clocks in all Classrooms, Administrative Unit offices, Cafeteria, Kitchen, Locker Rooms, Teacher's Lounge, Library, Auditorium and Gymnasium.

i. Exterior clocks shall be 15", round, with weatherproof housing with polycarbonate protective cover.

j. Wiring shall be in conduit, separate from network cabling. Clock circuit wiring shall consist of 3 #14 AWG typically.

k. Provide visual units, which are substantially different in appearance from a fire strobe indicating appliance to indicate Program/Classroom Change in Classrooms for the deaf and hard of hearing, and rooms with high ambient noise. The applicability of this requirement must be approved by the district. If required, the engineer must develop specification for appliances and power supplies.

l. Master clock controller shall be located in LAN/ Signal Equipment Room of Administrative Unit (new schools only).

m. Provide a terminal cabinet, complete with required terminal blocks, in each building, to be used for incoming and distributing cable terminations.

n. See public address/intercom/telephone and class-change signaling system design guide for coordination with clock system.

o. At existing school sites with an existing master clock system, new clocks shall be same make as existing master time control or clocks that are compatible with existing system.

p. Clocks shall be provided with hangers designed to ensure that they remain in place during earthquakes.

q. Provide block riser diagram of clock system, indicating all components and wiring.

r. When adding new clocks to an existing system confirm with clock manufacture if new clocks will work with existing clock system; then provide the appropriate design for a single comprehensive system.

s. Clock system at new sites shall be 2 wire reverse polarity, 12 hour and 59th minute correction impulse controlled.

D. COMPUTER AND NETWORKING SYSTEMS DESIGN

1. General

a. Design requirements for Wireless Network Systems shall be coordinated with the District's Information Technology Division.

b. A complete Local Area Network and Computer System shall be provided for all new school projects, new building additions, and modernization projects.

c. Electrical power with surge protection and filtration must be provided for all computer equipment, as well as an owner furnished rack mounted uninterruptible power supply for data frames and servers.

d. Refer to Guide Construction Specifications, Sections 25568 and 25569 – Premise Wiring Systems, for additional specific requirements.

e. The Commissioned Architect/Engineer shall consult with the District prior to design of system to determine specific project-related requirements.

f. Sites with more than one school, such as a continuation high school co-located on a high school campus shall be equipped with one (1) Main Distribution Frame to serve both schools wherever feasible.

g. The following acronyms are used in this section:

MDF = Main Distribution Frame

IDF = Intermediate Distribution Frame
LDF = Local Distribution Frame
LDC = Limited Distribution Cabinet
LAN = Local Area Network

h. Data outlets in Kindergartens and Early Education Centers shall be child proof. The outlets shall be specified to comply with the California Department of Social Services Requirements.

2. Local Area Network

a. For existing facilities the Architect/Engineer shall visit the site, fully familiarized himself/herself with the existing infrastructure design approach, and extend it to the new building(s) addition, area to be modernized or building(s) expansion. Provide an infrastructure with horizontal and vertical cabling to match existing conditions.

b. For new facilities the network-cabling infrastructure at each school will utilize a star topology design consisting of horizontal cabling, backbone cabling, and various telecommunications cabling pathways and spaces. The Engineer of Record shall determine the best route and method for cable conveyance throughout the school in accordance with project requirements and applicable design and industry standards. The Local Area Network shall consist of backbone and horizontal plant, and all equipment and wiring as follows:

1) Backbone and horizontal cable plant with the following characteristics:

a) Backbone fiber design consists of a hybrid cable with both single mode and multimode cable in minimum group counts of six each. For new or existing 50 uM MM sites, any added multimode fibers shall be based on a laser optimized, 50 micron multi-mode solution which includes 10 GbE operation (ten gigabit Ethernet) up to 500 meters.

b) Fiber Termination Units are to be indicated on drawings to cross-connect backbone fiber at both the main equipment (MDF) and secondary cross-connect points (IDFs, LDF, and LDC). Utilize figure A-1 of TIA 568-C.1 annex A to indicate interconnection method. Note on plans that pull through and splice methods will not be acceptable.

c) Design shall indicate an installation of optical fiber backbones in strand counts adequate to cross-connect all active classrooms, and instructional support locations.

d) Design shall indicate horizontal fiber with a minimum of 10% spare strands, in multiples of 6 strands, in each backbone cable.

2) Horizontal wiring extends from the work area outlet to the wiring closet. The horizontal wiring includes the work area outlet, the physical termination for the cables, and the patch panels and/or data switches located in the wiring closet. The horizontal wiring is the star topology where each work area outlet is connected to a wiring closet. The horizontal distance from the termination in the wiring closet to the work area outlet must not be greater than 90 meters (295'). The horizontal wiring consists of Category 6, 100 ohm, 4-pair unshielded twisted pair cable; and a 4-strand multi-mode fiber cable to the Limited Distribution Cabinet (LDC).

3) LAN equipment design shall incorporate no more than 20 outlets wired to a 24-port switch. This requirement shall be in addition to any growth factors for future wiring requirements as set forth in the District LAN specifications.

4) LAN Equipment Room, IDF Rooms, and Wiring Closets must be centrally located. Each closet must contain the terminations and devices for the horizontal wiring system. The closet must have sufficient space to accommodate all the components and servicing space. A typical wiring closet can have the following components:

a) Equipment, 19" rack for mounting patch panels, and switches.

b) Raceways for routing cables to work area outlets.

c) Raceways/cable tray for routing backbone wiring.

d) Rack-mounted UPS for active components in MDF/Server Racks in LAN Room and in all IDF and LDF racks. All UPS devices are to be located at the bottom of the rack space.

e) Cabinets, Racks, Patch Panels and Wire Management equipment and cabling are Contractor Furnished Contractor installed.

f) File servers, network switches, routers and UPS units are generally Owner furnished, Contractor installed.

g) All MDF, IDF, and LDF Racks shall have 50% physical space for future expansion. Provide rack elevation details showing all Owner and Contractor furnished components.

h) All other signal headend equipment shall be located in the LAN Equipment Room.

i) All other signal systems shall share the wiring closets with LAN IDF equipment

j) LAN Equipment Room and all IDF Rooms shall be air conditioned, 24 hours a day and 365 days a year. Coordinate with Mechanical Engineer.

k) In Secondary Schools for all grade levels, General Classrooms, Science and Shop Classrooms shall be equipped with one (1) 4-strand fiber drop to be terminated at a limited distribution cabinet (LDC) located in the classroom, and a minimum of six (6) student Category 6 drops, one (1) Category 6 drop for network printer, and one (1) Category 6 drops at the teacher's location. The category 6 data drops shall be run from the LDC inside the classroom. All empty openings on each of the faceplates shall be effectively closed using factory made blank inserts. All classroom drops should terminate on two port faceplates. Student two position outlets containing two Category 6 drops shall be located per educational specification requirements. Printer outlet shall be located near teacher's desk.

l) In Elementary Schools for all grade levels, General Classrooms, Science and Shop Classrooms shall be equipped with one (1) 4-strand fiber drop to be terminate at a limited distribution cabinet (LDC) located in the classroom, and a minimum of five (5) student Category 6 drops, one (1) Category 6 drop for network printers, and one (1) Category 6 drops at the teacher's location. The Category 6 drops shall be run from the LDC inside the classroom. All empty openings on each of the faceplates shall be effectively closed using factory made blank inserts. All classroom drops should terminate on two port faceplates. Student two position outlets containing two Category 6 drops shall be located per educational specification requirements. Printer outlet shall be located near teacher's desk. All drops shall be located on a single wall.

m) Kindergarten classrooms shall be equipped with one (1) 4-strand fiber drop to be terminated at a Limited Distribution Cabinet (LDC) located inside the classroom, and a minimum of three (3) student Category 6 drops, one (1) Category 6 drop for network printers and one (1) Category 6 drops at the teacher's location. The Category 6 drops shall be run from the LDC inside the classroom. All empty openings on each of the faceplates shall be effectively closed using factory made blank inserts. All classroom drops should terminate on two port faceplates. Student two position outlets containing two Category 6 drops shall be located per educational specification requirements. Printer outlet shall be located near teacher's desk. All drops shall be located on a single wall.

n) In Computer Laboratories, Technology Centers, Multi-Media Centers and Accounting Classrooms; A minimum of one (1), 6-strand fiber drop to the LDF in the Computer Laboratory and forty (40) Category 6 data drops distributed from the LDF. Category 6 drops shall be grouped with up to six Category 6 jacks per faceplate. Empty openings on

faceplates shall be effectively closed using factory made blank inserts. The LDF may be installed in the closest signal room or collocated within an IDF.

o) In Administrative Units, for offices a minimum of one wall outlet with two Category 6 outlets in a single 2-position faceplate shall be provided at each workstation. One of the two network connections will be labeled for Data. The remaining one connection will be labeled for Voice. Empty openings on faceplates shall be effectively closed using factory made blank inserts.

p) General workrooms shall receive a minimum of the following:

(1). Workroom/Project Rooms for Secondary Schools: Three (3) Category 6, one (1) Category 6 drop for printer.

(2). General Workroom for Secondary Schools: One (1) Category 6.

(3). Workrooms for Elementary Schools: One (1) Category 6.

(4). Workroom for Administration: One (1) copy machine.

(5). Workroom for Performing Arts/Music Workroom: Two (2) Category 6.

(6). Workroom for Science Classrooms: One (1) Category 6.

q) Conference rooms will receive up to two (2) Category 6 drops; at two separate locations (faceplates) in the room. Drops will terminate in a single faceplate with two Category 6 drops. One drop shall be labeled "voice" and the other "data".

r) In Library Reading Room, Circulation Center, Library Office and Conference Room, outlets at each workstation shall be provided. A minimum of one (1) 4-strand fiber drop to the Library LDF and a minimum of twelve (12) Category 6 data drops distributed from the LDF. Category 6 drops must be grouped with two Category 6 jacks (and two blank jacks) per faceplate. Drops must be distributed within the room according to the Project documents. Empty openings on faceplates shall be effectively closed using factory made blank inserts.

(1). High Schools circulation desks shall receive four (4) data drops.

(2). Middle Schools circulation desks shall receive three (3) data drops.

(3). Elementary Schools and Primary Centers circulation desks shall receive two (2) data drops.

(4). All Library offices shall receive two (2) drops.

(5). All Library Workrooms shall receive two (2) drops.

(6). All Primary Centers shall receive a minimum of six (6) student data drops in addition to the circulation drops.

(7). All Secondary School sites shall receive a minimum of 12 and a maximum of 40 total library drops. The designer shall base the student drop counts above 12 on a 6:1 ratio as applied to the maximum occupant load capacity of the room. As an example, if a library has an occupant capacity of eighty, the drop count will be 13 (13.3333 rounded down).

(8). Elementary School Library shall receive a minimum of one (1) 4-strand fiber drop to the Library LDF and a minimum of eight (8) student's Category 6 data drops distributed from the LDF (three (3) at circulation desk and five (5) in reading area), two (2) Category 6 data drops at librarian's circulation desk, and two (2) Category 6 data drops at librarian's workroom.

s) Student Nutritional Support Areas: A minimum of one (1), 4-strand fiber drop to the LDF and up to twenty (20) Category 6 data drops distributed from the LDF (12 drops for Elementary Schools, and 20 drops for Middle and High Schools). Category 6 drops must be grouped with two Category 6 jacks (and two blank jacks) per faceplate. Empty openings on faceplates shall be effectively closed using factory made blank inserts. Drops must be distributed within the room according to the District's standard schematic details.

t) Student Nutritional Support Areas (Exterior Locations): Each location shall receive two (2) Category 6 drops in an environmentally sealed enclosure as described in section 1.02 B. 4 of this specification.

u) Multi-purpose rooms/Auditorium shall contain a total of: Eight (8) Category 6 data drops distributed from the closest LDF or IDF location. Category 6 drops must be grouped with two Category 6 jacks per faceplate. Empty openings on faceplates shall be effectively closed using factory made blank inserts. Drops must be distributed within the room according to the Project documents and consistent with the descriptions below.

(1) In the stage area of a multipurpose room/auditorium, there shall be two (2) Category 6 drops located either at stage apron or the proscenium arch.

(2) On the other three walls of the multipurpose room, two (2) Category 6 data drops shall be evenly distributed and installed.

v) Gymnasium shall receive two (2) Category 6 data drops distributed from closest available LDF or IDF location. Category 6 drops must be grouped with two Category 6 jacks per faceplate. Empty openings on faceplates shall be effectively closed using factory made blank inserts.

w) Project documents shall indicate all horizontal fiber and Category 6 cabling requirements for non-instructional and office work areas, including book rooms and students stores.

x) Provide a cable tray system divided in three sections for all signal systems, except fire alarm, clock and building control systems.

y) Provide two (2) floor mounted outlets, one for connection to projector and one for connection to the school's computer network; also provide a microphone outlet in the same location, appropriately 15 feet from projection screen.

3. Uninterruptible Power Supply (UPS)

a. The site MDF cabinet shall be provisioned with one 208 volt, 30 amps NEMA L6-30P receptacle to connect to owner furnished contractor supplied uninterruptible power supply.

E. TELEPHONE SYSTEM

1. General

a. The Architect-Engineer shall consult and coordinate with the telephone utility provider in requesting service, and shall include in the contract documents the drawings and specifications or other requirements provided by the utility. Requests must be made early in design, to allow sufficient time for obtaining the utility engineers' input. For assistance in this area, please contact Information Technology Divisions Telecommunications Branch.

b. System requirements are different for Elementary Schools and for Middle Schools / High Schools. Requirements also may be different for new school construction and existing schools.

c. PABX or PBX systems, depending upon the size of the project to be served, require either floor space or wall-mounting space. Some PBX systems are contained within a system cabinet. Others may utilize a rack-mounted equipment configuration similar to data networking equipment. In planning a project, the access and egress to the cabinets or racks, and especially at the front, rear and sides of the main control cabinet, must be determined and planned to provide adequate space for operation and service. Consult the Information Technology Divisions Telecommunications Branch for proper sizing of floor space requirements.

d. System shall interface with the PA / Intercom system. Manual control of program tone over PA system shall be locked out when Fire Alarm System is in "Alarm". All manual and automatic program signals shall be deactivated during a fire-alarm condition.

e. Provide dedicated telephone line connections needed for elevators, areas of refuge, fire alarm and intrusion alarm systems monitoring.

1) The design shall indicate and provide all necessary elements to meet the latest applicable ASME code for elevators.

a) Provide an autodialing telephone located within the elevator cab, which shall have a button labeled "HELP"; this button will trigger the emergency telephone. The emergency telephone will cause an indicator light to illuminate in the elevator car after the call is answered at the call receiving location.

b) Provide an autodial hands free telephone, which shall first dial a red wall mounted telephone instrument strategically located in the Administrative Area/Main Office, and in the Adult School. If these devices are not answered in 30 seconds or less, the autodialing telephone will redial to an alternate location, such as school police.

c) This telephone system shall be capable of being quizzed by the person answering the call, and must be capable of informing the location of the elevator emergency. This can be accomplished via pre-recorded messages. All elevator emergency telephone instruments at a site shall operate using the same dialing codes and procedures.

d) The wall mounted telephone instrument shall be connected to the second Fire Alarm DACT telephone line via an RJ-31X switch, though a jack at the administration office(s). All elevator calls shall come to this telephone first.

e) Provide document frames with operational instructions and procedures adjacent to the telephone instrument. Refer to technical specification 14 2423, and standard technical electrical details for additional information.

f) Telephones in the designated areas of refuge shall be dial-less, hand free telephone instruments capable of automatically dialing the Main Office at a PBX extension, and an alternate location if the office does not answer in 30 seconds.

(1) Coordinate alternate location dialing destination with the Design Manager; make all necessary provisions for a complete system in the original design.

(2) Number and location of telephone lines dedicated for security system usage shall be coordinated with the Design Manager.

(3) Where required provide ADA compliant phones.

2. Elementary Schools

a. The following telephone lines are required for Elementary Schools (identical requirements for Early Education Centers provided the working areas exist) shall be as follows:

1) 1 PRI (Primary Rate Interface) with 40 DIDs.

2) 1 dedicated fax line.

3) 1 intrusion alarm line per alarm panel.

4) 2 fire alarm line per FACP (minimum or as needed to meet code requirements).

5) 1 line per elevator as needed.

6) 1 line for environmental control system as needed.

7) 1 T1 for data.

8) 1 phone with direct access to the outside at teacher's lounge.

3. Middle and High Schools - New Construction:

a. System shall consist of a PBX telephone system and telephone lines with connections to other systems (i.e., intercom, public address and class/program change signaling system. Provide public address, intercom, PBX telephone, and class/program change signaling system.

b. In Middle and High Schools the line requirements are as follows:

1) Secondary sites with 1 - 30 administrative phones.

a) One (1) PRI (Primary Rate Interface) with 100 DIDs

b) One (1) dedicated fax line.

c) One (1) dedicated intrusion alarm line per alarm panel.

d) Two (2) dedicated fire alarm lines per FACP (or as needed to meet code requirements).

e) One (1) dedicated line per elevator as needed.

f) One (1) dedicated line for environmental control system as needed.

g) One (1) payphone per campus under a sheltered student accessible area. A preferred location would be near the administration buildings or near the student's quad (possibly adjacent to the lunch shelter/MPR).

h) Two (2) T1's for data.

i) One (1) phone with direct access to the outside at teacher's lounge.

2) Secondary sites with more than 30 administrative phones.

a) Two (2) PRI with 100 DIDs.

b) One (1) dedicated fax line.

c) One (1) dedicated intrusion alarm line per alarm panel.

d) Two (2) dedicated fire alarm lines per FACP (minimum or as needed to meet code requirements).

e) One (1) dedicated line per elevator as needed.

f) One (1) payphone per campus under a sheltered student accessible area. A preferred location would be near the administration building or near the student quad (possibly adjacent to the lunch shelter/MPR).

g) Two (2) T1 for data.

4. Telephone Outlets

a. Telephone outlets shall be provided as follows:

1) One (1) attendant telephone console Type T1 in main office in Elementary Schools and two in Middle and High Schools' main office, plus one in each small learning community (SLC) administrative office.

2) Multi-line telephones in Principal's, Vice Principal's, Assistant Principal's, Dean's Offices, at workstations in Attendance Office (high schools and middle schools only), SLC's (Small Learning Communities), in Kitchen's office, (one fax, one telephone) and at each workstation in main office (except at workstations where attendant telephone consoles are located), Work Experience Coordinator and College Coordinator offices in high schools, Counselors Offices in Adult School and for each of following offices in high schools and middles schools: Custodian, Librarian, Nurse, Doctor, Textbook Room, Girls' P.E. Department, Boys P.E. Department, Industrial Arts Department, Grade Counselors, Counselors, and a two line telephone with two phone lines to library circulation desk.

3) Use wall mounted single line telephone where no desk is available such as teachers lounge rooms.

4) Single line desk PABX telephones shall be used only where specifically directed.

5) All telephone outlets, type IW and ID shall be connected to the PA/Intercommunication System. Identify Intercommunication Telephones from PABX telephones per LAUSD standard Symbol List and show them in appropriate location on Riser Diagrams. Descriptions above using the "Tx" descriptors refer to the LAUSD standard symbol definitions.

6) One wire connection (jack only) for each elevator.

7) One wire connection (jack only) for each fax machine in main administration area.

8) One wire connection for kitchen's office fax.

9) Two wire connection (jack only) for fire alarm system.

10) One wire connection (jack only) for intrusion alarm.

b. Single line Intercommunication Desk type telephones (ID) shall be used in classrooms and library reception desks. Use single line Intercommunication wall mounted telephones (IW) in Cafeteria, Auditorium, Gymnasium, Computer Rooms, Faculty Lounge, First Aid Room, Music/Choral Room, Locker rooms, etc. The classroom outlets are contractor-furnished and contractor-installed items and are specified under Guide Specification Section 25750. PBX and P.A. systems shall be interconnected to provide paging access capability from any designated intercommunication telephone. Do not program any classroom phones with this feature; they are only to possess this capability. . A separate interconnection provides classroom phones (IW and ID) access to the PBX for emergency calls to the public switched telephone network (PSTN).

5. Wiring Requirements

a. Wiring requirements for T5 telephone outlets is Category 6 cable terminating in Category 6 jack as specified in Specification Section 27 1013. The homeruns shall be routed to the closest IDF's dedicated voice patch panel for future Voice over IP network connections. From IDF a multi-pair telephone cable shall be used to connect all telephones to the PBX system in the administration building.

b. Wiring requirements for jack only telephone ports is one twisted pair #22 AWG, Category 3, cable terminating in RJ-11 jack and shall homerun to the main telephone backboard (thru telephone terminal cabinet of the building if applicable).

c. Refer to Guide Specifications Sections 27 1013 and 27 1014 Structured Cabling for equipment description and general requirements for existing and new sites respectively.

d. Refer to Guide Specifications section

e. The following diagram, Voice Communications Topology, shows a typical wiring selection and design for a multiple building campus or multi-floor building.

6. PBX General Requirements

a. A dedicated UPS providing at least 1 hour of emergency power for each system shall be furnished and installed by PBX equipment's vendor under separate contract (Owner Furnished, Owner installed under this contract).

b. Provide a dedicated, 30 Amp, 208 volt, 1 phase circuit with NEMA L6-30P outlet for connection to owner furnished UPS (which supplies power to the PABX equipment).

c. Allow 4 square feet of floor space adjacent to dedicated power outlet for the PBX UPS.

d. When designing for telephone systems take into account future requirements and make provisions for expansion in systems such as providing spare cables, sizing terminal boards with adequate spare terminals.

e. On sites with more than one school, such as a continuation high school co-located on a high school campus shall be equipped with a single PABX to serve all users on both sites wherever feasible.

f. The PBX system will be located either in the campus or building LAN room, or a separately designated room. Always provide main cross connect backboard or terminal cabinet in main building in LAN Equipment Room next to main telephone backboard (in new school campuses only). All wiring shall be routed via Cross-connect backboard or terminal cabinet through cable tray system.

g. Allow a separate 84 inch rack for the PABX and associated equipment in the LAN room.

h. Indicate on drawings the location of equipment and components, conduit and cable runs, and cable trays.

i. Cables shall be in raceways. Exposed cables will be allowed in cable tray system only.

j. All cable homeruns from outlets shall be routed to the closest IDF at each building. Provide separate patch panel in IDF dedicated to VOICE.

k. Cables homeruns to IDF may be run in same conduit or cable tray, which contain data cables routed to the same IDF. Voice and Data outlets are allowed to be installed on the same multi-position faceplates/boxes.

l. From IDF use a multi-pair telephone cable (riser rated or better) to route the telephone lines to PBX Cabinet (cross connect at both ends, in IDF room and LAN room). This temporary wiring shall be removed after Voice over IP system is implemented.

F. PUBLIC ADDRESS/INTERCOM/CLASS CHANGE SIGNALING SYSTEM

1. General:

a. Provide public address, intercom, and class/program change signaling systems.

b. Systems requirements are different for Elementary Schools and for Middle Schools / High Schools. Requirements also may be different for new school construction and existing schools. Verify specific requirements for each project.

c. There shall be a single public address/intercommunication system for each site. The Architect/Engineer shall select the appropriate system from one of the three specification-compliant manufacturers. The design shall comply with the following criteria:

1) The proposed public address/intercommunication system shall not exceed manufacturer's system capacity.

2) It is not acceptable to increase the manufacturer's stated capacity by tying two or more systems together.

d. Provide an Autonomous Public Address System in Multi-Purpose Rooms, large Group Instruction Rooms and Auditoriums. System shall include an override muting capability from main PA system associated with the emergency all-call announcements.

e. Provide an Autonomous Public Address System in Gymnasiums and athletic fields in Middle and High Schools. System shall include a muting capability from main PA system associated with the emergency all-call announcements.

f. The Main Public Address System and all Autonomous PA Systems shall be interfaced with the facility Fire Alarm System to cause audio muting of PA system speakers during general fire alarm conditions.

2. Main PA/Intercom System

a. Main PA System shall consist of public address, intercommunication and class/program change signaling equipment with capacity for speakers and telephones.

b. Provide intercom telephone service to each classroom, wired to the main Intercom/PA rack. In some cases, the classroom phones connect directly to the PBX; coordinate with Design Manager.

c. The system shall permit the following paging and intercom communication as follows: main office phone to classroom phones, classroom to classroom, and classrooms to office. Outside line access from a classroom phone through the PBX is limited to contacting emergency services only.

d. When designing PA systems, take into account future requirements and make provisions for expansion in systems such as providing spare cables, sizing terminal boards with adequate spare terminals, providing conduit stub-outs outside of buildings and size equipment such as P.A racks and PABX to accommodate future circuits as planned, or 20% minimum expansion.

e. See Guide Construction Specification, Section 27 5116 through 27 5130 for equipment description and additional requirements. These Specifications shall be included in the Contract Specifications.

f. PA/Intercom Rack(s)

1) P.A. Rack(s) shall be located in the LAN Equipment Room, lining up with TV, MDF, PBX and Energy Management System (EMS) racks.

a) Rack(s) shall be front and rear accessible for servicing. Main P.A. rack(s) shall consist of one or more free standing 19" rack(s) with following components:

b) AM-FM tuner. Antenna for this tuner is mounted on roof of Administrative Building with conduit and antenna down leads installed to P.A. Rack Using a TV antenna for receiving the FM signal is not permitted. Change connection of tuner to input of software programmed, digital PA system so tuner output can be delivered to selected speakers or zones.

c) CD player in Main Office with microphone. Cassette player is no longer required.

d) Intercom and program control panel. Analog intercom is disabled with the deletion of the switchbank requirement.

e) P.A. and emergency amplifier.

f) Berhinger feedback eliminator (or equivalent) for Main Office microphone.

g) Microphones. One microphone (always on via the microphone switch) shall be installed in Main office wired to the PA Rack.

h) CD changer. One CD changer shall be installed in Main office installed in a wall mount enclosure (optionally with angled fold down) wired to PA Rack. The CD player may be limited to a single CD.

i) For schools with an outside quad assembly area, a requirement may be added for a remote microphone outlet or wireless microphone system. Existing PA horns in or near this quad area would be zoned for the PA broadcasts from this microphone without installing additional horns. If a wired microphone outlet is installed, provide electrical safety measures to isolate this outdoor appliance. Coordinate with Design Manager prior to incorporating this requirement.

2) In medium and large campuses, multiple PA racks are required to accommodate the numbers of speakers. Show the elevation of racks with all components shown. Prove adequate space to install multiple racks.

3) In small campuses with single racks and a single card cage, provide ample room for expansion within this rack for a complete additional card cage.

g. An additional function of P.A. speakers is to announce program/classroom change. System shall interface with master clock system and Fire Alarm System for class-change signaling utilizing P.A. speakers. The P.A. Rack equipment must include a tone generator and inputs from Program/Clock Controller. Manual activation of separate tones shall be provided by both telephone codes and manual buttons on front of the PA rack.

h. Provide a switch on the PA rack which reroutes the master clock zone one switch closure to built-in steady tone of the secondary analog PA system. In the event that the primary digital, software-programmed PA has failed or is being serviced, an all-bell class change tone shall be provided via this switch. The tone duration is still controlled by the master clock.

i. Provide a separate manual activation button in the main office for notifying the plant manager via two beeps. This button would activate a zone of outside horns only. This zone has to be created in software and is accomplished using a spare software zone for outside horn assignment.

j. System shall interface with Fire Alarm System to silence all speakers during a general fire alarm condition and activation of indicating devices. (See Standard Details 5.14 and 5.15.)

k. System shall interface with the site PBX to allow access to emergency services from the classrooms. (Refer to Standard Detail 5.8)

l. Wiring Requirements.

1) For each P.A. speaker/horn provide one shielded twisted pair, #22 -#12 AWG, depending on the size of speaker and the length of the run.

2) For intercom telephones, one twisted unshielded pair #22.

3) For intercom telephones with co-located speaker, two twisted pair #22 one pair shielded and one pair unshielded.

4) For each microphone outlet, one twisted pair #22 AWG with overall shield.

5) For overriding autonomous P.A. system, one twisted pair #18 AWG.

6) For underground applications or under slabs at ground level use flooded type cables.

m. Intercommunication Phone Outlets

1) Provide intercommunication telephone Outlets as follows. (See also the sub-section "Telephone PBX Systems.")

2) Single line intercom desk telephones (ID) in Classrooms.

3) Single line intercom wall-mounted telephones (IW) in Cafeteria, Auditorium, Locker Rooms, Faculty Lounge, First Aid Room, Music/Choral Room, Teachers Work Rooms, etc.

4) Intercom telephone outlets, type ID (desk type where desk is available) and IW (wall-type) shall be connected to the PA/Intercommunication System thru PA Main terminal cabinet. The wires for speakers and intercom telephone serving a room shall be combined in a single cable with an overall jacket containing both shielded and unshielded twisted pairs.

5) Identify intercom telephones as separate from PABX telephones per LAUSD standard Symbol List and show them in appropriate locations on riser diagrams.

n. P.A. Speakers

1) Provide P.A. speakers in the following locations at minimum:

a) Classrooms, offices, corridors, library, teachers' workrooms, student store, plant manager's office and all occupied rooms where no PBX telephone has been provided.

b) Outdoors to cover all student assembly, athletic and activity areas. Size speakers/horns appropriate to the area covered. Do not impact adjacent residential areas.

c) Parking garages.

d) All other rooms and areas as appropriate to specific projects.

o. Paging

1) PABX and Intercom/P.A. systems shall be interfaced to provide paging capability from any designated telephone. Do not program classroom phones with this feature; they are only to possess this capability. PA/PBX interconnections shall be accomplished by using two separate paths. Paging lines from the PBX are required to have direct connections to the main Intercom/P.A. rack phone ports which operate as fxs ports. A telephone card in the PA rack operating as fxo port provides communications to the PBX, initiated from a classroom phone.

2) Provide a general paging zone for elementary schools and separate paging zones for middle and high schools. Zones for class change tones and or paging are as follows:

a) General paging zone. Note: Consider if this will include the gyms, shops, auditorium and athletic field and if the override mute is to be activated for these areas. Also, consider if this zone will be used by the class change tones and if these areas are to be included.

b) Classrooms only.

c) Gymnasium and athletic fields.

d) Shops. Note: Art shops are often left off this list. Have OAR determine if they want to be included (requires simple software configuration).

e) Auditorium/Multi-Purpose Rooms.

p. General System Requirements

1) Provide at least 1 hour of emergency power for PA/Intercom system at full load by installing a dedicated, rack mounted UPS unit. Provide a dedicated 120-volt circuit from UPS to each P.A. rack. The UPS shall be located in the PA rack with one or more battery packs. The model number and battery packs used depend on power calculations for 1 hour emergency power. Provide a SNMP web card into this UPS and Cat 6 in conduit to overhead cable tray. Provide conduit from cable tray to top of MDF cabinet and route the Cat 6 cable to one of the last switch positions of the core switch. Additional requirements for the UPS include 208 Vac single phase (phase to phase) input power. In addition, the input and output power connections with receptacles are provided by adding a SUPDM12 module. Be aware of radius tolerance requirements for the thick cable connecting the SUPDM12 and the AC input receptacle. Consider using a deeper cabinet as is required for the MDF to accommodate this cable. Have the OAR contact ITD to configure both the SNMP card and switch port.

2) In classrooms and offices, provide flush mounted baffles where new suspended ceilings are installed. Locate speaker at center of the room. Otherwise, provide surface mounted speaker baffles directly above the telephone handset at 8'-0".

3) In rooms without a teacher's desk, telephone handsets shall be located in close proximity to Teacher's work station, wall mounted at 4'-0" maximum to the highest operable part. In classrooms telephones shall be desk mounted with telephone jack mounted at +15" measured from the bottom of the receptacle outlet box to the level of the finished floor.

4) Provide speaker volume control in office areas only. For wall mounted speakers, volume control shall be installed within baffle with shaft extending out of baffle. Where speakers are ceiling-mounted, the volume controls shall be located on the wall in a convenient location.

5) Place the PA/ Intercom wall display, main PA display phone, CD player, and one emergency "always hot" (via mic switch) PA microphone in main clerical core area. Plan location of wall display so that it can be viewed from a maximum number of desks.

6) When designing P.A. systems, take into account future requirements and make provisions for expansion in systems such as providing spare cables, sizing terminal boards with adequate spare terminals. In small sites with room for only one cabinet, provide for expansion including room for additional card cages.

7) Main PA terminal cabinet shall be located on the wall in the same room where PA racks are located (LAN room in new campuses). All wiring shall be routed via main terminal cabinet through cable tray system. In situations where the cabling conduit penetrates the roof to route to another room for the MPATC, do not penetrate directly above the PA or autonomous PA rack.

Roof leaks shall be prevented from leaking directly in or around these conduits into the PA cabinet.

8) Provide at least one terminal cabinet in each building. Locate terminal cabinet in building IDF room(s).

9) Design loudspeaker installation using proper types and numbers of speakers to provide adequate listening patterns in larger or special rooms and outdoor areas. Position outdoor speakers in a manner that minimizes the impact to residential neighbors of the site. Consider problems of feedback. Provide a feedback eliminator in PA rack for Main Office microphone. Some models are line level and require a preamp for the microphone; however, as an alternative, one mic level model should be available, but it should be rack mountable.

10) Note on plans: The final class change tone type may or may not be volume sensitive. For example, a chime sounds relatively the same at different levels, but a last minute change to a steady tone may be exceedingly loud or very low. Contractor shall test the class change tone by setting to each available type and perform a final volume adjustment of the preamps, software volume settings, and PA amplifier accordingly.

11) Fire Department requires self-supporting, non-guyed antenna masts. Ensure adequate structural support.

12) Locate antenna masts in least conspicuous locations as viewed from main school entrance.

13) Indicate mounting details on drawings of antenna, speaker baffles, special speaker mounting brackets, speaker clusters, etc.

14) Indicate on drawings a block-riser diagram of entire P.A. system, indicating components such as speakers and intercom telephones, cable trays, conduit and cable runs and underground facilities.

15) Indicate on drawings the location of equipment and components, conduit and cable runs, and cable trays. Also indicate on drawings the wiring details of all point to point connections inside the PA racks.

16) Cables shall be in raceways. Exposed cables will be allowed in cable tray system only.

17) Provide grounding facilities for Public Address Systems consisting of 3/4" conduit and a #6 THWN wire, or as required by code and specification to connect the Main Public Address terminal cabinet, and other terminal cabinets to the building grounding system. Where connection to existing building ground system is not practical, provide a separate ground rod to be used for grounding of the racks and antennas.

3. Gymnasium Autonomous P.A./Sound System

a. Components include:

1) Freestanding 19" rack with mixer pre-amplifiers, power amplifiers, cassette tape player, CD player, AM-FM radio, and graphic or parametric equalizer. Locate rack in Gymnasium Office.

2) Terminal cabinet for termination of all inputs and outputs of the system.

3) AM-FM antenna mounted on roof with downlead in conduit to radio tuner and grounding. Do not use a TV antenna for the FM signal.

4) Loudspeakers in gymnasium court consisting of a cluster of minimum 4 horn loudspeakers mounted near ceiling in center of room in such a manner as to cover all 4 quadrants of room. Mount cluster in a steel enclosure firmly anchored to ceiling or roof structure.

5) Two microphone outlets mounted flush with finished floor at center of side court. Use microphone pockets that prevent a tripping hazard. Next to microphone outlets, provide two 120V, 15 amp receptacles flush with finish floor.

6) One microphone outlet in each of the Girls and Boys Coaches Offices.

7) Assistive Listening System.

b. Provide Program line to main P.A. rack in Administrative Unit to distribute local programs to main P.A. system.

c. Provide Emergency Override line, including relays from main P.A. console, to mute the local program during an emergency all-call.

d. Provide adequate speaker coverage from main P.A. rack to allow broadcast of main P.A. system programs and announcements into gymnasium areas. A separate Program line to an input of the autonomous system is not required.

e. Provide a dedicated 120-volt circuit for Autonomous PA Rack.

4. Elementary Schools Multi-Purpose Room Autonomous P.A./Sound System

a. Components include:

1) Wall mounted amplifier in cabinet with a minimum of 8 input sources for tape, projector, and 5 microphones. Amplifier cabinet shall be flush or surface mounted and located back stage.

2) Input/output switching panel mounted adjacent to or below amplifier cabinet.

3) Three recessed floor microphone outlets flush mounted near front of stage platform, equally spaced and wired to pre-amplifier mixer inputs.

4) Recessed microphone outlet flush mounted in front face of stage platform and wired to pre-amplifier mixer input.

5) Recessed microphone outlet flush mounted in floor at center of audience area and wired to pre-amplifier mixer input.

6) A minimum of two Speakers mounted on either side of the stage platform and wired to amplifier outputs.

7) Projector outlet flush mounted in floor at center of audience area and wired to pre-amplifier mixer input.

8) Receptacle, 120V, 15 amps, flush mounted in floor at center of audience area.

9) Assistive Listening System.

b. Provide adequate speaker coverage from the Main PA to hear emergency, class passing tones, zone pages and all-call announcements

c. Provide Emergency Override line, including relays from the main P.A. console, to mute the local program during emergency announcements.

d. Provide sufficient main P.A. speaker/horn coverage to allow broadcast of main P.A. system programs and announcements in multi-purpose rooms, gymnasia, auditoria, and other specialized areas with separate or autonomous PA systems. Include horns for area just outside the gym offices.

e. Provide dedicated 120-volt circuit for Autonomous PA wall mounted Rack.

5. Large Group Instruction Room Autonomous P.A./Sound System

a. Large Group Instruction Rooms are rooms with capacity for 100 students or more, but without a stage. Contact the Office of Risk Assessment for any necessity of ADA required assistive listening systems in this or similar locations.

b. Components include:

1) Wall mounted amplifier in cabinet with a minimum of 8 input sources for tape/CD, Audio from laptop computer, projector, and 4 microphones. Amplifier cabinet shall be flush or surface mounted in closest signal room.

2) Input/output switching panel mounted adjacent to or below amplifier cabinet.

3) Microphone outlet flush mounted on instruction wall at +48" A.F.F. and wired to pre-amplifier mixer input.

4) Microphone outlet flush mounted in floor at center of audience area and wired to pre-amplifier mixer input.

5) Provide two infrared wireless microphones.

6) Speakers mounted above instructional wall and wired to amplifier outputs.

7) Projector outlet flush mounted in floor at center of audience area and wired to pre-amplifier mixer input.

8) Receptacle, 120V, 15 amps, flush mounted in floor at center of audience area.

9) Assistive Listening System.

c. Provide Emergency Override line, including relays, to mute local program from main P.A. console.

d. Provide adequate speaker coverage from the main P.A. rack to allow broadcast of main P.A. system programs/class change tones and announcements in multi-purpose room areas.

e. Provide dedicated 120-volt circuit for Autonomous PA wall mounted Rack.

6. Middle and High Schools Multi-Purpose Room / Auditorium / Theater Autonomous

P.A./Sound System

a. Components include:

1) A freestanding 19" rack backstage with mixer pre-amplifiers, power amplifiers, CD player, cassette tape player, AM-FM radio, graphic or parametric equalizer, and receivers for wireless microphones.

2) Terminal cabinet for termination of all inputs and outputs of system, except inputs of wireless microphones.

3) AM-FM antenna mounted on roof with surge/arrester, and downlead in conduit to radio tuner. The antenna mast shall be grounded.

4) Microphone outlets (three) mounted flush in stage platform, overhead, and in stage platform front. Each microphone outlet shall be wired to one input of pre-amplifier mixer. Wireless microphones and receivers shall be provided. Each wireless microphone receiver shall be wired to one pre-amplifier mixer input. Use high quality, multichannel wireless microphone systems designed to prevent interference from other emissions (e.g. radio/TV stations).

5) Provide two speaker outlets in the front face of the stage for monitor speaker connections. Unmounted, stage monitor (wedge shaped) speakers lay on the front of stage to allow performers to hear themselves, and have flexible cord connections to these outlets.

6) Projector outlet in control room wired to pre-amplifier mixer input.

7) Speakers shall be provided to produce a uniform sound level throughout auditorium. Optionally, provide sub-woofers separately from the speaker clusters, either on or in the face of the stage platform. Note on plans that prior to start of installation, a sound system analysis shall be performed to properly locate sound columns.

8) A headset intercom system shall be provided between projection rooms and backstage for stage cueing and lighting coordination. System shall include headsets, power supplies and input jacks.

9) Assistive Listening System with signage.

10) In performing arts auditoriums, as an option, provide a mixing console either located in the sound booth room or in a sectioned area in the seating area (typically in the center back behind the seating area). Install a conduit in or on the floor to cable the console snake cable to the sound booth. Provide a means to secure the console from vandalism. Provide adequate AC outlets and lighting for operation of the console.

b. Provide Emergency Override line, including relays, to mute local program from main P.A. console.

c. Provide speakers from main P.A. rack to allow broadcast of main P.A. system programs and announcements with adequate coverage in auditorium building areas (for emergency all-call or auditorium zone page only).

d. Provide dedicated 120-volt circuit for Autonomous PA wall mounted Rack.

e. In Performing Art Centers/Theaters (new facilities), a theater consultant hired by the architect shall determine the scope of sound system beyond the requirements defined here.

1) The electrical engineer shall coordinate with theater consultant and architect to provide power, cabling, racks, speaker clusters and raceways where needed. In gymnasiums focus the design to limit reflected sound yet permit intelligible, increased volume which occurs during emergency all-call announcements.

7. Athletic Field Autonomous P.A./Sound System

a. Components include:

1) Rack mounted amplifier in cabinet with a minimum of 8 audio input sources for tape, projector, and 5 microphones. Amplifier cabinet shall be flush or surface mounted, located in sound control booth.

2) Provide a separate system of home side horns, home side stand microphones, home side microphone outlets and amplifier for the cheerleaders (a common system that used to be provided with older athletic field P.A. systems).

3) Provide GFCI power outlets for athletic field sound systems.

4) Input/output switching panels mounted adjacent to or below amplifier cabinet.

5) Microphone outlet mounted on an appropriate light pole or at concession room and wired to amplifier input. Consider using a wireless microphone solution instead of conduit and cabling that previously ran to the visitor's bleacher side. Use high performance, multiple channel wireless systems to prevent interference from various emission sources such as local radio and TV broadcasts (see the Shure Pro Audio web site for updates on wireless noise solutions).

6) Outdoor horn loudspeakers to cover all P.E. fields.

b. Assisted listening system where an outdoor assembly area is designated as assembly occupancy.

c. Provide Emergency Override line, including relays, to mute local program from autonomous PA to permit emergency broadcasts from main P.A. console through separate speakers/horns.

d. Provide adequate speaker coverage from the main P.A. rack to allow broadcast of main P.A. system programs and announcements in auditorium building areas. Emergency announcements are hard-wired to these speakers. Software dictates if these speakers are included in any zone pages or in a normal all-call page.

e. Provide a dedicated 120-volt circuit for Autonomous PA Rack.

f. Do not locate any equipment in the field or areas that would create a safety hazard.

G. SECURITY INTRUSION ALARM SYSTEM

1. General

a. The District's preferred security intrusion alarm system is the DSC MAXSYS 4020 intrusion system.

1) The input element is a sensing device designed to monitor status of a protected area in a school, using infrared/motion detectors. These intrusion detectors are connected individually to identified terminals of the control panel or controller via cable to form a closed loop.

2) The control panel provides a small amount of current constantly flowing through loop. However, if one of the intrusion detectors is disrupted, opened, or the cable is cut, the controller senses the absence of current in the loop.

3) In an alarm condition, the controller can activate an optional siren and transmits alarm code to a digital receiver located at the central station of the Los Angeles School Police Headquarters.

4) Upon answering the call, information appears on a dispatcher's computer screen.

2. Sensing Devices

a. Motion Detectors:

1) Motion detectors shall be passive infrared detecting both motion and infrared emission at the same time to eliminate false detection.

2) Provide motion detectors in all areas or rooms that are located along the perimeter of the first floor of a building.

3) Provide motion detectors in rooms located above the first floor only if there is outside access or potential for entering directly by climbing trees, etc.

4) Provide motion detectors in corridors and hallways on each floor of a building.

5) Provide motion detectors in computer rooms, LAN equipment rooms, IDF rooms, Multi-Purpose Building, Kitchen and Dining Rooms, Gymnasium and all other major spaces.

6) Install motion detectors on an outlet box on the ceiling to obtain maximum efficiency. Use wall-mounted detectors only where ceiling-mounted are impractical.

7) Locate the motion detector at a corner of a room, facing away from sunlight, windows, heating elements, HVAC outlets and any turbulent air movements.

8) Provide remote control panel including a 12VDC power supply in each building for motion detectors.

9) A siren is required. An interior siren is preferred to an outdoor installation. If the school decides against a siren feature, bypass the connection with a 500 ohm resistor but leave the siren in place.

b. Door Switches (provide only in special cases):

1) Door switches shall be of magnetic type.

2) Provide door switches for walk-in freezers or coolers in a kitchen.

3) Provide door switches for all exterior doors not covered by motion detectors on the interior, including restrooms with direct exterior access.

3. Alarm Zones

a. Each sensing device shall be identified with an alarm zone or alarm point, which shall be identified at the remote annunciator and at the control center. The zone or point identification shall be descriptive of the location of the sensing device, such as Administrative Building Room 120.

b. There shall be no more than two motion detectors per zone or no more than two points to identify the location. Areas where two detectors per zone may be required include multi-purpose buildings, gymnasiums, auditoriums, and two classroom relocatable buildings.

c. Zones or points shall be listed and indicated on site and building drawings, identifying each one by building, area and room number.

4. Zone By-Pass Keypads

a. Provide a strategically located zone by-pass keypad in places such as the interior wall of the Main Office, Kitchen/Cafeteria building, Student Store, Gymnasium Lobby, Multi-Purpose Building, Auditorium/Theater, Adult School Office, Computer/Multi-media/Science laboratories, Music/Band Room, offices of academies in multi-academy learning centers, and Plant Manager's Office to de-activate the alarm when entering a building is necessary after the alarm system is armed.

1) A separate keypad will not be required, if any of the areas listed above is only accessible through another controlled area with a keypad.

2) Each main security panel can support a maximum of 8 keypads. If more key pads are required obtain authorization from District representative.

b. The by-pass keypad shall be a liquid crystal display.

c. Do not locate keypads in corridors or other areas easily subject to impact damage or vandalism (MS and HS only).

d. Consult with District representative to determine if other locations may be required.

5. Main Security Panel (MSP) and Annunciator

a. Main Security Panel and graphic annunciator are also called headend equipment. They are used to annunciate alarm zones and to transmit alarm signals via telephone line to the central monitoring station located at the District Police Headquarters.

b. MSP consists of maximum of 16 zones, expandable to 128 zones by the use of zone expansion modules, each with motion and tamper inputs, single phone line monitor and power supply housed in a lockable cabinet.

c. Controller shall be located in a LAN equipment room (new facilities) or closet in Administration Unit (existing facilities).

d. In campuses where numbers of zones exceed 128, or in campuses where total combus wiring from the controller to a remote security panel or to any keypad connected, exceed 1000 feet, split the campus to be protected by two independent controllers. Both controllers shall be annunciated in the main office.

e. MSP shall be fed from a separate circuit of 120-volt power source. It will be stepped down through a 120/16-18 VAC, 40VA transformer.

f. Graphic annunciator(s) shall be located in main office of the Administration Building. The Graphic Annunciator shall have full LED annunciation for all zones. Provide a keypad at each annunciator. Provide a separate repower module for each graphic annunciator panel if required (based on power calculations). Wire size of combus may have to be increased to accommodate increased power demand between repower module and led driver boards in the graphic annunciator panels.

6. Remote Security Panels (RSP)

a. Provide a Remote Security panel at each building (except relocatable buildings where a group of relocatables may be controlled by one RSP), connected to the main security panel by combus wiring.

b. RSP consists of maximum of 16 zones, expandable to 128 zones by the use of zone expansion modules, each with motion inputs and power supply housed in a lockable cabinet.

c. RSP shall be fed from a separate circuit of 120-volt power source. It will be stepped down through a 120/16-18 VAC, 40VA transformer.

d. The RSPs shall be located in IDF rooms wherever possible.

7. Power Supply, Cables, Raceways and Cabinets

a. Cables used for connection between MSP and annunciator in clerk's office, all homeruns from sensing devices to MSP/RSP and combus wiring between MSP and RSP as well as wiring to the keypads shall be 4 conductor, #22 for up to 1000 feet. Note on plans: do not set the charging jumper for high-charge on repower modules, and adjust the voltage potentiometer for 13.8 vdc, and apply fingernail polish to prevent tampering of this pot setting.

b. Use flooded type cables for underground applications.

c. Cables shall be installed in raceways. Concealed raceway shall be used for new building construction and exposed raceway shall be used for existing building installations. Exposed raceway in electrical rooms shall be conduit and exposed raceway in classrooms; offices and corridors shall be wiremold.

d. Cable length, resistance, capacitance and power calculations must be designed by the Architect to strictly conform to the manufacturer's design guide. Any deviation from the manufacturer's specifications for these types of systems can result in system malfunctions and/or high maintenance costs to the District.

e. Existing underground raceways used for public address system or TV master antenna system may be used to run security intrusion alarm system cables if there are spaces available in those raceways. Any cables pulled out from an existing conduit shall be replaced with new.

f. Power supplies consisting of receptacles, transformer/ rectifier and batteries shall be installed in a lockable NEMA 1 enclosure or a lockable terminal cabinet.

g. Terminal Cabinets and Junction Boxes:

1) At least one terminal cabinet shall be provided in each building except relocatable buildings.

2) At least one junction box (6"x 8") shall be provided in each relocatable building.

8. Existing Security Intrusion Alarm Systems

a. At some District school sites existing intrusion alarm equipment may differ from the system described above.

b. Existing system headend equipment may consist of an annunciator/switch panel, a relay panel and a dialer or transponders.

c. If this situation is encountered, remove existing annunciator/switch panel, relay panel, dialer or transponder. Wire all existing zones directly to new controller. A new annunciator panel shall be installed in main office (or LAN room if present).

9. Site Plan

a. Instruct the contractor to provide a site plan for use by the District central monitoring stations. Site plan shall be as follows:

1) Indicate location of buildings, zone numbers, and repower battery panel locations.

2) Indicate school code number and zone chart.

3) Indicate surrounding street names and direction.

4) Site plan shall be drawn on 8 1/2" x 13" sheet.

H. CLOSED CIRCUIT TELEVISION (CCTV) AND AUDIO SURVEILLANCE SYSTEMS

1. General

a. As part of the Los Angeles Unified School District's commitment to provide a safe working and learning environment, surveillance systems are to be used in approved, designated areas of schools and school grounds where there is no expectation of privacy as an additional and further means to continue to provide for that safe environment. Surveillance systems are defined as electronic devices for visual image (only) monitoring, recording and visual image data storage. (Parking garages are an exception and have audio monitoring and recording as well as video.)

b. Surveillance systems ARE STRICTLY PROHIBITED WHERE A "REASONABLE EXPECTATION OF PRIVACY" EXISTS. This includes the following:

1) No surveillance shall be installed in such spaces as restrooms, locker rooms, classrooms, private offices, and private workspaces.

2) Cameras must be directed so that they do not look through windows or other openings into private areas.

3) Cameras providing outside surveillance, such as parking lots or building perimeters must not be directed beyond school property.

c. Currently, only a coax or Cat 6 converted home run cabling CCTV design using DVRs is permitted. Use of the local LAN, use of a newly constructed separate LAN or the WAN is not permitted. See Bulletin 1197.

d. All real-time visual monitoring equipment (except point-of-entry monitors), including monitor screens, consoles, controllers and other appropriate equipment, and data recording devices, must be located in a secure monitoring site, with restricted access by approved individuals only. Do not locate them in a common LAN Equipment Room.

1) Secure monitoring sites may be located, secure from public viewing, in Principal's Office, Assistant Principal's Office, or a Police Office or special Security Room. For adult education or other after-hours use, the same provisions apply; systems must be able to be secured from unauthorized use.

e. Provide CCTV surveillance systems as follows:

1) Parking Garage Systems: In all parking structures (Audio Surveillance are also required).

2) School Building and Site Systems: Only when directed in writing by the District's authorized representative. (These systems shall be video only, with NO AUDIO SURVEILLANCE OR RECORDING.)

2. Parking Garage Surveillance System

a. Closed circuit television system shall consist of CCTV cameras, camera enclosures, monitors, coaxial switcher/controller system, digital video controller and recorders (DVR), and pan-and-tilt drives, cablings, power supplies and raceways. The video surveillance system shall be designed to be integrated with a School Building and Site System, either concurrently or in the future.

b. Audio surveillance equipment shall consist of controller, microphones, speaker/microphones, combiners, and call stations.

c. The basic system requirements are as follows:

1) One CCTV camera with pan and tilt spaced every 100 feet and within vandal-resistant enclosure in parking structures.

2) One fixed CCTV camera within vandal-resistant enclosure installed inside the parking structure entrance. Field of view shall include the vehicle access gate to the parking lot.

3) Surveillance microphones spaced every 60 feet, with a maximum of six microphones per zone.

4) Push to talk Emergency Speaker/microphone call stations every 50 feet in garage, one at elevator's lobby and one at each pedestrian point of egress.

5) Sixteen CCTV cameras maximum per DVR.

6) One monitor for each group of sixteen cameras.

d. Locate monitors, Digital Video controller and recorders (DVR) and audio surveillance base stations system in a console/rack station either in the Police /Security Office (in secondary schools) or the Main

Administrative office. Terminal cabinets for Parking Garage Systems may be located in the LAN Equipment Room.

3. School Building and Site Surveillance System (Required only at selected sites)

a. Provide CCTV surveillance system, cameras and other equipment to monitor any remote spaces where safety or security risks indicate a need. These include:

1) Main Office and Reception public spaces.

2) Attendance Office public space.

3) Corridors, lobbies, and other public circulation and access spaces.

4) Cafeteria.

5) Lunch Shelter.

6) Other interior and exterior locations determined during the design phase of the project.

b. Closed circuit television system shall consist of CCTV cameras, camera enclosures, monitors, digital video controller and recorders (DVR), and pan-and-tilt drives. Where Garage exists, the headend equipment shall be integrated with the Parking Garage Surveillance System to provide a single campus-wide system.

1) Provide pan-and-tilt or fixed CCTV camera to cover all corridors, stairwells, elevator lobbies, and other interior public areas (no classrooms).

2) Provide sixteen cameras maximum for each monitor and DVR, fewer if design and monitoring conditions warrant.

3) Cameras shall be located so that every camera is monitored by at least one other camera.

4) Cameras shall be located and secured so as to minimize vandalism, but there shall be no covert or concealed cameras.

c. No audio surveillance shall be provided for this system.

d. Provide drawings at Design Development and Construction. Document Phases that show all camera locations and zones of coverage. Use VideoCAD 6 or equivalent for designing and indicating camera coverage.

e. At all schools using CCTV buildings and site surveillance systems, appropriate signage must be posted to advise the public that the systems and camera are in operation.

1) Standard sign language and format has been adopted and is available on request.

2) Signs must be placed prominently at all points of entry to the school site, both pedestrian and vehicle. Where surveillance is provided in parking garages, place the sign at the entrance to the parking garage.

3) Location of signs shall be submitted at Design Development Phase for the District review. Signage with details must be shown in project construction documents.

I. GARAGE AND MAIN DOOR ENTRY SYSTEMS

1. Parking Structure Entry

a. Provide a stand-alone intercom call station to be mounted on card reader pedestal. The intercom unit shall be connected to PA/Intercom system. A switch at main reception office next to PA administrative telephone shall be connected to garage entry controls for communication purposes and to allow remote operation of the gate.

b. See Guide Specification Section 11 1200 for description of Garage Entry system.

2. School Main Entrance Surveillance System (in selected sites only)

a. Provide a CCTV camera in a vandal proof enclosure connected to a monitor in the main office. It shall be located directly inside the entrance door it protects. No recording shall be permitted for this system.

b. Provide an intercom base station in the main office near the CCTV monitor, and a two-way talk/listen remote station outdoors near the entry door.

c. Provide a pushbutton and wiring to activate door electric strike to permit entrance.

d. See Guide Specification Section 28 2313 for description of components.

J. TELEVISION DISTRIBUTION SYSTEM

1. TV System

a. The television distribution system shall be an over-the-air (OTA) system constructed to receive the following Advanced Television Systems Committee (ATSC) digital television channels in the VHF/UHF television spectrum (channel assignment subject to change – verify channels designations at time of design development):

Call Letters	Previous Analog	DTV Freq
KCBS - DT	2	43
KNBC - DT	4	36
KTLA- DT	5	31
KABC- DT	7	07
KCAL- DT	9	09
KTTV - DT	11	11
KCOP - DT	13	13
KCET - DT	28	28
KMEX - DT	34	34
KLCS - DT	58	41

b. Consult with the Design Manager and/ or OAR for projects needing locally broadcasted TV signals. This is particularly important in schools whose design scope includes media centers; the design shall include the necessary pathways and equipment for this operation.

2. System Descriptions

a. TV system and equipment consists of:

1) Head End Equipment:

a) Headend 19" rack with mixing networks, channel converters, processors, splitters, combiners, modulators, directional couplers, test taps, line amplifier, and video monitor.

2) Line extender TV cabinets including amplifiers to be located in the IDF (Signal room) of remote buildings.

3) Digital antennas mounted on roof of Administration Unit.

4) For antenna downleads use coax RG-6/U.

5) In the event of difficulties in the transmission of UHF channels across the campus, set the agile processors for conversion to available unused VHF channels 3, 6, 8, 10, or 12. Additionally, in schools that predominately have older analog TVs with only 2-13 channel tuners, these three channels will have to be reassigned to unused VHF.

6) Antenna location(s) requires field-site signal measurements and line-of-site availability (use http://www.antennaweb.org as a guide). .In the event of weak or insufficient signal availability, provide alternative CATV services. If required, locate antenna on the highest building, condition the signal for distance, and route conduit to TV rack. Also, using a fringe area antenna is an alternative solution as long as the antenna is durable for a high wind area.

7) If CATV is required, the rack modules have to be analog to digital QAM (AQD) since only local analog channels in a basic cable service package are provided "in the clear." If digital to digital modules are used (AQT), the school will have to subscribe to a digital channel package and receive only one set top box. This service only provides one channel at a time for distribution. Unless 10 of these boxes are obtained and adapted to rack mounting, 10 digital channel distribution for the school is unobtainable without an antenna.

8) The TV front end design shall permit the use of 8VSB digital over-the-air signal or CATV digital QAM signal processing. The output signal in either case shall be 256 QAM for ATSC compatible TV receivers.

9) When using output combiners either to division (before the AQT modules) or combine TV signals (after the AQT modules) from or to a single coax signal in the rack, do not connect adjacent channels to connectors physically next to each other. Co-channel interference may occur.

10) Digital signals are self-correcting, but produce no output below certain levels. The design shall address necessary modifications and requirements to correct signal weakening, such requirements may include but not be limited to gain settings reduction, and minimizing length of jumper coaxial cables.

b. Distribution, Cabling and Power:

1) Backbone: Use two (2) single mode fibers from the data fiber optic backbone cabling to transmit the television signals between buildings. One single mode fiber shall be used, while the second shall be left as spare. Install fiber to coax distribution amplifiers in the first floor of remote building at TV terminal cabinet. A coax-RG11/U cable shall be used to connect media converter's output to TV terminal cabinet located in the same room.

2) In small sites, or where less than ten TV outlets are served in the remote building, use coax-RG11/U or larger cable for distribution from the closest IDF to remote TV terminal cabinets.

3) For building distribution from TV terminal cabinet to outlets, use coax-RG6/U cables.

4) Use self-terminating, dropping tap methods for building coax distribution (no splitters).

c. Provide adequate number of line extender amplifiers in system so that signal level at any outlet shall nominally be between -1 dBmV and +4 dBmV (digital). Usually up to four TV outlets may be daisy chained to be served by a single RG-6U cable homerun to TV terminal cabinet.

d. Provide 120 volts, 20 amps, dedicated circuit to headend rack and line extender cabinets.

e. Cable runs shall be in raceways or cable trays.

f. Terminal outlets shall be mounted 18" above finished floor at TV monitor location or directly behind any wall mounted TV locations (existing sites with wall-mounted TVs only), and shall have a self-tapping directional coupler design.

g. TV outlet shall be provided at VCR/ DVR location (media cabinet), Principal's Office, Library, and at teacher's workstation. A single TV drop from cable tray shall serve the classroom.

h. Provide the following cable and outlets as follows:

1) Provide double gang outlet boxes for audio/video system next to ceiling mounted projector, at TV monitor location, and at wall next to teacher's workstation.

i. Provide 120 volt, 15-amp receptacle at TV and projector outlets.

j. Antenna mast, cabinets and raceways shall be effectively grounded.

k. Submit system calculations indicating signal levels at components including terminal outlets. All block diagrams and construction details must be included in construction drawings.

3. Modernization Projects

a. For modernization projects, or where new buildings are added to existing school sites and an existing television distribution system is to be extended, following procedure shall be followed:

1) Obtain project record drawings of existing system.

2) Visit job site to compare project record drawings with actual field conditions and note any deviations from project record drawings.

3) Determine at what point existing TV system can be tapped and extended to new work location.

b. Usually line extender amplifiers need to be installed depending on attenuation values calculated. Signal level at any outlet shall be between +7 dBmV and +10 dBmV (analog signal). The optimum digital signal measurements are +6 to +8 dBmV lower (256 Qam) than these analog measurements. Digital signals also have requirements for minimum carrier to noise, multiplex quality analysis, MER, constellation, and BER (bit error rate) evaluation. Use a Sencore 1426 portable tester or equivalent. The BER test is dependent on two different carrier to noise tests which differ only if there are adjacent broadcast channels next to the channel under test. Refer to the CATV specifications for test procedures.

K. OVERHEAD DIGITAL PROJECTOR SYSTEM

1. System Requirements

a. In all classrooms and any instructional areas make provisions for an overhead digital projector system as follows:

1) Provide a video projector mounting plate with a duplex receptacle. Locate mounting plate approximately 15' away from projector screen location.

2) Stub-up a 1 ½" conduit, 4" minimum above ceiling space from teacher's workstation area, and at Audio/Visual cabinet.

L. SOUND ENHANCEMENT SYSTEM

1. Systems Requirements

a. In all classrooms and any instructional areas make provisions as follows for owner furnished owner installed audio enhancement systems:

1) Stub-up a 1 ½" conduit, 4" above ceiling space from teacher's workstation area, and audio/visual cabinet.

M. SCHOOL RADIO COMMUNICATION SYSTEM

1. System Requirements

a. Each secondary school has a radio communication base station to support its hand-held portable radios. It is provided by the District, and is located in the open office of the Administration Unit – usually on top of file cabinets or on special shelving. It receives signals from a roof-mounted antenna.

b. A one-inch inside diameter conduit for the coax antenna cable from the roof to the room is required as part of the building construction, terminating in a double gang deep device box with a single hole (one inch grommeted) stainless steel cover plate at the base-station location and in a weatherhead on the

roof. Locate the box at 18 inches above finished floor in an accessible location. Conduit shall be provided with pull string.

1) Conduit should extend 24 inches to 30 inches above the roof; it shall be braced at roof level and properly flashed to support the antenna.

2) Conduit must have only sweep bends, no sharp turns.

3) Conduits shall have no more than two 90 degree bends between pull boxes.

c. Provide a 120V duplex U-ground dedicated power receptacle for the base station; locate outlet at no more than 12 inches from antenna device box.

N. SIGNAL SYSTEMS RACEWAY AND TERMINAL CABINETS

1. Raceways and Routing

a. All signal systems' wiring and cabling, including fire alarm, clock, security intrusion alarm, telephone, public address, television, and computer networking shall be installed in raceways.

b. Fire alarm and clock systems shall be installed in conduit. For all other signal systems, cable trays are preferred.

c. For underground distribution to all buildings, signal systems shall be installed in conduit, sized for 40% fill (30% fill for new campus to accommodate future growth), with the following as a minimum standard:

1) 4" C-Fiber Optic Data Backbone System with three innerducts – two 1 ½" and one 1".

2) 3" C-PA / Intercommunication/ Telephone systems. In large campuses, use 4" conduit or multiples conduit as needed.

3) 3" C-Intrusion Alarm System/ CCTV system.

4) 3" C-Cat. 6 data cables/ TV distribution (coaxial cables if applicable).

5) 2" C-Fire Alarm System.

6) 2" C-Clock System.

7) 3" C-Spare.

8) 3" C-Minimum of two for telephone entrance service.

9) 3" C-EMS and Lighting Controls backbone system with one 1½", and one 1" innerducts.

d. For end drops to buildings not containing more than two classrooms, the conduit size shall be as follows as a minimum standard:

1) 3" C-Fiber Optic Data System.

2) 2" C-PA / Intercommunication/ Telephone systems

3) 2" C-Intrusion Alarm System/ CCTV system.

4) 2" C-Cat. 6 data cables/ TV distribution (coaxial cables if applicable).

5) 2" C-Fire Alarm System.

6) 1" C-Clock System.

7) 2" C-Spare.

8) 2" C-EMS and Lighting Controls backbone system with two ¾" innerducts.

e. For inside building distribution, the sizes of conduits or cable trays shall be selected per 40% cable fill requirements for different systems. Provide separate conduits for fire alarm and clock systems.

2. Terminal Cabinets and backboards

a. The information indicated here are supplemental to requirements indicated elsewhere in the design guideline.

b. Terminal cabinets shall be provided for each signal system, in each building.

1) For public address system, a main PA terminal cabinet shall be provided, located near PA Rack and PABX equipment. If the Main PA terminal cross connects are located inside the dedicated LAN room, an open field (rather than a cabinet) cross-connect is acceptable. If the open field solution is selected, the backboard used must be separate and distinct from the main telephone backboard and cross connect field. All wiring between PABX and P.A. rack and stations shall be routed thru this terminal cabinet. Cabinet or backboard must be sized in accordance with number of terminations required to be made plus 20% spare capacity. Other buildings shall each be provided with at least one P.A terminal cabinet sized in same manner as PA main terminal cabinet. All cabinets shall include required terminal blocks for cable terminations.

2) For Telephone system, locate main telephone and PBX cross connect backboard shall be provided in LAN room, next to Main PA terminal cabinet. Provide at least one telephone terminal cabinet in the IDF room at first floor of each remote building to cross connect all multi-pair telephone cables originating from voice patch panels of all IDF's in the building.

3) For security intrusion alarm system, one terminal cabinet shall be provided for the main security panel and for each remote security panel. Cabinets shall include terminal strips, power supply, power outlet, and backup battery.

4) For fire alarm system, a main terminal cabinet shall be provided, located near control panel. All wiring between control panel and field devices shall be routed thru this terminal cabinet. Cabinet shall be sized in accordance with number of terminations required to be made plus 20% spare capacity. Each building shall be provided with at least one terminal cabinet sized in same manner as main terminal cabinet. All cabinets shall include required terminal strips for wire or cable terminations.

5) For clock/program system, a main terminal cabinet shall be provided, located near Clock/Program Controller. All wiring between control panel and field devices shall be routed

thru this terminal cabinet. Each building shall be provided with at least one terminal cabinet. All cabinets shall include required terminal strips for wire terminations.

6) For TV system, at least one terminal cabinet shall be provided in each building. Cable terminations shall be made in cabinets, with approved components. Depending on distance and signal drop from headend equipment to remote terminal cabinets, remote terminal cabinets may include line extender amplifiers to compensate for signal drop (only where copper distribution is used).

O. PROXIMITY CARD ACCESS CONTROL SYSTEM

1. System Requirements

a. Each school site shall be equipped with a contact less proximity card access control system to control access to elevators and parking garages/areas.

b. The system shall be capable of operating on a new or existing IP network, and shall be accessible, configurable, and manageable from any network connected computer.

c. The system shall be capable of continuous operation even during power downtimes or outages, and shall be equipped with the hardware and software necessary for the orderly shut down of the controller during a power failure.

d. The system shall be designed with a full feature, high performance data base management system.

1) The operating system shall not require client side software other than a web browser.

e. The system shall be compatible with HID Corporate 1000 LAUSD formatted card coding system.

f. Elevators with multiple access points (doors) on a single floor shall receive a card reader at each hall call station.

g. Locate proximity card access control equipment cabinets in electrical rooms, signal terminal rooms, or other suitable spaces approved by the Design Manager or Owner Authorized Representative.

h. The system must be capable of notifying school and/or District designated personnel via SMS or E-mail messages (utilizing the District's mail server) when problems or situations that require immediate attention arise.

2. Power Requirements

a. Provide a dedicated 120 volt circuit for power and battery backup at each system cabinet.

3. Data System Requirements

a. Provide a data network outlet inside each access control system cabinet. These outlets shall be connected via Cat 6 cables to the nearest computer network system distribution point (MDF, IDF, or LDF).

4. Specifications and Technical Details

a. The District's technical specifications and construction details are based on the S2 NetBox Enterprise Security Management System. Equal or better products from other manufacturers may be acceptable subject to Owner's review and approval.

b. The AOR shall edit or modify the specifications and technical details to reflect the actual requirements of the system being proposed if other than the S2 Netbox. Obtain approval on any substitutions prior to start of design.

3.9 PLANTING AND IRRIGATION

A. GENERAL REQUIREMENTS

B. PLANTING

C. SOILS

D. IRRIGATION

E. PLANT SELECTION

3.9 PLANTING AND IRRIGATION

A. GENERAL REQUIREMENTS

a. Landscapes are essential to the quality of life by providing areas for active and passive recreation and as an enhancement to the environment by cleaning air and water, preventing erosion, offering fire protection, and replacing ecosystem lost to development. Because schools represent important visual elements in the community, a well-conceived landscape design is essential – one that is economically maintainable and water efficient yet still provides a naturally beautiful campus that enhances its neighborhood. Adequate shading of outdoor teaching, gathering and play areas with year-round shade trees; durable plants that need little pruning or shaping; drought-tolerant landscaping providing ease of maintenance – all are important elements of the landscape development.

B. PLANTING

1. Guidelines

a. Examine existing trees on site, identify those that should be preserved, and incorporate them into site planning, with recommendations to the District that they be saved in place, relocated, and provide method of protection during construction.

b. See "Site Design" section for planning and design criteria on landscaping, planting and tree locations.

c. Trees shall be spaced to provide a maximum of five-feet of overlap of full canopies.

d. Use plant materials appropriate to the site and project, selected from District's "Approved Plant List".

e. Refer to the District's "Guide Specifications" for additional requirements.

f. No tree box smaller than 24 inches is to be specified.

C. SOILS

1. Guidelines

a. Examine physical properties of the existing soil at site and provide during the Design Development Phase a preliminary assessment of possible major soil problems, such as salinity and alkali conditions, and the need for soil amendments or imported topsoil in the early design stage. Provide a soil management report. The 100% design shall reflect an onsite soil management plan.

b. If considered necessary, consult with the District regarding services of a soil specialist and laboratory testing during the design stage.

c. Provide for stockpiling of good existing topsoil to be used in planting areas, free of all debris and rock over ¾".

d. Specify characteristics and source approval for topsoil to be imported, installation methods and blending if appropriate.

e. Specify subsoil ploughing and subsurface drainage to alleviate problems created by poor aeration, soil compaction or inadequate drainage.

f. Specify replacement of top 3 feet of soil where trees are planted in existing paved areas or other heavily compacted soils.

g. Indicate method of slope stabilization on banks 2:1 or steeper.

h. Plans shall indicate the area (in square feet) of each planting area.

D. IRRIGATION

1. Design Requirements

a. The design shall be consistent with the California Code of Regulation, Title 23 Water, Division 2 Department of Water Resources, Chapter 2.7 State Model Water Efficient Landscape Ordinance Section 490-495.

b. The landscape design documents shall include the following elements as detailed in the State Model Water Efficient Landscape Ordinance Section 492(b&c), provide all formulas and calculations to support your estimates.

c. Each landscape documentation package shall include a cover sheet, referred to as the Water Conservation Concept Statement. It serves as a check list to verify that the following elements of the landscaping documentation package have been completed:

1) Maximum Applied Water Allowance.

2) Estimated Applied Water use.

3) Estimated Total Water Use.

4) Landscape Design.

5) Irrigation Design.

6) Planting Design Plan shall include the square footage of the landscape area for each station, zone, controller and total square footage for all landscape area.

7) Irrigation Watering Program Schedules. For controllers based on a Y2 month cycle.

8) Maintenance Schedules.

9) Landscape Irrigation Audit Schedule.

10) Grading Design plan.

11) Soil Analysis.

d. The Architect-Engineer shall check the availability of reclaimed water at the site, or its nearby availability from where it could be extended to the site at no cost to LAUSD. If available the Designer shall request approval for its use in the project's irrigation system.

2. Design Efficiencies

a. All irrigation systems shall be provided with controllers with electrically operated control valves and seasonal irrigation schedules based on climatic conditions, incorporating water conservation design and utilizing methods appropriate for specific terrains, soil types, wind conditions, temperatures and other environmental factors in order to ensure a high degree of water efficiency.

b. Soil types and infiltration shall be considered when designing irrigation system.

c. All irrigation systems shall be designed to avoid runoff, low head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks roadways, or structures.

d. Proper irrigation schedules for each station, to include sequences of cycle and soak times shall be provided with your designs and plans.

e. Special attention shall be given to avoid runoff on slopes and to overspray in planting areas with a width less than ten feet and in median strips.

f. Select the proper equipment components and provide irrigation schedules for each station to meet or exceed the required irrigation efficiency of 0.625.

g. Encourage the capture and retention of storm water onsite.

h. Maximize infiltration and retention.

i. Encourage the use of recycled water.

j. Encourage the use of economic incentives to promote the efficient use of water.

k. Educate water user on the efficient use of water.

l. Address regional differences, including fire prevention needs.

m. Include provisions for landscape maintenance practices that foster long-term landscape water conservation.

n. Promote benefits of consistent local ordinances and District guidelines, whichever is more stringent.

o. The estimated water use shall not exceed the Maximum Applied Water Allowance (MAWA).

p. Designer shall add and sign the following statement into the plans: "I have complied with the criteria of the ordinance and applied them accordingly for the efficient use of water in the irrigation design plans."

3. Design Plans

a. Provide CAD site plans that shall include:

1) A Master site plan shall include showing the location of all irrigation zones for each controller with point of connections, backflow device, pressure regulators, isolation valves, mainlines, flow sensor/master valve & conduit, remote valves stations and quills.

2) A complete plan layout for each controller shall include showing the location of the point of connection to the main piping system, main and lateral lines, isolation valves, pressure regulator, master valve & conduit, flow sensor & cable, remote valves, rain sensor, controller and all sprinklers.

3) Soil management criteria and plans as needed.

4) Design Plans shall utilize and include District Design Guide Details.

5) The landscape design shall be created by a Landscape Designer, Irrigation Designer, or Licensed Landscape Contractor.

4. Design Calculations

a. Provide design hydraulic and water budget calculations, water efficiency landscape worksheets (based on 0.7 evapotranspiration (ET) adjustment factor to support the irrigation design plans using the following format:

1) Static Water Pressure- Hi and Low.

2) Water meter- Size, friction loss @ required GPM.

3) Backflow Device- Size, friction loss @ required GPM.

4) Master Valve- Size, friction loss @ required GPM.

5) Flow Sensor- Size, friction loss @ required GPM.

6) Isolation Valves, Size, friction loss @ required GPM.

7) Mainline piping, Size, developed length, friction loss at each sizes used @R/GPM.

8) Lateral piping, Size, developed length, friction loss at each sizes @R/GPM.

9) Remote Valves, Sizes, friction loss @ required GPM.

10) Elevation Change.

11) Total Pressure loss.

12) Pressure required @ sprinkler head.

13) Lowest Static Pressure (-10%).

14) Residual Water pressure..

15) Water Budget.

b. Provide design hydraulic calculations to support the design when incorporating a booster pump. Keep in mind, peak demands effecting water pressures are normally not during irrigation watering hours (10 pm to 6 AM)

c. Provide design calculations information to support incorporating a pressure regulator.

d. Water pressure over 80 psi shall be regulated per Zone to meet manufacturer's suggested pressure-heads.

5. Design Materials and Components

a. Call out design materials as specified in the LAUSD Guideline Specifications and LAUSD Design Guide Details to ensure quality of materials with uniformity in maintenance and procurement.

b. The following are some notable required materials that shall not be compromised:

1) All valves including remote valves, isolation and shut-off valves shall be brass or bronze. Plastic valves are not acceptable.

2) Drip Irrigation is not acceptable.

3) Mainline and lateral PVC piping shall be a minimum schedule 40 PVC piping above ground is not acceptable.

4) PVC male adapters are not acceptable, use schedule 80 PVC nipples when connecting to copper, brass, bronze or steel materials.

6. Water Supply, Meter and Backflow Device

a. Provide a separate irrigation water meter and main of adequate size to satisfy maximum instantaneous demand and projected future demands.

b. For large sites, three or more watering acres, or any multiple of that in unit size, there may be separate points of connection on designated irrigation meters for each such unit.

c. Water piping from meter connection to backflow device shall be no smaller in diameter than backflow device served.

d. Provide Reduced-Pressure-Principle Backflow Prevention Devices upstream from irrigation system for meter protection.

e. Provide pressure regulator when necessary, never exceeding 100 psi.

f. Provide enclosure for backflow device and pressure regulators where necessary to reduce potential vandalism.

7. Piping Design

a. Piping materials shall conform to the District's Guide Specifications.

b. Flow velocity: Five (5) feet per second maximum, based on industry-standard friction pressure loss values and complete hydraulic calculations.

c. Pipe size shall be sufficient to support a minimum of two control valves operating at the same time. (One opening, one closing)

d. Follow the manufacturer's GPM demand and pressure requirements; make allowance for a 10% error margin with all GPM demand and sprinkler-head coverage values.

e. Size all valves (including remote control valves) no smaller than the piping served downstream, except that when piping is increased in size to reduce friction loss, remote valves may then be sized one pipe size smaller than the piping served.

f. Install shut off valves needed to isolate loop systems or major branch lines.

g. Do not use exposed PVC piping above ground.

8. Athletic Fields

a. The placement and location of irrigation equipment such as Controllers, backflow devices, remote valve, isolation valves, quill valves and yard boxes for maintenance accessibility and student safety is a very important concern. The following are ideal locations for placement of the above irrigation equipment in order of number 1 is the most preferred location. For Sports fields (Football, Baseball, Softball, Soccer field):

1) Install all equipment including the controller off the field of play in a fenced enclosure with valves such as remote valves, normally placed in a yard box, installed above the ground on a manifold system.

2) Place the hose quill valves for football fields up against the perimeter cement curb to field. For other sport fields install next to wall, fence or outer perimeter of grass field, preferably next to pavement.

3) Install Controller and backflow device as near as possible to a wall or fence, away from the field of play. Place the remote valves in marked yard box with-in 12 inch of fence, wall, and or outer perimeter of grass field which is normally next to pavement. An Isolation valve in a marked yard box prior to the group of quills is ideal.

4) Install remote valves in a minimum group of three to easily locate the yard boxes in future. An Isolation valve in a marked yard box prior to the group of remote valves is ideal.

b. General Physical Education Field:

1) Install Controller and backflow device as near as possible to a wall or fence, away from the field of play. Place the remote valves in marked yard box with-in 12 inch of fence, wall, and or outer perimeter of grass field which is normally next to pavement.

2) Install remote valves in a minimum group of three to easily locate the yard boxes in future. An Isolation valve in a marked yard box prior to the group of remote valves is ideal.

9. Sleeves

a. Pressure piping installed under driveways, heavy traffic thresholds or sidewalks shall be sleeved.

b. Sleeves shall be a minimum of 2 pipe sizes larger than the pipe it serves and include a tracer wire.

c. Sleeves for long distances are not a good thing. Mainline piping must be center loaded to prevent movement due to expansion and contraction, which will cause the main line to break within the sleeve. Never exceed 60 feet of continues sleeve in any area.

10. Sprinklers

a. Provide 100% head-to-head triangulated coverage or other approved 100% configuration

b. Locate sprinklers with pop-up spray 12 inches away from buildings, 4 inches away from paved areas or parking stalls, and where trees will not interfere with spray pattern.

c. Reduce spacing in areas where winds during irrigation times may blow spray outside irrigation area.

d. Locate sprinkler lines on banks parallel to contours.

e. Sprinklers on fixed risers are not acceptable. All sprinkler heads shall be pop-up heads and installed with double swing-joints.

f. Drip irrigation is not acceptable.

g. All sprinkler spray heads shall have a built-in check valve to prevent drain down from the lowest head, including level irrigation systems.

11. Controllers shall be provided with the following

a. Locate controller close to a building, wall or fence and accessible for use. Install in vandal-resistant secured enclosure that prevents unauthorized access and control changes.

1) Include self-adjusting controllers, and controls for runoff and overspray.

b. Provide Rain Sensor-Locate in area accessible to rain and not easily vandalized. Do not in stall under roof overhang.

c. Flow Sensor and Master Valve to provide mainline and lateral line protection

1) Do not install manual control valves and quill valves on irrigation stations/zones using a flow monitoring system. Tie in before flow sensor.

d. Provide a hand-held wireless remote control unit (one per site).

e. Each controller shall be provided with three (3) extra stations for future connections.

12. Remote Valves serving Lawn and Planter Locations

a. Remote valves serving planter areas shall be installed in marked yard box, located along the outer perimeter of planter it is serving as close to the side walk or pavement as possible in order to easily access and utilize during operation with getting wet by sprinklers during operation.

b. Remote valves serving turf areas shall be installed in marked yard box, located along the outer perimeter of grass area it is serving, as close as possible to the sidewalk or pavement in order to easily access and utilize during operation with getting wet by the sprinklers during operation.

1) When at all possible, install remote valves in a minimum group of three to easily locate the yard boxes in future. An Isolation valve in a marked yard box prior to the group of remote valves is ideal.

E. PLANT SELECTION

1. Section Parameters

a. Design shall reflect plants, trees, shrubs, etc that support the landscape and the environment for which they are intended. Plants are to chosen based on plant type, height, width, texture, seasonal interest, texture, form, use, disease and insects, soils, etc.

b. Landscape plants shall be selected based on the geographical location, indigenous plants and appropriate grouping.

c. Pests attracting plants shall be avoided.

d. Designer shall obtain approval of any plants not in the approved list prior to proceeding.

2. Approved Plant List

a. Refer to the following link for the Approved Plant List: http://www.laschools.org/employee/design/fs-studies-and-reports/file?file_id=226675942

3.10 BUILDING ACOUSTICAL REQUIREMENTS

A. ALLOWABLE MAXIMUM BACKGROUND SOUND LEVEL (BSL) FROM HVAC NOISE

B. ALLOWABLE MAXIMUM BACKGROUND SOUND LEVEL (BSL) FROM TRAFFIC NOISE OR PLAYGROUND NOISE

C. ALLOWABLE MAXIMUM REVERBERATION TIME (RT 60)

D. ALLOWABLE MINIMUM SOUND TRANSMISSION CLASS (STC) VALUES FOR PARTITIONS SEPARATING A CLASSROOM OR LIBRARY

E. ALLOWABLE MINIMUM STC VALUES FOR FLOOR / CEILING ASSEMBLIES SEPARATING CLASSROOMS OR LIBRARIES

F. ALLOWABLE MINIMUM STC VALUES FOR DEMISING PARTITIONS SEPARATING ALIKE AND DISLIKE FUNCTIONS

G. ALLOWABLE MINIMUM STC VALUES FOR FLOOR / CEILING ASSEMBLIES SEPARATING OTHER ALIKE AND DISLIKE FUNCTION

H. ALLOWABLE MAXIMUM IMPACT & ISOLATION CLASS (IIC) LEVELS FOR FLOOR/CEILING ASSEMBLIES ABOVE CLASSROOMS

3.10 BUILDING ACOUSTICAL REQUIREMENTS

A. ALLOWABLE MAXIMUM BACKGROUND SOUND LEVEL (BSL) FROM HVAC NOISE

Function	dBA	Suggested Construction
Classrooms	45 Max. 40 Target	See HVAC Design Criteria
Conference Rooms Library Office	45	
Cafeteria Gymnasium Corridor Locker Rooms	50	
Multi-Purpose Room	40 Max. 35 preferred	Duct routing and location or air transfer openings shall not significantly compromise the sound isolation of the envelope of the space.

…B. Allowable Maximum Background Sound Level (BSL) from Traffic Noise or Playground Noise

Function	DBA	Suggested Construction
Classroom	45 Max. 40 Target	Wall construction to provide STC based on actual exterior sound levels. Glazing: ¼" monolithic typical. ¼ "3/8" laminated if needed. DO NOT use thermal insulating dual glazing. Weather-stripped solid core or hollow metal door with drop threshold, or provide vestibules with two doors.
Conference Library Office	45	Same as above.

Cafeteria Gymnasium Corridor Locker Rooms	50	¼" monolithic glazing. Weather-stripped solid core or hollow metal door with drop threshold, or provide vestibules with two doors.
Multi-Purpose Room	40 Max. 35 Preferred	Doors from the Stage and Multi-Purposes Room should lead into corridors and other circulation areas, NOT directly into adjoining classrooms or other occupied spaces. As far as is practical, attempt to site the space away from noise sources such as railways, freeways, industrial noise sources etc. Reasonable measures should be incorporated to limit transient noise intrusion into the space, e.g. acoustical seals should be provided at all doors to the Multi-Purpose Rom and Stage,

NOTE: Background noise shall be defined and measured as specified in ANSI Standard 2.60

C. Allowable Maximum Reverberation Time (RT 60)

Function	T60	Suggested Construction
Classroom (all) Conference Library	.60	Acoustical tile ceiling with minimum NRC of .0.70 min.
Conference Library Office >15,000 cu.ft.	.70	Acoustical tile ceiling with minimum NRC of .55
Cafeteria Gymnasium Corridor Locker Rooms		Minimum 50% of ceiling area covered with acoustical tile with minimum NRC of .55 or equivalent absorption.
Multi-Purpose Room		The target mid frequency reverberation time for the space, unoccupied, is 1.2 seconds. Since a greater quantity of acoustically absorbent finishes are required as the volume of the space increases. It is suggested that this volume accommodating the audience should not exceed 240 cu. feet per person.

D. Allowable Minimum Sound Transmission Class (STC) Values for Partitions Separating a Classroom or Library from:

Function	STC	Suggested Construction
Classroom Conference Library Office Corridor Shower Room Staircase Outdoor Playground or lunch Shelter	45	One layer of 5/8" thick drywall on each side of a single steel stud 24 on center or 2x4 wood staggered studs at 16" on center partition with full width insulation, penetrations not desirable All joints and penetrations properly sealed.
Speech Clinic Health Care Facility	50	One layer of 5/8" thick drywall on one side of a single steel stud 24" on center or 2"x4" wood staggered studs at 16" on center partition and 2-layers of 5/8" thick drywall on the other side with full width insulation, penetrations not desirable All joints and penetrations properly sealed.
Music Room Mech. Equipment Rm Gymnasium Cafeteria M/P Room	60	Two layers of 5/8" thick drywall on one side of a double steel stud partition 24" on center or 2"x4" wood staggered studs at 16" on center and 3-layers of 5/8" thick drywall on the other side with full width double insulation. Stud lines are separated by a one inch airspace. All joints and penetrations properly sealed.

E. Allowable Minimum STC Values for Floor / Ceiling Assemblies Separating Classrooms or Libraries from:

Function	STC	Suggested Construction
Classroom Conference Library Office Corridor Shower Room Staircase Outdoor Playground Or Lunch Shelter	45 (unless higher needed to meet background noise level criteria)	Nominal 6" thick lightweight concrete on steel fluted deck or plywood sub floor with suspended acoustical tile ceiling a minimum 30" below the deck. or 5/8" drywall suspended ceiling; All penetrations properly sealed.

Speech Clinic Health Care Facility	50	Same as above
Music Room Mech. Equipment Gymnasium Cafeteria	60	Nominal 6" thick lightweight concrete on steel fluted deck or plywood sub floor with suspended 5/8 acoustical tile ceiling a minimum 30" below the deck with insulation in the cavity. Install the cavity. All joints and penetrations properly sealed.

F. Allowable Minimum STC Values for Demising Partitions Separating Alike and Dislike Functions

Function	STC	Suggested Construction
From Office or Conference Room to Office or Conference Room	35	1-layer of 5/8" thick drywall on each side of a single steel stud 24" on center or 2"x4" wood staggered stud at 16" on center partition Weather-stripped solid-core wood door with drop-threshold. All joints and penetrations properly sealed.
From Office or Conference Room to Corridor or Staircase or Shower Room	45	1-layer of 5/8" thick drywall on each side of a single steel stud 24" on center or 2"x4" wood staggered stud at 16" on center partition insulate the cavity. Weather-stripped solid-core wood door. All joints and penetrations properly sealed.

From Office Conference Room Music Room to Outdoor Playground	50	1-layer of 5/8" thick drywall on one side of a single steel stud 24" on center or 2"x4" wood staggered stud at 16" on center partition and 2-layers of 5/8" thick drywall on the other side Insulate the cavity. All joints and penetrations properly sealed. Steel sound-rated door STC-49.
From Corridor or Staircase or Shower Room to Corridor Staircase Shower Room		No requirements.
From Music Room to Mech. Equipment Rm Gymnasium Cafeteria M/P Room Office Conference Room	60	2-layers of 5/8" thick drywall on one side of double steel stud 24" on center or 2"x4" wood staggered stud at 16" on center partition and 3-layers of 5/8" thick drywall on the other side. Insulate the cavity. All joints and penetrations properly sealed. Steel sound-rated door. STC-49.
From Office Conference Room to Mech. Equipment Room or Gymnasium or Cafeteria	60	2-layers of 5/8" thick drywall on one side of double steel stud 24" on center or 2"x4" wood staggered stud at 16" on center partition and 2-layers of 5/8" thick drywall on the other side. Insulate the cavity. All joints and penetrations properly sealed. Steel sound-rated door. STC-49.
From Music Room To Music room	62	2-layers of 5/8" thick drywall on one side of double steel partition 24" on center or 2"x4" wood staggered stud at 16" on center and 3-layers of 5/8" on the other side. Insulate the cavity. All joints and penetrations properly sealed. Steel sound rated door. STC-49

G. Allowable Minimum STC Values for Floor / Ceiling Assemblies Separating Other Alike and Dislike Function

Function	STC	Suggested construction
From Office or Conference Room to Office or Conference Room	35	Nominal 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended acoustical tile ceiling a minimum 30" below the deck. All joints and penetrations properly sealed.
From Office or Conference Room to Corridor or Staircase or Shower Room	45	Nominal 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended acoustical tile ceiling a minimum 30" below the deck. All joints and penetrations properly sealed.
From Office or Conference Room or Music room to Outdoor Playground		Provide extra wall STC to meet 45 DBA background noise level; (See "Traffic noise" requirement above. All joints and penetrations properly sealed.
From Corridor or Staircase or Shower Room to Corridor or Staircase or Shower Room		Provided extra STC to meet 45DBA background noise level; See "Traffic noise" requirement above. All joints and penetrations properly sealed.
From Music Room to Mechanical Equipment Room or Gymnasium or Cafeteria	60	Nominal 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended 5/8" thick drywall ceiling a minimum 30" below the deck. Insulate the cavity. All joints and penetrations properly sealed.
From Office or Conference Room to Mech. Equipment Rm Gymnasium Or Cafeteria	60	Nominal 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended 5/8" thick drywall ceiling a minimum 30" below the deck. Insulate the cavity. All joints and penetrations properly sealed.

From Music Room To Music Room	62	Nominal 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended 5/8" thick drywall ceiling a minimum 30" below the deck. Insulate the cavity. All Joints and penetrations properly sealed.

H. Allowable Maximum Impact & Isolation Class (IIC) levels for Floor/Ceiling Assemblies Above Classrooms

Function	IIC	Suggested Construction
Classroom	50	Vinyl tile over 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a suspended acoustical tile a minimum 30" below the deck. Alternative: Equivalent IIC using carpeting.
Gymnasium Music Room Dance Studio	50+	Vinyl tile over 6" thick lightweight concrete on a steel fluted deck or plywood sub floor with a 5/8" thick suspended drywall ceiling a minimum 30 below the deck. Insulate the cavity.

GENERAL NOTES:

Provide acoustical consultant recommendations for all auditoria and for special cases such as unusual exterior ambient noise.

Book Four
Submittal Requirements

4.0 Submittal Checklists

4.1 SUBMITTAL REQUIREMENTS

Schematic Design

DRAWINGS:

OTHER DOCUMENTS:	% Compl	Scale (Min) "/ ft.	Information Included	Location Reference
General				
At a preliminary Schematics review meeting, present the District with three or more design solutions, for selection of one to be refined. Provide site analysis diagrams showing key site influences: Solar, winds, views, traffic, neighborhood context, topographical features. Mount illustrations (*) on 30"x40" boards. The deliverables include the following:				
Title Sheet			☐ Project name & address, project directory w/ all consultants ☐ LAUSD ID and Logo (on all drawings)	
Vicinity and Location Map	*		☐ Neighborhood land uses and characteristics, parking, setbacks on adjacent and frontage properties ☐ Streets, crossings, signals, gen'l traffic & pedestrian densities	
Color Photos	*		☐ Surrounding properties and improvements ☐ Proposed site, including existing buildings and surroundings	
Site Plan	*		☐ Buildings, playground areas, future buildings ☐ Scope and Limits of Work, Off-Site Improvements ☐ Relevant topographical features, grading concepts ☐ Driveways, streets, parking, walks, future street widening ☐ Existing landscape features, planting concepts	
"Check List of Offsite Work, Utilities & Easements"	Prelim.		☐	

Civil Engineering

Site Survey		100%		☐ Boundary & Topography. Note "FOR REFERENCE ONLY."
	Basis of Design	Prelim.		☐ Description of systems, criteria, surface drainage & retention, water availability & conservation, other sustainability issues, sub-surface investigation recommendations, City requirements and post-construction storm water treatment ☐ Symbols List, coordinated with LAUSD Civil Standards
Landscape				
	Basis of Design	Prelim.		☐ Description of design approach & criteria, plant selections, irrigation, soil preparation requirements
Architecture				
Floor Plans		Schem.	1/8	☐ Room names, doors and windows, special finishes ☐ Cabinets, furniture & equipment to show function, capacity ☐ Stairs, ramps, elevators, major structural elements ☐ Equipment rooms (mech'l, power, data), major shafts & chases
Roof Plans		Schem.	1/8	☐ Slopes, covered walks, material changes
Exterior Elevations		Schem.	1/8	☐ Wall features and materials, important features
Building Sections		Schem.	1/8	☐ Relevant sections to show important building configurations or structural conditions
	Basis of Design	Prelim.		☐ Design approach and philosophy, general description of buildings & mat'ls, important design factors, community issues, sustainability measures
Structural Engineering				
Floor and Roof Plans		Schem.		☐ Diagrammatic layout of main structural elements
	Basis of Design	Prelim.		☐ Description of systems, bearing conditions, load criteria, foundation-engineering

			report reference (or geologic investigation recommendations)
HVAC			
	Basis of Design	Prelim.	☐ Description of systems, criteria, special energy and sustainability issues, envelope criteria, possible phasing
Plumbing & Fire Protection			
	Basis of Design	Prelim.	☐ Description of systems and criteria, fixture types, gen'l loads, water availability, on- and off-site drainage provisions
Electrical			
	Basis of Design	Prelim.	☐ Description of all electric power related systems, including emergency power, computer power, equipment types, etc. ☐ Description of all signal systems, incl. Fire alarm, intrusion alarm, CCTV/Audio Surveillance Systems, PA/Intercom, Autonomous PA/Sound System (Gym, Auditorium, Athletic fields, multi-purpose rooms and large instruction rooms), TV Distribution (copper or Fiber Optic), clock system, Classroom Sound Enhancement System. ☐ Description of lighting system in typical areas, indicating fixture types and lighting controls. ☐ Indicate measures and strategies to achieve maximum CHPS scores. ☐ Typical Classroom Plan (Lighting, Power & Data Outlets). Other special conditions,if necessary (8.5 x11 or 11x17 bound with Basis of Design).
Food Service		Prelim.	☐ Basis of Design, criteria, descriptive material
Graphics & Signage		Prelim.	☐ of other design disciplines as may be needed

Theater Consultant	Prelim.	☐	by the size and complexity of the project.
Kitchen Consultant	Prelim.	☐	

Other:

SP2A Building Area Diagrams and Area Calculations	☐	Show compliance with Building Program
Cost Estimate	☐	O.O.M. for each alternate. Final estimate in District format
CHPS Scorecard	☐	Forecast of CHPS points anticipated to be achievable supported by project Basis of Design and preliminary plans
Savings by Design Incentive Program	☐	Record of application submittal
Renewable Energy Study, as applicable	☐	Feasibility study to determine the most cost effective renewable energy technology or combination of technologies

4.2 SUBMITTAL REQUIREMENTS

Design Development

DRAWINGS:

OTHER DOCUMENTS:	% Compl	Scale (Min) "/ ft.	Information Included	Location Reference
General				
Title Sheet, Vicinity and Location Map	80%		☐ Project name & address, project directory w/ all consultants ☐ LAUSD ID and Logo (on all drawings) ☐ List of DSA Deferred Approvals	
Drawing Index	95%		☐ List all drawings planned for final set. Indicate those included.	
General Notes	65%		☐ Legend, Abbreviations, Symbols (LAUSD Approved)	
Code Analysis	80%		☐ Construction Type, Occupancies, Areas, Separations, Exit Wdth. ☐ ADA path of travel and accessibility criteria ☐ Exit signs, fire extinguishers ☐ Applicable Codes	
Site Plan	50%	1/20	☐ Buildings, w/ names, overhangs, number of stories, gross area ☐ Driveways, service roads, parking & layouts, walks ☐ Hardscape, planting areas, site furniture, drinking fountains ☐ Playground layouts, paving types ☐ ADA accessibility signage, ramps, railings, HC parking ☐ Fire Dept. access, hydrants & F.D. Approval block ☐ DSA Application Number. for existing buildings	
Construction Phasing Plan	25%		☐ For multi-phase projects: Limits of Work, barriers, access	
Site Details	20%		☐ Flag pole, planters, site walls, fencing, railings, signage, parking, playground	

				equipment, stairs and ramps, bollards, trash enclosure
Architectural Presentation Drawings			☐	Vicinity Plan and Photos (as for Schematic Design Submittal)
			☐	Site and Floor Plans, Elevations, Sections (in color)
			☐	Perspective Rendering (in color) (Above mounted on 30" x 40" boards)
			☐	Materials / Finishes Boards
	"Check List of Offsite Work, Utilities & Easements" 100%		☐	
CHPS Scorecards			☐	Detailed Account of CHPS Points achieved in School Design.
Civil Engineering				
Topographic Survey	100%		☐	Note "FOR REFERENCE ONLY"
Site Plan	50%	1/20	☐	Building locations (dimensions or coordinates), Work Limits
			☐	Floor Plan Elevations, Key Dimensions, Grids
			☐	Existing and Finish Contours (0.5' intervals typ.), spot elevations, ADA-compliant slopes
			☐	Property lines, streets, setbacks, easements, walls & fences
			☐	Site walls and top-of-wall elevations
			☐	Utilities, UG tanks, fencing, walks, drives, planting, other features, onsite and adjacent (existing and new)
			☐	Construction phasing provisions, for multi-phase projects
Demolition Plan	25%		☐	Buildings, paving, utilities, old foundations - offsite and onsite. Limits of Work, specific demolition notes, legend, coordinate sysmbols with LAUSD Standards
Street and Parking Plan	30%	1/20	☐	Pavement dimensions, Fire Department access, references
Grading and Drainage Plan	30%	1/20	☐	Existing & New Design grades,final grading, flow lines, CB's, culverts, downspouts, references legend & symbols per

				LAUSD Standards. Identify paving types & landscape areas Post construction storm water management system including structural and nonstructural BMP's
Site Utilities Plan (Water & Drainage)	30%	1/20	☐	Piping, manholes, valves, CB's, drinking fountains, hose bibbs, combination SS/SD drain valves, PIV's
Off-site Civil Work Plans	30%		☐	Off-site work (drains, walks, drives, streets, hydrants, utilities tie-ins, street-vacations, street trees, power poles, etc.) per public agency requirements
Drainage Plans/ Profiles	30%	1/10	☐	
Site Details	20%		☐	Curbs, gutters, drainage structures, valves, boxes, utilities connections, . . .
Log of soil borings	100%		☐	
Storm Water Calc'ns	100%		☐	
Basis of Design	100%		☐	
Landscaping				
Site Plan *(on Civil Engineering Background)*	50%	1/20	☐	Planting areas with plant references Location of existing trees (to remain) in area of work and proposed relocation if necessary
Plant Schedules	35%		☐	Names, sizes, detail references
Details	35%		☐	Planting, site furniture, special features
Irrigation Plans	50%		☐	Piping, sprinkler & controller locations, references Water POC, meter & backflow preventor locations
IrrigationDetails	35%		☐	Valves, control schedules
Basis of Design	100%			
Architecture				
Floor Plans	35%	1/8	☐	Structural grid, finish floor elevations, final dimensions
			☐	Room Names, Numbers, References
			☐	Floor finishes, floor drains
			☐	Door & Window locations, sizes
			☐	Partition locations, finishes, types, fire-ratings
			☐	ADA compliance provisions, references

			☐ Cabinets, furniture & equipment layout (incl. N.I.C. items)
Enlarged Floor Plans	20%	1/4	☐ Educational spaces, library, admin. area, restrooms, kitchens, mech'l equip.rooms, special areas. All FFE incl. N.I.C. items.
Roof Plans	35%	1/8	☐ Structural grid, slopes, drains, scuppers ☐ Elevations of top of steel, sheathing, parapet walls ☐ Parapets, screens, walkways, items visible on roof
Reflected Ceiling Plans	25%	1/8	☐ Lights, grilles, access panels ☐ Fire ratings of ceilings and walls ☐ Soffits, special items
Exterior Elevations	35%	1/8	☐ Structural grid, floor elevations, key dimensions ☐ Wall features and materials, all important features ☐ Doors, windows, louvers
Building Sections	35%	1/8	☐ Sections sufficient to show all major building configurations ☐ Structural grid, floor elevations, dimensions, Rm.Names, Nbrs. ☐ Major materials, structural elements
Exterior Envelope Sections	75%	1/2	☐ Key wall sections w/ structl.grid, dimensions, address acoustical requirements per Acoustical Design Guidelines
Exterior Envelope Details	20%	1 1/2	☐ Key details, incl. roofing, drains, skylights, waterproofing
Interior Elevations	10%	1/8	☐ Major room elevations, mat'ls & features (MP, Gym, typ.CR) ☐ Cabinets, Furniture & Equipment (incl. N.I.C.)
Interior Finish Schedules	20%		☐ Room Names, Numbers, Elevation & Detail References ☐ Ceiling and soffit heights ☐ Preliminary materials and paint finishes
Door Schedules and Types	10%		☐ Numbers, Locations, Detail References ☐ Door and Frame Materials
Window and Louver Schedules and Types	25%		☐ Numbers, Locations, Detail References ☐ Sash and Frame Materials
Door, Window and Louver Details	25%		☐ All details incl. Thresholds, hardware references, fire ratings, panic hardware,

				smoke seals
Vertical Circulation Plans, Sections, Details	35%	1/4	☐	Stairs, Elevators, etc. with structural grid, dimensions
			☐	Major materials and equipment, typical details
			☐	Equipment room layouts, pits, holding tanks, etc.
Interior and Miscellaneous	25%		☐	Wall types and details, with fire-ratings, address acoustical requirements per Acoustical Design Guidelines
Details			☐	Ceiling, soffit, suspended fixtures w/ structural anchoring
			☐	Floor/ ceiling/ wall/ roof assemblies w/ fire ratings, UL fire-assembly numbers
			☐	Cabinet and equipment, w/ structural anchoring
Basis of Design	100%		☐	Design approach and philosophy, general description of buildings & materails, community issues, sustainability measures
Structural Engineering				
Foundation Plans	20%	1/8	☐	Structural grid, finish floor elevations, dimensions, references
			☐	Bottom-of-footing elevations, pipe trenches adjecent to footings
			☐	Slab penetrations & depressions, dimensioned
Floor and Roof Plans	35%		☐	Framing and floor construction, penetrations, openings
			☐	Shear walls and other lateral force resisting elements
Sections	35%	1/8	☐	Foundation and member sizes
Wall Sections & Elevations	35%		☐	
Secondary framing & supports for finishes	20%		☐	
Retaining wall elevations,sections	20%		☐	
Details	20%		☐	
Basis of Design	-		☐	Description of systems, bearing conditions, load criteria, foundation-engineering report reference
Preliminary Calculations	35%		☐	Including calculations and details for: 1) Elements of non-structural components, equipment anchorage and attachment to

				the structure; 2) Stairs, handrails, and landings.
HVAC				
HVAC Floor and Roof Plans *(On Architectural Backgrounds)*	35%	1/8	☐	Duct & diffuser/ grille layout (double-line) with CFM's, smoke detectors, combination smoke/ fire dampers with State Fire Marshal approval numbers
			☐	Existing mechanical systems & components
			☐	Equipment locations and rooms
HVAC Piping Plans	35%		☐	Piping & valve layouts and sizes
Air-flow Diagrams	35%		☐	Flow and riser diagrams for each air system, incl. controls, outside air and exhaust, CFM, velocities, pressures
HVAC Piping System Diag'ms	35%		☐	Schematic and riser diagrams for each piping system, incl. pipe sizes, controls, instrumentation, valves, etc.
Enlarged Floor Plans	25%		☐	Equipment layouts, piping, ducts,coordination of major duct & pipe space, and a typical classroom layout
Equipment Schedules	25%		☐	All equipment - types, sizes, capacities, weights
Control System Diagrams	25%		☐	
Details	20%		☐	
Equipment Mounting Details	10%		☐	Mounting details for all HVAC components, incl.pads, curbs, seismic restraints, vibration isolators
Basis of Design	-		☐	Description of systems, criteria, controls, exhaust provisions, impacts on building envelope
Final load estimates	100%		☐	
Calculations per CBC Energy Efficiency St'ds	50%		☐	Critical findings affecting glazing, lighting, other bldg elements
Plumbing				
Site Plan *(on Civil Engineering Background)*	50%		☐	Mechanical Utilities (gas, steam, heating water), coordinate w/ site utilities
Floor and Roof Plans *(on Arch'l Backgrounds)*	35%	1/8	☐	Piping, fixtures, floor drains, equipment and rooms
			☐	Existing utilities, equipment and P.O.C's, demolition

				requirements
			☐	Major pipe space coordination, incl. roof-drain locations
Enlarged Floor Plans	25%		☐	Equipment layouts, piping, supply air & exhaust, major pipe space coordination
Equipment Schedules	25%		☐	All equipment -- types, sizes, capacities, weights
Piping System Diagrams	25%		☐	Schematic and isometric riser diagrams for each piping system, incl. pipe sizes, controls, valves, etc.
Details	20%		☐	
Piping and Equpment Mounting Details	10%		☐	Mounting details for all components, incl.pads, curbs, seismic restraints, vibration isolators
Basis of Design	-		☐	Description of systems, criteria, restroom controls, water conservation, utilities connections requirements
Calculations	50%		☐	
Fire Protection				
Floor Plans *(on Arch'l Backgrounds)*	35%	1/8	☐	Mains, risers, P.O.C.'s
			☐	Sprinkler head layouts (On smaller projects, may be shown with Plumbing)
	100%		☐	Hydraulic calculations
Electrical				
Site Plan	10%		☐	Service equipment locations (power, phone, TV, MPOE)
(on Civil Engineering Background)	10%		☐	Conduit duct bank routing and underground pull boxes for power and signal systems
	35%		☐	Exterior lighting (Pole mount and wall mount), Indicate fixture types.
	35%		☐	Exterior Signal devices (Fire Alarm horns, PA speakers, CCTV cameras, etc.)
Lighting Floor Plans/RCPs	35%	1/8	☐	Indicate all lighting fixture locations and types. Show panels. Show switches and lighting control components in all rooms.
Power Floor Plans	35%	1/8	☐	Indicate all receptacles locations and types. Show panels.
Signal Floor Plans	35%	1/8	☐	Indicate all signal system

				devices. Show Cable tray layouts and conduit sleeves locations. Show Terminal cabinets, racks and data frames.
Fire Alarm Floor Plans	35%	1/8	☐	Indicate all initiating & alarm devices, control panels, annunciator and terminal cabinets.
Enlarged Floor Plans	35%	1/4	☐	Equipment rooms layouts showing panels, transformers, inverters, cable trays, LAN racks & signal equipment, terminal cabinets, working & access space
Light Fixture Schedule	90%		☐	Show fixture description, manufacturers cat.#, lamp type, ballast type, numbers of lamps and ballasts, input wattage and mounting type.
Panel Schedules	65%			Show panel schedules.
Lighting Control Diagrams	65%			Show contol diagrams and energy forms
Signal Block and Riser Diagrams	35%		☐	Show headend equipment and terminal cabinets/racks in satellite buildings. Show interconnections.
Fire Alarm Block and Riser Diagrams	35%		☐	Show Main Fire Alarm Control Panel and Satellite control panels or expanders.. Show interconnections.
Single-line Diagram	35%		☐	Equipment & feeder sizes (new and existing to be used)
			☐	Main switchboards, panels, breakers, MCC's, etc.
			☐	Load calculations based on allotments indicated in Design Guide per square foot basis to size main service and power distribution panels and for submission to Utility Company.
			☐	Indicate Grounding system.
Details	35%		☐	Utility company details if available.
			☐	ADA-complying heights of all racks and devices
Equipment Mounting Details	35%		☐	Mounting details for all fixtures, shelving & equipment, incl. seismic restrain-Not required for this submittal.
Basis of Design	95%		☐	Update and indicate changes to original Basis of Design submitted in schematic phase.

Lighting Calculations	65%	☐	Provide point-by-point calcs. incl. graphic display for all typical rooms and areas for both normal and emergency modes demonstrating compliance with Design Guide, IES standards, SCE Classroom Lighting Design manuals and applicable codes.
Fire Alarm System Calcs.	65%	☐	Provide point-by-point calcs. incl. graphic display for all
Title 24 Compliance	50%	☐	Critical findings affecting glazing, lighting, HVAC, other bldg elements and use of day lighting.
		☐	LTG forms showing compliance with Title 24 and CHPS guidelines and standards.
		☐	Coordinate with Mechanical Engineer and Architect to optimize energy use and achieve higher CHPS scores.
Food Service	25%	☐	Plans, Elevations, Sections, Details, Descriptive Data
Graphics & Signage	25%	☐	of other design disciplines as
		☐	may be needed by the size and complexity of
Theater Consultant	25%		the project.

Specifications	☐	List of District Guide Specification and special sections added by the AE that required for the project, with Table of Contents
Other:		
Product Information	☐	Catalog cut sheets of architectural and engineering products, organized in CSI format, esp. those not in District standards
Request for Product/Substitution	☐	Submit for District's review any proposed deviation from the School Design Guide.
Review	☐	Submit for District's review any proposed proposed product not listed in the Guide Specifications.
SP2A Building Area Diagrams	☐	Updated,

and Area Calculations		showing compliance with Building Program
Cost Estimate	☐	Detailed CSI Cost Estimate in compliance with Districts estimating guide.
	☐	Site Development Cost Estimate in compliance with Districts estimating guide
CHPS Scorecard	☐	Detailed account of CHPS Points achieved in School Design
Incentive Program	☐	Record of design documents submitted to entities offering incentives
S.D. Review Comments	☐	All comments & dwgs., with responses to each comment

4.3 SUBMITTAL REQUIREMENTS

Construction Documents -- 50 %

DRAWINGS	OTHER DOCUMENTS	% Compl	Scale (Min) "/ ft.	Information Included	Location Reference
General					
Title Sheet, Vicinity and Location Map		80%		☐ Project name & address, project directory w/ all consultants ☐ LAUSD ID and Logo (on all drawings)	
Drawing Index		95%		☐ List of DSA Deferred Approvals ☐ List all drawings planned for final set. Indicate those included.	
General Notes		80%		☐ Legend, Abbreviations, Symbols (LAUSD Approved)	
Code Analysis		90%		☐ Construction Type, Occupancies, Areas, Separations,Exit Wdth. ☐ ADA path of travel and accessibility criteria ☐ Exit signs, fire extinguishers ☐ Applicable Code	
Site Plan		75%	1/20	☐ Buildings, w/ names, overhangs, number of stories, gross area ☐ Driveways, service roads, parking & layouts, walks ☐ Hardscape, planting areas, site furniture, drinking fountains ☐ Playground layouts, paving types, detail references ☐ ADA accessibility signage, ramps, railings, HC parking ☐ Fire Dept. access,	

			hydrants & F.D.Approval block
			☐ DSA Application Nbr. for existing buildings
Construction Phasing Plan	50%		☐ For multi-phase projects: Limits of Work, barriers, access
Site Details	35%		☐ Flag pole, planters, site walls, fencing, railings, signage, parking, playground equipment, stairs and ramps, bollards, trash enclosure
"Check List of Offsite Work, Utilities & Easements"			☐
CHPS Scorecard			☐ Detailed account of CHPS Points achieved in School Design
Civil Engineering			
Topographic Survey	100%		☐ Note "FOR REFERENCE ONLY"
Site Plan	75%	1/20	☐ Building locations (dimensions or coordinates), Work Limits ☐ Floor Plan Elevations, Key Dimensions, Grids ☐ Existing and Finish Contours (0.5' intervals typ.), spot elevations, ADA-compliant slopes ☐ Property lines, streets, setbacks, easements, walls & fences ☐ Site walls and top-of-wall and bottom-of-footing elevations ☐ Utilities, UG tanks, fencing, walks, drives, planting, other features, onsite and adjacent (existing and new) ☐ Construction phasing provisions, for multi-phase projects
Demolition Plan	75%		☐ Buildings, paving, utilities, old foundations - offsite and onsite. ☐ Limits of Work, specific demolition notes, legend, coordinate symbols with LAUSD

				Standards
Street and Parking Plan	65%	1/20	☐	Pavement dimensions, Fire Department access, references
Grading and Drainage Plan	65%	1/20	☐	Existing & New Design grades,final grading, flow lines, CB's, culverts, downspouts, references legend & symbols per LAUSD Standards. Identify paving types & landscape areas. Post construction storm water management system including structural and nonstructural BMP's
Site Utilities Plan (Water & Drainage)	65%	1/20	☐	Piping, manholes, valves, CB's, drinking fountains, hose bibbs, combination SS/SD drain valves, PIV's
Off-site Civil Work Plans	65%		☐	Off-site work (drains, walks, drives, streets, hydrants, utilities tie-ins, street-vacations, street trees, power poles, etc.) per public agency requirements
Drainage Plans/ Profiles	65%	1/10	☐	
Site Details	35%		☐	Curbs, gutters, drainage structures, valves, boxes, utilities connections, . .
Log of soil borings	100%		☐	
Calculations	100%		☐	
Basis of Design	-		☐	Updated
Landscaping				
Site Plan *(on Civil Engineering Background)*	75%	1/20	☐	Planting areas with plant references Location of existing trees (to remain) in area of work and proposed relocation if necessary
Plant Schedules	65%		☐	Names, sizes, detail references
Details	35%		☐	Planting, site furniture, special features
Irrigation Plans	50%		☐	Piping, sprinkler & controller locations, references Water POC, meter &

				backflow preventor locations
IrrigationDetails		35%		☐ Valves, control schedules
	Basis of Design	-		☐ Updated

Architecture

Floor Plans	75%	1/8	☐ Structural grid, finish floor elevations, final dimensions ☐ Room Names, Numbers ☐ Door & Window Numbers, Wall Numbers, references ☐ Partition types, fire-ratings, ADA compliance, references ☐ ADA compliance, references ☐ Cabinets,furniture & equipment layout, detail references (incl. N.I.C. items) ☐ Floor depressions, penetrations, housekeeping pads, FD's & slopes, detail references
Enlarged Floor Plans	50%	1/4	☐ Educational spaces, library, admin. area, restrooms, kitchens, mech'l equip.rooms, special areas. All FFE incl. N.I.C. items. shown.
Roof Plans	75%	1/8	☐ Structural grid, slopes, drains, scuppers, penetrations ☐ Elevations of top of steel, sheathing, parapet walls ☐ Equipment, ducts, pipes, curbs and pads, pipes & ducts ☐ Parapets, screens, walkways,all items visible on roof with dimensions and detail references
Reflected Ceiling Plans	75%	1/8	☐ Lights, grilles, access panels, sprinklers, penetrations ☐ Fire ratings of ceilings and walls

Exterior Elevations	75%	1/8	☐ Soffits, special items, dimensioned & referenced ☐ Structural grid, floor elevations, dimensions ☐ All wall features and materials, w/ dimensions & references, incl. expansion joints, screeds, copings and sills ☐ Doors, windows, louvers, w/ dimensions and references
Building Sections	75%	1/8	☐ Sections sufficient to show all major building configurations ☐ Structural grid, floor elevations, dimensions, Room Names, Nbrs. ☐ Major materials, structural elements, detail references
Exterior Envelope Sections	100%	1/2	☐ Key wall sections w/ structl.grid, dimensions, references address acoustical requirements per Acoustical Design Guidelines
	50%		☐ Other wall sections
Exterior Envelope Details	50%	1 1/2 1 1/2	☐ Key details, incl. roofing, drains, skylights, waterproofing ☐ Roof-mounted equipment curbs, platforms, pipe and duct supports, penetrations, with water proofing and flashings
Interior Elevations	50%	1/8	☐ All room elevations, materials ☐ All wall features, w/ dimensions & detail references
Interior Finish Schedules	65%		☐ Cabinets, Furniture & Equipment (incl. N.I.C.) ☐ Room Names, Numbers, Elevation & Detail References ☐ Ceiling and soffit heights ☐ Completed materials and paint finishes ☐ Paint color selections
Door Schedules and Types	50%		☐ Numbers, Locations, Elevations, Detail References

			☐ Door and Frame Materials
Window and Louver Schedules and Types	50%		☐ Finish Hardware Types Numbers, Locations, Detail References ☐ Sash and Frame Materials
Door, Window and Louver Details	50%	3	☐ All details incl. thresholds, hardware references, fire ratings, panic hardware, smoke seals
Vertical Circulation Plans, Sections, Details	50%	1/4	☐ Stairs, Elevators, etc. with structural grid, dimensions ☐ Major materials and equipment, typical details ☐ Equipment room layouts, pits, holding tanks, etc.
Interior and Miscellaneous	25%		☐ Wall types and details, with fire-ratings address acoustical requirements per Acoustical Design Guidelines
Details			☐ Ceiling, soffit, suspended fixtures w/ structural anchoring ☐ Floor/ ceiling/ wall/ roof assemblies w/ fire ratings, UL fire-assembly numbers ☐ Cabinet and equipment, w/ structural anchoring
Basis of Design	-		☐ Updated

Structural Engineering

Foundation Plans	35%	1/8	☐ Structural grid, finish floor elevations, dimensions, references ☐ Bottom-of-footing elevations, pipe trenches adj. to footings ☐ Slab penetrations & depressions, dimensioned
Floor and Roof Plans	65%		☐ Framing and floor construction, penetrations, openings ☐ Shear walls and other lateral force resisting elements
Sections	60%	1/8	☐ Foundation and member sizes

Wall Sections & Elevations		60%		☐
Secondary framing & supports for finishes		40%		☐
Retaining wall elevations,sections		60%		☐
Details		50%		☐
	Basis of Design	-		☐ Updated
	Calculations	75%		☐ Including calculations and details for: 1) Elements of non-structural components, equipment anchorage and attachment to the structure; 2) Stairs, handrails, and landings.

HVAC

Floor and Roof Plans *(On Architectural Backgrounds)*		75%	1/8	☐ Duct & diffuser/ grille layout (double-line) with CFM's, smoke detectors, combination smoke/ fire dampers with State Fire Marshal approval numbers ☐ Existing mechanical systems & components ☐ Equipment locations and rooms
HVAC Piping Plans, Flr./Roof		75%		☐ Piping & valve layouts and sizes
Air-flow Diagrams		75%		☐ Flow and riser diagrams for each air system, incl. controls, outside air and exhaust, CFM, velocities, pressures
HVAC Piping System Diag'ms		75%		☐ Schematic and riser diagrams for each piping system, incl. pipe sizes, controls, instrumentation, valves, etc.
Enlarged Floor Plans		50%		☐ Equipment layouts, piping, ducts, major duct & pipe space coordination
Equipment Schedules		50%		☐ All equipment -- types, sizes, capacities, weights
Control System Diagrams		50%		☐
Details		35%		☐
Equipment Mounting Details		35%		☐ Mounting details for all

				HVAC components, incl.pads, curbs, seismic restraints, vibration isolators
	Basis of Design	-		☐ Updated
	Final load estimates	100%		☐
				☐ Title 24 Energy Standards Compliance Forms: Performance Method analysis of each building
	Final calculations per CBC Energy Efficiency St'ds	100%		

Plumbing

Site Plan *(on Civil Engineering Background)*	75%		☐	Mechanical Utilities (gas, steam, heating water), coordinate w/ site utilities
Floor and Roof Plans *(on Arch'l Backgrounds)*	75%	1/8	☐	Piping, fixtures, floor drains, equipment and rooms
			☐	Existing utilities, equipment and P.O.C's, demo. requirements
			☐	Major pipe space coordination, incl. roof-drain locations
Enlarged Floor Plans	50%		☐	Equipment layouts, piping, supply air & exhaust, major pipe space coordination
Equipment Schedules	60%		☐	All equipment - types, sizes, capacities, weights
Fixture Schedules	60%		☐	
Piping System Diagrams	75%		☐	Schematic and isometric riser diagrams for each piping system, incl. pipe sizes, controls, valves, etc.
Details	35%		☐	
Piping and Equpment Mounting Details	35%		☐	Mounting details for all components, incl.pads, curbs, seismic restraints, vibration isolators
Basis of Design	-		☐	Updated
Final calculations	100%		☐	

Fire Protection

Floor Plans *(on Arch'l Backgrounds)*	75%	1/8	☐	Mains, risers, P.O.C.'s
			☐	Sprinkler head layouts
			☐	(On smaller projects,

			may be shown with Plumbing)
Electrical			
Site Plan *(on Civil Engineering Background)*	75%		☐ Service equipment locations (power, phone, TV) Show vault/pad details, primary and secondary conduit routing ☐ Conduit duct bank routing and underground pull boxes for power and signal systems. Show sizes. ☐ Exterior lighting (Pole mount and wall mount), Indicate fixture types. Assign panel circuit homeruns ☐ Exterior Signal devices (Fire Alarm horns, PA speakers, CCTV cameras, etc.)
Lighting Floor Plans/RCPs	75%	1/8	☐ Indicate all lighting fixture locations and types. Show panels. Show switches and lighting control components in all rooms. Assign panel circuit homeruns
Power Floor Plans	75%	1/8	☐ Indicate all receptacles locations and types. Show panels. Assign panel circuit homeruns
Signal Floor Plans	75%	1/8	☐ Indicate all signal system devices. Show Cable tray layouts and conduit sleeves locations. Show Terminal cabinets, racks and data frames. Show conduit interconnections.
Fire Alarm Floor Plans	75%	1/8	☐ Indicate all initiating & alarm devices, control panels, annunciator and terminal cabinets. Indicate candela ratings
Enlarged Floor Plans	75%	1/4	☐ Provide equipment

Equipment room layouts		rooms layouts showing panels, transformers, inverters, cable trays, LAN racks & signal equipment, terminal cabinets, working & access space. ☐ Size equipment and provide dimensioned layouts and weight information. Coordinate with Structural Engineer for seismic details. ☐ Calculate heat loads and coordinate with Mechanical for sizing HVAC equipment. ☐ Provide cable tray layout in LAN Room and signal rooms.	
Light Fixture Schedule	100%	☐ Show fixture description, manufacturers cat.#, lamp type, ballast type, numbers of lamps and ballasts, input wattage and mounting type.	
Panel Schedules	80%	☐ Provide Panel schedules showing load details and calculations.	
Lighting Control Diagrams	75%	☐ Provide lighting control diagram showing all components and interconnections.	
Signal Block and Riser Diagrams	75%	☐ Show Headend equipment and terminal cabinets/racks in satellite buildings. Show interconnections. Show all components. Show all interconnections indicating conduit and cabling information.	
Fire Alarm Block and Riser Diagrams	75%	☐ Show Main Fire Alarm Control Panel and Satellite control panels or expanders. Show all components. Show all interconnections indicating conduit and cabling information.	

Single-line Diagram	75%	☐ Equipment & feeder sizes (new and existing to be used) ☐ Main switchboards, panels, breakers, MCC's, etc. ☐ Load calculations based on actual connected loads Resize main service and power distribution panels based on actual loads. Include spare capacities required by Design Guide. ☐ Indicate Grounding system for main service and satellite buildings. ☐ Indicate Voltage drops and length for all feeders. ☐ Short-circuit ratings of all panelboards calculated based on available fault current from utility company ☐ Provide Utility company contact information.
Details	85%	☐ Utility company standard details ☐ Typical ADA-complying heights of all racks and devices ☐ Applicable LAUSD standard details.
Equipment Mounting Details	50%	☐ Mounting details for all fixtures, shelving & equipment, incl. seismic restrain. Coordinate with structural
Basis of Design	95%	☐ Update and indicate changes to original Basis of Design submitted in schematic phase.
Lighting Calculations	95%	☐ Update Point-by-point calcs. incl. graphic display typical rooms and areas for both normal and emergency modes demonstrating compliance with Design Guide, IES standards, SCE

		Classroom Lighting Design manuals and applicable codes.
Fire Alarm System Calcs.	50%	☐ Battery and voltage-drop calculations.
Title 24 Compliance	100%	☐ Update-Critical findings affecting glazing, lighting, HVAC, other bldg elements and use of day lighting. ☐ Update-LTG forms showing compliance with Title 24 and CHPS guidelines and standards. ☐ Update-Coordinate with Mechanical Engineer and Architect to optimize energy use and achieve higher CHPS scores. ☐ Incorporate comments received from "Saving by Design" Review
Food Service	50%	☐ Plans, Elevations, Sections, Details,
Graphics & Signage	50%	☐ Descriptive Data of other design disciplines as may be needed by the size and complexity of the
Theater Consultant	50%	☐ project.

Specifications		
		☐ Set of District Guide Specifications with Table of Contents and Technical Sections required for the project, edited in MS Word whith track changes on to reflect the specific work of the project, plus additional sections to recognize unique materials or assemblies. Specify two or more manufacturers for each product. ☐ Verify most current version of the Guide

	Specifications is used.
	☐ Verify LAUSD issue date is not changed.
OTHER:	
SP2A Building Area Diagrams	☐ Updated
Product Information	☐ Catalog cut sheets not submitted with DD package
Request for Product/Substitution Review	☐ Submit any proposed deviation from the School Design Guide for District review.
	☐ Submit any proposed proposed product not listed in the Guide Specifications for District review.
Record Reports	☐ All utility company, public agency and fire dep't contacts
Cost Estimate	☐ Detailed CSI Cost Estimate in compliance with Districts Estimating Guide
	☐ Site Developlent Cost Estimate in compliance with Districts Estimating Guide
CHPS Scorecard	☐ Detailed account of CHPS Points achieved in School Design
Savings By Design Incentive Program	☐ Savings by Design Energy Analysis Recommendation Letter & Architect's Response
D.D. Review Comments	☐ All comments & dwgs., with responses to each comment

4.4 SUBMITTAL REQUIREMENTS

Construction Documents -- 100 % C.D. - DSA Submittal

DRAWINGS:

OTHER DOCUMENTS:	% Compl	Scale (Min) "/ ft.	Information Included	Location Reference
General				
Title Sheet, Vicinity and Location Map	100%		☐ Project name & address, project directory w/ all consultants ☐ LAUSD ID and Logo (on all drawings) ☐ List of DSA Deferred Approvals	
Drawing Index	100%		☐ List all drawings for final set.	
General Notes	100%		☐ Legend, Abbreviations, Symbols (LAUSD Approved)	
Code Analysis	100%		☐ Construction Type, Occupancies, Areas, Separations, Exit Wdth. ☐ ADA path of travel and accessibility criteria ☐ Exit signs, fire extinguishers ☐ Applicable Codes	
Site Plan	100%	1/20	☐ Buildings, w/ names, overhangs, number of stories, gross area ☐ Driveways, service roads, parking & layouts, walks ☐ Hardscape, planting areas, site furniture, drinking fountains ☐ Playground layouts, paving types, detail references ☐ ADA accessibility signage, ramps, railings, HC parking ☐ Fire Dept. access, hydrants & F.D.Approval block ☐ DSA Application Nbr. for existing buildings	
Construction Phasing Plan	100%		☐ For multi-phase projects: Limits of Work, barriers, access	
Site Details	100%		☐ Flag pole, planters, site walls, fencing, railings, signage, parking, playground equipment, stairs and ramps, bollards, trash enclosure	
			☐	
"Check List of Offsite Work, Utilities & Easements"				
Civil Engineering				
Topographic Survey			☐ Note "FOR REFERENCE ONLY"	

Site Plan	100%	1/20	☐ Building locations (dimensions or coordinates), Work Limits ☐ Floor Plan Elevations, Key Dimensions, Grids ☐ Existing and Finish Contours (0.5' intervals typ.), spot elevations, ADA-compliant slopes ☐ Property lines, streets, setbacks, easements, walls & fences ☐ Site walls and top-of-wall and bottom-of-footing elevations ☐ Utilities, UG tanks, fencing, walks, drives, planting, other features, onsite and adjacent (existing and new) ☐ Construction phasing provisions, for multi-phase projects
Demolition Plan	100%		☐ Buildings, paving, utilities, old foundations - offsite and onsite Limits of Work, specific demolition notes
Street and Parking Plan	100%	1/20	☐ Pavement dimensions, Fire Department access, references
Grading and Drainage Plan	100%	1/20	☐ Final grading, flow lines, CB's, culverts, downspouts, references, post-construction storm water management system including structural and non-structural BMP's
Site Utilities Plan (Water & Drainage)	100%	1/20	☐ Piping, manholes, valves, CB's, drinking fountains, hose bibbs, combination SS/SD drain valves, PIV's
Off-site Civil Work Plans	100%		☐ Off-site work (drains, walks, drives, streets, hydrants, utilities tie-ins, street-vacations, street trees, power poles, etc.) per public agency requirements
Drainage Plans/ Profiles	100%	1/10	☐
Site Details	100%		☐ Curbs, gutters, drainage structures, valves, boxes, utilities connections, . . .
Log of soil borings	100%		☐
Calculations	100%		☐
Basis of Design	-		☐ Final update

Landscaping

Site Plan (on Civil Engineering Background)	100%	1/20	☐ Planting areas with plant references
Plant Schedules	100%		☐ Names, sizes, detail references
Details	100%		☐ Planting, site furniture, special features
Irrigation Plans	100%		☐ Piping, sprinkler & controller locations, references Plans shall contain information required by the California State Water Efficient Landscape Ordinance Section 492 b & c.
IrrigationDetails	100%		☐ Valves, control schedules

Basis of Design	-		☐ Final update ☐

Architecture

Floor Plans	100%	1/8	☐ Structural grid, finish floor elevations, final dimensions ☐ Room Names, Numbers ☐ Door & Window Numbers, Wall Numbers, references ☐ Partition types, fire-ratings, ADA compliance, references ☐ ADA compliance, references ☐ Cabinets,furniture & equipment layout, detail references (incl. N.I.C. items)
Enlarged Floor Plans	100%	1/4	☐ Floor depressions, penetrations, housekeeping pads, FD's & slopes, detail references ☐ Educational spaces, library, admin. area, restrooms, kitchens, mech'l equip.rooms, special areas. All FFE incl. N.I.C. items.
Roof Plans	100%	1/8	☐ Structural grid, slopes, drains, scuppers, penetrations ☐ Elevations of top of steel, sheathing, parapet walls ☐ Equipment, ducts, pipes, curbs and pads, pipes & ducts ☐ Parapets, screens, walkways,all items visible on roof with dimensions and detail references
Reflected Ceiling Plans	100%	1/8	☐ Lights, grilles, access panels, sprinklers, penetrations ☐ Fire ratings of ceilings and walls ☐ Soffits, special items, dimensioned & referenced
Exterior Elevations	100%	1/8	☐ Structural grid, floor elevations, dimensions ☐ All wall features and materials, w/ dimensions & references, incl. expansion joints, screeds, copings and sills ☐ Doors, windows, louvers, w/ dimensions and references
Building Sections	100%	1/8	☐ Sections sufficient to show all major building configurations ☐ Structural grid, floor elevations, dimensions, Room Names, Numbers. ☐ Major materials, structural elements, detail references
Exterior Envelope Sections	100%	1/2	☐ All wall sections w/ structural grid, dimenions, references
Exterior Envelope Details	100%	1 1/2	☐ Key details, incl. roofing, drains, skylights, waterproofing
		1 1/2	☐ Roof-mounted equipment curbs, platforms,

			pipe and duct supports, penetrations, with water proofing and flashings
Interior Elevations	100%	1/8	☐ All room elevations, materials ☐ All wall features, w/ dimensions & detail references
Interior Finish Schedules	100%		☐ Cabinets, Furniture & Equipment (incl. N.I.C.) ☐ Room Names, Numbers, Elevation & Detail References ☐ Ceiling and soffit heights ☐ Completed materials and paint finishes ☐ Paint color selections
Door Schedules and Types	100%		☐ Numbers, Locations, Detail References ☐ Door and Frame Materials
Window and Louver Schedules and Types	100%		☐ Numbers, Locations, Detail References ☐ Sash and Frame Materials
Door, Window and Louver Details	100%		☐ All details incl. Thresholds, hardware references, fire ratings, panic hardware, smoke seals
Vertical Circulation Plans, Sections, Details	100%	1/4	☐ Stairs, Elevators, etc. with structl.grid, dimensions ☐ Major materials and equipment, typical details ☐ Equipment room layouts, pits, holding tanks, etc.
Interior and Miscellaneous Details	100%		☐ Wall types and details, with fire-ratings ☐ Ceiling, soffit, suspended fixtures w/ structural anchoring ☐ Floor/ ceiling/ wall/ roof assemblies w/ fire ratings, . UL fire-assembly numbers ☐ Cabinet and equipment, w/ structural anchoring
Basis of Design			☐ Final update

Structural Engineering

Foundation Plans	100%	1/8	☐ Structural grid, finish floor elevations, dimensions, references ☐ Bottom-of-footing elevations, pipe trenches adjecent to footings
Floor and Roof Plans			☐ Slab penetrations & depressions, dimensioned ☐ Framing and floor construction, penetrations, openings ☐ Shear walls and other lateral force resisting elements
Sections	100%	1/8	☐ Foundation and member sizes
Wall Sections & Elevations	100%		☐
Secondary framing & supports for finishes	100%		☐
Retaining wall elev'ns,sections	100%		☐

Details		100%		☐
	Basis of Design	-		☐ Description of systems, bearing conditions, load criteria, foundation-engineering report reference
	Final Calculations	100%		☐ Including calculations and details for: 1) Elements of non-structural components, equipment anchorage and attachment of the structure; 2) Stairs, handrails, and landings.

HVAC

Floor and Roof Plans *(On Architectural Backgrounds)*		100%	1/8	☐ Duct & diffuser/ grille layout (double-line) with CFM's, smoke detectors, combination smoke/ fire dampers with State Fire Marshal approval numbers ☐ Existing mechanical systems & components ☐ Equipment locations and rooms
HVAC Piping Plans, Flr./Roof		100%		☐ Piping & valve layouts and sizes
Air-flow Diagrams		100%		☐ Flow and riser diagrams for each air system, incl. controls, outside air and exhaust, CFM, velocities, pressures
HVAC Piping System Diag'ms		100%		☐ Schematic and riser diagrams for each piping system, incl. pipe sizes, controls, instrumentation, valves, etc.
Enlarged Floor Plans		100%		☐ Equipment layouts, piping, ducts, major duct & pipe space coordination
Equipment Schedules		100%		☐ All equipment -- types, sizes, capacities, weights
Control System Diagrams		100%		☐
Details		100%		☐
Equipment Mounting Details		100%		☐ Mounting details for all HVAC components, incl.pads, curbs, seismic restraints, vibration isolators
	Basis of Design	-		☐
	Final load estimates	100%		☐
	Final calculations	100%		☐ Title 24 Energy Standards Compliance Forms: Performance Method with analysis of each building.
	CBC Energy Efficiency St'ds			

Plumbing

Site Plan *(on Civil Engineering Background)*		100%		☐ Mechanical Utilities (gas, steam, heating water), coordinate w/ site utilities
Floor and Roof Plans *(on Arch'l Backgrounds)*		100%	1/8	☐ Piping, fixtures, floor drains, equipment and rooms ☐ Existing utilities, equipment and P.O.C's, demolition requirements

			☐ Major pipe space coordination, incl. roof-drain locations
Enlarged Floor Plans	100%		☐ Equipment layouts, piping, supply air & exhaust, major pipe space coordination
Equipment Schedules	100%		☐ All equipment -- types, sizes, capacities, weights
Piping System Diagrams	100%		☐ Schematic and isometric riser diagrams for each piping system, incl. pipe sizes, controls, valves, etc.
Details	100%		☐
Piping and Equipment Mounting Details	100%		☐ Mounting details for all components, incl.pads, curbs, seismic restraints, vibration isolators
Final calculations	100%		☐
Fire Protection			
Floor Plans *(on Arch'l Backgrounds)*	100%	1/8	☐ Mains, risers, P.O.C.'s ☐ Sprinkler head layouts ☐ (On smaller projects, may be shown with Plumbing)
Electrical			
Site Plan	100%		☐ Service equipment locations (power, phone, TV) Show vault/pad details, primary and secondary conduit routing
(on Civil Engineering Background)			Show utility companies point of connections ☐ Conduit duct bank routing and underground pull boxes for power and signal systems. Show sizes. Show underground conduits fill ratios. Coordinate with Civil to avoid conflict with Sewer, Gas and water lines and access manholes.
			☐ Exterior lighting (Pole mount and wall mount), Indicate fixture types. Indicate homeruns and conduit routing to panelboard. Show circuit numbers and wiring. ☐ Exterior Signal devices (Fire Alarm horns, PA speakers, CCTV cameras, etc.) Indicate Device types. Indicate homeruns and conduit routing to signal terminal cabinet. Show wiring infor.
Lighting Floor Plans/RCPs	100%	1/8	☐ Indicate all lighting fixture locations and types. Show panels. Show circuit numbers, J. boxes, switching and wiring for

			all areas. Indicate rooms ID's. Show all wiring and conduit interconnections. Provide exit signs (high and low mount) and all exit door. Provide directional exit signs.
Power Floor Plans	100%	1/8	☐ Indicate all receptacles locations and types. Show panels. Show circuit numbers, J. boxes and wiring for all areas. Indicate rooms ID's. Show all wiring and conduit interconnections.
Signal Floor Plans	100%	1/8	☐ Indicate all signal system devices. Show Cable tray layouts Show terminal cabinets, J. boxes, equipment and wiring for all areas. Indicate rooms ID's. Show all wiring and conduit interconnections.
Fire Alarm Floor Plans	100%	1/8	☐ Indicate all initiating & alarm devices, control panels, annunciator and terminal cabinets. Indicate candela ratings Show J. boxes, devices ID's, circuit ID's and wiring for all areas. Indicate rooms ID's. Show all wiring and conduit interconnections.
Enlarged Floor Plans Equipment room layouts	100%	1/4	☐ Provide equipment rooms layouts showing panels, transformers, inverters, LAN racks & signal equipment, terminal cabinets, working & access space. ☐ Update equipment sizes and provide dimensioned layouts and weight information. Coordinate with Structural Engineer for seismic details. ☐ Update calculate heat loads and coordinate with Mechanical for sizing HVAC equipment. ☐ Update cable tray layout in LAN Room and signal rooms. ☐ Indicate Outside plant conduits terminations in LAN Room. ☐ Indicate Telephone and Cable TV utilities point of connections in LAN Room.
Light Fixture Schedule	100%		☐ Update fixture description, manufactures cat.#, lamp type, ballast type, numbers of lamps and ballasts, input wattage and mounting type. Coordinate with

		specifications.
Panel Schedules	100%	☐ Update Panel schedules showing load details and calculations.
Lighting Control Diagrams	100%	☐ Update lighting control diagram showing all components and interconnections. Show Room ID's where components are located.
Signal Block and Riser Diagrams	100%	☐ Show Headend equipment and terminal cabinets/racks in satellite buildings. Show interconnections. Show all components. Show all interconnections indicating conduit and cabling information. Show Room ID's where components are located. ☐ Provide separate Riser Diagram for each signal system. Data and telephone (PBX) shall be combined.
Fire Alarm Block and Riser Diagrams	100%	☐ Show Main Fire Alarm Control Panel and Satellite control panels or expanders. Show all components. Show all interconnections indicating conduit and cabling information. Show Room ID's where components are located.
Single-line Diagram	100%	☐ Update equipment & feeder sizes (new and existing to be used) ☐ Update information for Main switchboards, panels, breakers, MCC's, etc. Provide physical spaces for future expansion. ☐ Update load calculations based on actual connected loads Resize main service and power distribution panels based on actual loads. Include spare capacities required by Design Guide. ☐ Update information for grounding system for main service and satellite buildings. ☐ Update Voltage drops and length for all feeders. ☐ Update short-circuit ratings of all panelboards calculated based on available fault current from utility company
Details	100%	☐ Update Utility company contact information. ☐ Provide complete Utility company standard details ☐ Provide ADA-complying heights of all typical racks and devices

		☐ Provide complete relevant LAUSD standard details.
Equipment Mounting Details	100%	☐ Provide mounting details for all fixtures, racks, panels & equipment, incl. seismic restrain. Coordinate with structural
Basis of Design	100%	☐ Update and indicate changes to original Basis of Design submitted in previous submittal phase.
Lighting Calculations	100%	☐ Update Point-by-point calcs. incl. graphic display-Update typical rooms and areas for both normal and emergency modes demonstrating compliance with Design Guide, IES standards, SCE Classroom Lighting Design manuals and applicable codes.
Fire Alarm Sys. calc.	100%	☐ Update Battery and voltage-drop calculations-
Title 24 Compliance	100%	☐ Update-Critical findings affecting glazing, lighting, HVAC, other bldg elements and use of day lighting.
		☐ Update-LTG forms showing compliance with Title 24 and CHPS guidelines and standards.
		☐ Update-Coordinate with Mechanical Engineer and Architect to optimize energy use and achieve higher CHPS scores.
		☐ Incorporate comments received from "Saving by Design" Review
		☐ Complete CHPS score board.
Food Service	100%	☐ Plans, Elevations, Sections, Details of other design disciplines as may be needed by the size and complexity of the project.
Graphics & Signage	100%	
Theater Consultant	100%	
Kitchen Consultant	100%	
Specifications	100%	☐ Cover indicating District, project name & address, architect's name & address, license number, professional seal and signature
		☐ Clearly described scope of work in Division 1, Section 01 1100
		☐ Set of District Guide Specifications with Table of Contents and Technical Sections required for the project, edited in MS Word whith track changes on to reflect the specific work of the project, plus additional sections to recognize unique materials or assemblies. Specify two or more manufacturers for each product.
		☐ Verify most current version of the Guide

	Specifications is used. Do not change the LAUSD issue date.
	☐ 6 sets including General Conditions (7 if project has a kitchen)
Other Documents:	
DSA Aplication Form	☐ 3 Sets. Completed and signed by the Architect of Record
	☐ Scope of work clearly described, identifying all new buildings and uses
	☐ Coordinate required fees with DSA and LAUSD Project Managers
SP3A Building Area Diagrams	☐ 2 Sets.
Check Lists for DSA Submittal:	☐ 2 Sets each.
DSA Structural Requirements	☐ All documents checked to address "Checklists"
DSA Fire and Life Safety	☐ referenced & attached.
DSA Local Fire Authority Approval	☐
DSA Energy Review	☐ 1 set of Construction Documents and Title 24 electronic data input
Calculations:	☐ 2 Sets each.
Structural Engineering	☐ Final Calculations (see "Structural Requirements Checklist")
	☐ "Testing and Inspection" List
HVAC Engineering	☐ Final Energy Calculations & Compliance Forms (Title 24)
Electrical Engineering	☐ Final Energy Calculations & Compliance Forms (Title 24) (Coordinate and bind with Mechanical Engineering Calcs)
Reports and Approvals:	☐ 1 Set each.
Soils Report	☐
Local Fire Authority Approval	☐ Approval block signed by Fire Dept. representative, and showing fire mains, valves, hydrants, connections, access drives
Product Information:	☐ 2 Sets each.
Mechanical	☐ Equipment catalog data indicating dimensions, weights, corner weight distribution and center of gravity locations
	☐ Catalog Data on vibration isolators and seismic restraints
	☐ Struct'l calculations on vibration isolators, seismic restraints and equipment anchorage (Submit all above with plans in a binder with proper reference to the plans.)
Plumbing	☐ Cut sheets of all Plumbing Fixtures for Accessibility Review

Electrical	☐ Fire Alarm System Manual containing: ☐ Cut sheets and CSFM Listing sheets of all fire-alarm devices, with index ☐ F.A. System Devices Symbol List ☐ Cut sheets for Assistive-Listening System of Autonomous PA/ Sound Systems for Auditorium, Gymnasium, and Multi-Purpose Room
Cost Estimate	☐ 6 Sets.
CHPS Scorecard	☐ Detailed account of CHPS Points achieved in School Design
Savings by Design *Incentive Program*	☐ Savings by Design Contract
50% C.D.Review Comments	☐ All comments and drawings with responses to each comment

4.5 CHECKLIST OF OFF-SITE WORK, UTILITIES & EASEMENTS

(Provide details on a separate sheet)

PROJECT TITLE _____ PROJECT NO. _____

Telephone No.

ARCHITET _____ _____

CONSULTANS

CIVIL _____ _____

MECHANICL _____ _____

ELECTRICAL _____ _____

	Agency Consulted	Needed Y/N	Coordinated			Date	
			Y	N	N/A		
Street Dedications & Alley Vacations	City-Dept. of Transportation						
Widening	"						
Cul-de-sac	"						
Corner Cuts	"						
Bus Turn-outs	"						
Transit shelter est.	"						
Street Improvements	City – Dept. of Transportation						
Widening (Check all streets abutting school)	"						
Cul-de-sac	"						
Bus Turn Out	"						
Bus Pad	"						
Sidewalk	City – Dept. of Transportation						
Repair							
Replacement							
Pave Parkway							
Street Trees	City Planning/Zoning Street Tree Div.						
Street Lighting	City Planning/Zoning Street Lighting Div						
Handicapped Ramps (4 sides of each corner)	City Planning/Zoning						
Building Setbacks							
Front							
Side							
Rear							
Building to Building							
Fencing Requirement							

Fire Truck Access	Fire Dept						
Fire Hydrants	Fire Dept						

Utilities	Agency Consulted	Needed Y/N	Coordinated			Date	
			Y	N	N/A		
Electrical							
Overhead Power Pole							
Underground Manhole							
Transformer							
Guy Wires & Poles							
Telephone							
Overhead Poles							
Underground Manhole							
Cable TV							
Overhead Power Poles							
Water							
Gas							
Storm Drain							
Sanitary Drain							
Fuel Line							

Sidewalks:	Provide repairs and improvements as needed for safe access, including improvements for new driveway, etc.
Street Trees:	Minimum of 1 tree per 25 linear feet of frontage recommended. Verify requirement and types of trees acceptable by the City Street tree Division
Street Lighting:	No Mandatory requirement except as may be required for street dedications and alley vacations. Contract City Street Lighting Division
Driveway location:	Transportation Department would prefer access driveway to a site garage at a minimum of 150 feet from curb. Verify requirements.
Building Setbacks:	Identify zoning requirement for building setbacks in addition to Fire Department and code requirements.
Fire Truck Access:	Verify with the Fire Department where access should be located. Ensure proper paving thickness is identified on the drawings.
Fire Hydrant:	Contact the Fire Department and determine if new fire hydrants are required and coordinate locations if new hydrants are required.
"A" Permit	Identify if "A" permit is required. Identify scope of work if the "A" permit is required.
"B" Permit	Identify if "B" permit is required. Identify scope of work if the "B" permit is required.

4.6 CIVIL DESIGN CHECKLIST

100% Submittal

School: _____

Architect: _____

Project Name: _____

Engineer: _____

*This form shall be completed and submitted with the submittal package. The submittal will be deemed incomplete without the completed form.

Items required for submittal:	Check Items Complete.
A. Demolition Plan: 1. Show removal of all concrete or masonry walls, fences, curbs, gutters, trees, asphaltic concrete pavement, planting, debris, pipes and all structures required to be removed. 2. Coordinate plumbing, electrical, architectural and mechanical drawings and specifications with the civil engineering drawings to ensure that there are no conflicts or interferences. 3. Cover removals in the specifications. 4. Show all pertinent information which will aid contractor in making removals. **B. Paving Plan:** 1. Thickness and types of all paving and base course. Use thickness directed by the district. 2. Paving limits. 3. Concrete landings at all exterior doorways of buildings, not opening onto concrete areas, for installation of door stops. 4. Contraction and expansion joints and pattern for score lines in concrete areas and dimension for same. In walks on adobe soils omit expansion joints. Use continuous mild steel reinforcement instead. (No wire mesh) **C. Grading Plan:** 1. New and existing contours in and adjacent to work area. 2. Benchmark. (Location and elevation) 3. Paving and grading limits. 4. Exterior door locations. 5. Finish elevations in paved areas to 0.01'. 6. Ridges, flow lines, grade changes and top and bottom of banks, indicate spot	

elevations at changes in directions of above items.

7. Existing and finish contours at 0.5' intervals except on high banks, where 5'-0", contours may be used.
8. Finish contours as straight lines. Free hand or curved lines are not acceptable.
9. Wall elevations at top, ends, at slope changes and at abrupt changes in elevations.
10. Downspouts and drinking fountain locations and label.
11. Date of topographical survey.
12. Spot elevations and arrows indicating direction of slope are not acceptable on working drawings.
13. Existing manholes, yard boxes, vaults, and other surface structures which may require adjustments to fit new finish grade.
14. Depth and location of existing underground utility lines if information is available.
15. Floor drains in lunch area and indicate top of grate elevation.
16. Submit final quantity estimates of earthwork volumes.

D. Storm Drain Plan:

1. Complete storm drain system with type of pipes, sizes slopes, invert elevations, catch basin top and invert elevations and downspout lines.
2. Locations, details, and construction detail for manholes, junction chambers, transition structures, collars, easements, connections to existing storm drain lines, outlet structures, and other storm drain structures.
3. Storm drain system on grading plan, provided plan is not unduly cluttered.
4. Profiles of storm drain pipes, and for drain pipes 12" or larger, when conflicts with other utilities are possible.

E. Miscellaneous

1. Miscellaneous details on separate sheet or on any civil engineering drawings where space is available.
2. Details of catch basin, curbs, walls, cleanouts, headers, storm drain structures, headwalls, encasements, mow strips, gutters, and other pertinent details.
3. Plan and profile of retaining walls, concrete block fences and respective footings. Coordinate retaining wall and footing elevations with structural engineer. Structural details of such structures to be indicated on structural drawings. Plan and profile may be indicated on architectural or structural drawings provided that dimensions and elevations required for staking are indicated.

F. Special Earthwork Plan:

1. Limits of areas where special earthwork is required such as removal of loose fills trash or dump areas, or loose earth in basements, swimming pools tanks, etc.
2. This information is usually determined from soil reports and information supplied by the District.
3. Limits of special earthwork described above are denoted by term "bottom of

excavated plane" and is abbreviated to "B.E.P." B.E.P. elevations, locations and dimensions should be indicated on grading plan if it can be clearly indicated. Data shall originate from the structural engineer in coordination with the soil engineer. The B.E.P. and specifications for special earthwork will be reviewed by the District structural engineer.

4. A special paragraph shall be included for specifications for over excavation.

G. Staking Plan:

1. Building ties, overall property dimensions and building corner dimensions required for staking. Coordinates system for staking required for secondary schools.
2. Controls for major improvements such as wall, banks, athletic fields, etc., shall be adequately tied downed by dimensions and coordinates.
3. If above data is indicated on other that civil engineering drawings, it shall be checked by the civil; engineer.

H. Logs Of Soil Boring:

1. Show logs of soil borings and indicate locations on plan. Datum of boring samples must be coordinated with datum of grading plan.
2. Logs of soil borings may be reproduced from the soils reports onto standard size vellum as part of set of drawings. Location of soil borings may likewise be reproduced on same sheet.

I. Off-Site Drawings:

1. Prepare drawing in accordance with the requirements of the agencies having jurisdiction.
2. See attachment to this chapter, "checklist of offsite work, utilities & easements". This checklist must be completed and submitted to the design and construction branch with the 100% construction documents.

4.7 PLUMBING AND MECHANICAL DESIGN CHECKLIST

100% SUBMITTAL

ITEMS REQUIRED FOR SUBMITTAL **CHECK ITEMS COMPLETE**

FOR ALL DRAWINGS

1. Drawing Title
2. Scale
3. Sheet Title
4. Project Title
5. Sheet Number
6. Company Sticker
7. Registration Seal

PLANS

A. General

1. North Arrow.
2. Key Plan. (where applicable)
3. Match Line. (where applicable)
4. Column line numbers.
5. Room names and numbers.
6. Floor elevations indicated at least on first floor and basement floor plans.
7. General notes and reference to them on each drawing.
8. Legend of symbols and abbreviations.
9. Detail references.
10. Equipment anchorage details and / or reference to the structural drawings. Structural drawings shall address anchorage of all equipment.
11. Coordinated with structural drawings. Mechanical drawings shall address space coordination with structural members.
12. Coordinated with Electrical Drawings. All mechanical and plumbing equipment that requires power must be addressed on the electrical drawings. All transformers and other heat dissipating equipment must be addressed on the mechanical drawings.
13. Coordinated with Architectural elevations, furniture plans etc. so that thermostats and registers are not behind doors or on chalkboards etc.
14. Spell check all drawings with room for proper service.
15. Indicate service clearances on drawings.

B. Floor Plans

1. All air inlets and outlets must be identified for service, type, throw pattern and capacity by both symbols and notes.
2. All ducts must have sizes indicated.
3. No ducts will straddle walls.
4. No ducts will cross a wall at a slant unless absolutely unavoidable.
5. No ducts will cross a fire-rated wall at a slant.
6. Manual volume dampers at all branches.
7. All equipment must be identified as follows:
    a. Equipment that is specified in a schedule must be identified by the symbol indicated in the schedule.
    b. Equipment described in the legend must be identified by the symbol indicated in the legend.
    c. Equipment that is neither in the schedules or the legend must be fully identified and described in detail.
8. Preferably no equipment except plain ducts are to be located above non-lift up type ceilings.
9. No unrelated ductwork across electrical rooms or computer rooms if possible.
10. No thermostats on exterior walls.
11. Abbreviations indicated in legend.
12. Indicate access panels and doors.
13. No air inlet / outlet openings close to fans, air handlers or air conditioning units. Provide some ductwork in between for sound attenuation.
14. Whether sufficient space is available to accommodate ductwork and equipment with room for proper service.
15. Indicate service clearances on the drawings.

C. Floor Plans (Piping)

1. No pipes across electrical rooms and computer rooms.
2. No valves above non-lift up ceilings if possible.
3. No straddling of walls with pipes.
4. No crossing walls at a slant.
5. No unnecessary penetration of demising walls.
6. Zone valves provided for each floor or logical zone.

7. Expansion loops and anchors for straight runs longer than 50'-0".
8. Seismic joints and anchors at seismic separations.
9. Leak containment troughs for pipes that have to pass through electrical rooms.
10. All pipes and equipment identified.
11. All pipe sizes indicated.
12. Indicate access panels / doors.
13. Reference notes between plans and risers
14. Reference notes between plans and plot (site) plan.
15. Invert elevations of house sewers leaving the building.
16. In general, piping should be run to clear steel and concrete beams. Where absolutely necessary, piping may be run through beams. Where it is necessary to clip beam flanges or run piping through the web of steel beams or through concrete beams, permission from the structural engineer must be obtained and confirmed; and all such special conditions should be clearly noted on the drawings.
17. Note piping rising within a story as "rise." Note that rising to the story above as "UP." Piping dropping within a story should be noted as "drop." That dropping to the story below should be noted as "Dn." Piping at the ceiling should be noted as "at ceiling" when exposed and as "in ceiling" when concealed. Piping under the floor, other than obvious fixture drain lines, should be noted as "under floor," "at ceiling below," or "in ceiling below," as required.
18. Verify wall thickness where 3" or larger pipes risers are located inside walls.
19. Verify column structural construction before locating risers inside column sheathing.
20. Verify all utilities including domestic water, fire service, sewer, storm drain and gas are addressed on the plumbing and civil site plans as applicable.

PLUMBING (DOMESTIC HOT AND COLD WATER SYSTEMS)

P1. Indicate the job address on each page of the plan.

P2. Plans shall not be smaller than 1/8 inch per foot scale.

P3. Provide ¼" scale blow-ups of toilets, kitchens and laboratories except for single closet toilets.

P4. Show all pipe sizes on the plan.

P5. Provide riser diagrams for hot & cold water systems, waste & vent systems, storm drainage systems and fuel gas systems.

P6. Provide site water piping plans. If provided on civil drawings co-ordinate and indicate proper reference.

P7. Indicate size and location of water meter. If provided on civil drawings co-ordinate and indicate proper reference.

P8. Install a shut-off valve in the domestic water supply to each building in a vault outside the building as specified.

P9. The riser diagram shall indicate all the fixtures served, the pipe size and the fixture unit count on each leg of pipe, pressure regulators, back flow prevention devices, and water meter if applicable.

P10. Show all new and all existing devices located between the city water service and the building plumbing system that cause pressure losses or gains in the system. Devices shall include but not be limited to pumps, water softeners, and sub meters. If site water distribution is indicated on civil drawings, make proper references but water pressure loss calculations must be provided on plans.

P11. State make(s), model(s), and size(s), of the above items and indicate if they are new or existing.

P12. Provide manufacturer's specification sheets for such devices indicating the pressure loss through the device(s) from 0 flow to the rated flow.

P13. Indicate on the plans, all fixture unit loads in addition to the loads of the new fixtures including but not limited to, existing fixtures, irrigation load, make up water for cooling towers and boilers, demand for future use, and any other uses.

P14. Show the future water demand where applicable.

P15. Indicate maximum and minimum water supply pressure on the plans.

P16. Provide hydraulic calculations for sizing the cold and hot water systems on plans. Also refer to P-10.

P17. The minimum water pressure supplied to the most remote fixture shall be not less than the requirements of that fixture and not less then 15 PSI, whichever is higher.

P18. Indicate pressure-regulating valves on the plans where maximum water pressure is more than 80 psi.

P19. Verify whether a reduced pressure backflow device at the meter by the local water purveyor and provide if required comply with LADWP Rule 16-D.

P20. Show size of water meter on the riser diagram.

P21. Provide a temperature & pressure relief valve on the water heater. The valve shall discharge to an approved location. Pressure relief valves for water heaters installed inside a building shall discharge to a floor sink or service sink.

P22. Provide an approved thermal expansion tank at the water heater.

P23. Indicate make, model and size of the thermal expansion tank.

WASTE AND VENT SYSTEMS

W1. Show the slope of the horizontal drainage piping.

W2. Show size and location of the sewer main in the street. If provided on civil drawings co-ordinate and indicate proper reference.

W3. Provide suds relief for laundry washers where applicable.

W4. The aggregate cross sectional area of the vents shall not be less than that of the largest required building sewer.

W5. Obtain a Bureau of Sanitation permit or clearance for Industrial Waste. (Fat, oils, grease & corrosive laboratory waste)

W6. Show details for the island venting.

W7. Install a clean out every 100 feet or a manhole every 300 feet in the building sewer (site sewer) in straight runs and for each aggregate horizontal change in direction exceeding 135°.

W8. Provide yoke vents where required.

W9. Provide lot subdivision. The building sewer shall not cross lot lines.

W10. All wet vented fixtures shall be within the same story.

W11. Combination waste and vent system is only allowed where structural conditions preclude the installation of a conventional system.

W12. Provide a separate vent for each waste branch line exceeding 15' in length.

W13. The minimum area of any vent installed in a combination waste and vent system shall be at least 1/2 the cross sectional area of the drainpipe served.

W14. Each drainpipe and each trap, in a combination waste and vent system, shall be 2 pipe sizes larger than the sizes required by UPC.

W15. No vertical waste pipes, toilets or urinals are allowed a combination waste and vent system.

W16. Relief vents shall be provided every 100' along the main.

W17. Show on plans type & use of each fixture served by the combination waste and vent system.

W18. Provide a vent downstream of the furthest fixture served by the combination waste and vent system.

W19. The discharge line from the ejector shall be provided with an accessible check valve and gate valve. The gate valve shall be located on the discharge side of the check valve. Gate valve and check valve shall be located outside the pit.

W20. Provide detail of sewage ejector on plans with valves, fittings and sump complete with elevations of inlet pipe; pump on/off and high water alarm levels.

W21. Provide dual pumps each capable of handling the load independently.

W22. Provide airtight cover for the sump.

W23. Sump(s) shall be provided with a vent pipe that extends through the roof.

W24. Show load discharging into the sump on plans.

W25. Indicate pump schedule complete with make, model, flow rate, head, horsepower and electrical characteristics of pump on plan.

W26. State length of pipe & elevation difference between the bottom of the sump and the gravity line.

W27. Sumps receiving waste from water closets shall have minimum 3-inch discharge.

W28. Allow two fixtures units for each gallon per minus discharging from the sewage ejector.

NATURAL GAS SYSTEMS

G1. Indicate on the plans the total developed length of the system from the meter or regulator to the most remote gas outlet.

G2. Provide a separate gas shutoff valve for each logical part of the system to allow independent service of connected equipment and devices.

G3. Indicate on the plans the hourly volume (CFH) of gas required at each outlet.

G4. Provide an approved type seismic gas shutoff valve.

G5. Show on plan size, make and model of seismic gas shut off valve.

G6. The seismic shut off shall be installed rigidly to the exterior of the building or structure containing the fuel gas piping.

G7. No gas pipes shall be installed under a new building.

G8. Provide a letter from the gas company stating that they will deliver the desired pressure and volume of gas at 100% submittal.

G9. Show on plans size, make, model, orifice size, spring number, pressure at the inlet of the pressure regulator, and setting of pressure regulator.

G10. An approved gas valve shall be installed immediately preceding each regulator.

G11. Pressure regulator shall be vented to the outside of the building.

G12. Provide engineering calculations used in sizing the piping system on plans.

RAIN WATER SYSTEMS

R1. Indicate on riser diagram the area (ft2) covered by each drain.

R2. Indicate on the plan the slope of horizontal piping.

R3. Indicate overflow drain. Otherwise, note the reasons for not having them such as scuppers on plans.

R4. Roof drain and over flow drains shall be piped independently to the outside of the building.

R5. The discharge line from the sump shall be provided with an accessible backwater valve.

R6. Backwater valve shall be located outside the pit.

R7. Sump(s) shall be made of concrete, metal or other approved materials. Fiberglass sumps shall be approved by the Los Angeles city Mechanical Testing Laboratory.

R8. Provide dual sump pumps.

R9. Minimum size of pump shall be 15 gpm.

R10. Provide an airtight cover. (94.1101.5.3)

R11. The sump pit shall be at least 15 inches in diameter and 18 inches in depth.

R12. The discharge line from the sump shall be at least 1 1/2 inch diameter.

R13. Where the pump discharge line connects to a horizontal drain line, such connection shall be made from the top through a wye branch fitting.

R14. The lowest inlet to the sump shall have a minimum clearance of 2 inches above the high water level.

R15. Sump(s) shall be provided with a vent pipe, which shall extend a minimum of six feet above the solid sump cover.

R16. Show load discharging into the sump.

R17. Indicate pump schedule complete with make, model, flow rate, head, horsepower and electrical characteristics of pump on plan.

R18. Provide detail of sump pump on plans with valves, fittings and sump complete with elevations of inlet pipe; pump on/off and high water alarm levels.

R19. State length of pipe & elevation difference between the bottom of the sump and the gravity line.

SUBSURFACE DRAINS

S1. Show subsurface drainage on the floor plans.

S2. State piping material.

S3. Non-perforated piping shall be made of metal as in sanitary drainage systems.

S4. Provide a statement from a civil engineer showing the required flow.

S5. Either terminate the subsurface drains to the city storm drain, or provide a soil report showing that there is no continuously flowing springs or ground water.

AIR CONDITIONING

A1. Show job address on plans.

A2. Plans shall be clearly legible, and at a scale no smaller than 1/8 inch per foot.

A3. Show equipment schedule on the plans.

A4. Show the room names and room numbers of each area.

A5. Show all fire rated walls and ceilings on plans.

A6. Indicate if rated corridors are tunnel type or full height.

A7. Provide a primary and a secondary condensate drains and secondary drains pans for cooling coils installed above the ceiling or in furred spaces. The drain from the secondary drain pan shall terminate in a visible location.

A8. Duct shall be constructed in accordance with chapter 6 of the Uniform Mechanical Code.

A9. Provide duct type smoke detectors in the supply air duct: in every air conditioning system in excess of 2,000 cfm. Multiple units serving the same room, or having common return air plenum or a common outside air duct are considered to be one system for the determination of the cfm. If the area smoke detection system is of the complete area coverage type, the area detectors may be used for shutdown.

A10. Show all fire rated walls and ceilings on planes.

A11. Listed fire dampers and smoke dampers are required to be installed at all duct penetrations through area separation and occupancy separation walls. Indicate smoke detectors that will operate these dampers on plans.

A12. Listed fire dampers and smoke dampers are required to be installed at all duct penetrations through fire rated shafts.

A13. Listed fire dampers are required to be installed at all due penetrations through fire rated ceilings.

A14. Provide a copy of the manufacturer catalogs for the mechanical equipment used.

A15. Provide combination smoke/fire dampers to isolate ducts serving rated corridors.

A16. Provide combination smoke/fire dampers in ducts penetrating elevator lobbies.

A17. Provide a permanent roof access.

TITLE 24

A18. Provide outside air per current Title 24 requirements.

A19. Make-up air shall be electrically interlocked with their associated exhaust systems.

A20. Back draft dampers shall be provided in outdoors air supply and exhaust systems.

A21. Provide economizer in every cooling unit exceeding 2,500 cfm. (3 Tons capacity for roof top units.)

A22. Show thermostats for each unit or zone control device.

A23. Provide complete Title 24 Compliance Documentation with the Performance Compliance Approach.

VENTILATION SYSTEMS

GENERAL

V1. Exhaust ducts under positive pressure and venting systems shall not extend into or pass through ducts or plenums.

V2. Show location & sizes of all ventilation ducts & openings.

V3. Environmental exhausts duct shall terminate outside the building and shall be equipped with a back draft damper.

V4. Exhaust outlets shall be 10 feet from property line: 3 feet from exterior roof/wall; 10 feet from opening into the building: 10 feet above grade.

V5. Make-up air shall be provided for all rooms with exhaust.

TOILET ROOMS

V6. Toilet rooms shall have 10 air changes per hour.

V7. Provide a duct type smoke detector in the toilet exhaust system exceeding 2,000 cubic feet per minute.

V8. Provide combination fire smoke dampers where the toilet exhaust ducts penetrate a fire rated shaft. (If the area smoke detection system is of the complete area coverage type, the area detectors may be used for shutdown.)

V9. Provide combination fire smoke dampers at every penetration of area separation and occupancy separation wall.

CORRIDOR VENTILATION

V10. Rooms adjacent to the corridor shall not draw air from the corridor or transfer air to the corridor except for small quantities as exfiltration into a negative pressure toilet with make up air supply.

GARAGE VENTILATION

V11. Provide calculations on plans showing that the exhaust system is capable of uniformly exhausting 1.5 cfm per square foot of gross floor area.

V12. Provide make up air.

V13. Show the termination of the garage exhaust. Exhaust outlet shall terminate not less than 10 feet from property line, 3 feet from exterior wall or roof, 10 feet from openings into the building, 10 feet above adjoining grade.

V14. Do not connect any other ventilation system to the garage ventilation system.

KITCHEN HOODS

H1. Provide kitchen lay out plans showing location of hoods ducts, shafts, make-up air, operable windows and their area, and the volume of the kitchen.

H2. Provide roof plans showing the location of the kitchen exhaust blower, property line and any openings into the building.

H3. Provide make-up air.

H4. Provide elevations showing finished floor, cooking equipment, grease exhaust hood, distance between cooking equipment and grease filters, overhang, finished ceiling, flushing, fire rated shaft, clearance between duel and shaft, cleanouts, slope of horizontal ducts, roof, blower, diverter, distance of outlet termination above roof.

H5. Each exhaust outlet within a hood shall serve not more than a 12-foot section of hood unless the hood is U.L. listed to exceed.

H6. Duct system shall have a slope not less than 1/4 inch per linear foot toward the hood or toward an approved grease reservoir. When horizontal ducts exceed 75 feet in length, the slope shall not be less than 1 inch per linear foot. The bottom of duct elevations shall be indicated on plans to verify clearance from structural members, etc.

H7. Duct enclosures from the point of ceiling, wall or floor penetration shall be at least one hour, except it shall be two-hour fire resistive construction in Type I & II buildings.

H8. The duct enclosure shall be sealed around the duct at the point of penetration.

H9. A clearance of at least 3 inches and not more man 12 inches shall be maintained between duct and enclosure.

H10. Air velocity within the duct system shall be not less than 1,500 feet per minute and shall not exceed 2,500 ft/min.

H11. Exposed grease duct/hood systems serving a Type I hood shall have a clearance from unprotected combustible construction of at least 18 inches. Clearance may be reduced to not less than 3 inches when the combustible construction is protected with material required for one-hour fire-resistive construction.

H12. Hoods less than 12 inches from the ceiling or wall shall be flashed solidly with materials as specified in CMC Sec.508.2.

H13. Exhaust outlets serving grease duct systems shall terminate above the roof surface, 10 feet from property line, 10 feet from air intake openings and 10 feet above adjoining grade. Base of fan shall be 2 feet above roof surface.

H14. A grease gutter shall drain to a receptacle accessible for cleaning.

H15. Type I Hoods for use over solid-fuel cooking equipment shall be provided with separate exhaust systems.

H16. Indicate on plans what provisions have been made for fire protection in the hood and in the duct.

H17. The fire-extinguishing system shall be interconnected to the fuel or current supply so that the fuel or current is automatically shut off to all equipment under the hood when the system is actuated. Show controls on plans.

H18. The exhaust and make-up air systems shall be connected by electrical interlock switch. Show controls on plans.

H19. Provide grease duct cleanouts per code.

FUME HOOD EXHAUST

H20. Motors for fans used to convey flammable vapors or dusts shall be located outside the duct or shall be protected with approved shields and dust-proofing.

H21. Motors and fans shall be accessible for servicing and maintenance.

H22. Parts of fans in contact with explosive or flammable vapors, fumes or dusts shall be of nonferrous or non-sparking materials or their casing shall be lined or constructed of such material.

H23. Both the fan and the casing shall be of non-sparking materials. When fans are required to be spark resistant, their bearings shall not be within the air stream, and all parts of the fan shall be grounded.

H24. The termination point for fume hood exhaust shall not be less than the following:

1. 30 feet from property line
2. 10 feet from openings into the building
3. 6 feet from exterior walls or roofs
4. 30 feet from combustible walls or openings into a building which are in the direction of the exhaust discharge
5. 10 feet above adjoining grade.

REFRIGERATION MACHINERY ROOM (Chiller Rooms)

M1. A 3 feet wide & 6 feet 8 inches high clearance shall be provided around at least two sides of all moving machinery.

M2. Door(s) shall swing in the direction of exit.

M3. Provide 2 separate exits.

M4. Provide calculation showing that the capacity of the exhaust system complies with section.

M5. A switch of the break-glass type, controlling the emergency purge ventilation system, shall be provided adjacent to and outside of the exit door.

M6. Switch controlling fans providing ventilation shall be in glass-covered enclosures and shall be located adjacent to and outside of the exit door.

M7. Show make-up air inlets and exhaust outlets on plan.

M8. Make-up air shall be from outside of the building and shall be equipped with a back draft damper.

M9. Exhaust shall be discharged at least 20 feet from property line. Show that on plans.

M10. Only equipment essential to the operation of refrigeration system shall be allowed in the machinery room.

M11. State type of refrigerant.

M12. Show location of refrigerant-vapors detectors.

FIRE PUMP & GENERATOR ROOM

M13. Show engine exhaust pipe.

M14. Show clearances for the engine exhaust pipe. It shall be a minimum of 18 inches from combustible construction and 2 inches from non-combustible construction.

M15. Show termination of engine exhaust pipe.

M16. The engine exhaust pipe shall extend above the roof surface, and shall be legated not less than 12 inches from any openings into the building, 2 feet from an adjoin building and 7 feet above grade when located adjacent a public walkway.

M17. Enclose the engine exhaust pipe in a fire rated shaft.

M18. Show combustion air.

M19. Dampers are not allowed in combustion-air ducts.

M20. Show room ventilation.

M21. The room ventilation shall be added to the combust air.

M22. Show room ventilation exhaust.

M23. Show point of termination outside of the building of the room ventilation.

M24. Combustion air shall not be drawn from the garage.

4.8 ELECTRICAL DESIGN CHECKLIST

100% Submittal

School: _____

Architect: _____

Project name: _____

Engineer: _____

*This form shall be completed and submitted with the submittal package. The submittal will be deemed incomplete without the completed form.

Items required for submittal:	Check Items Complete
J. Single Line Diagram: 5. Voltage, amperage, phase and wires shown. 6. Available fault current shown at each equipment bus. 7. Circuit breaker frame and trip size. 8. Switch rating, fuse size and type of fuse. 9. Conduit, wire size, length and voltage drop of each feeder. 10. Load summary of main distribution switchboard showing 30% future growth spare capacity above connected load. Provide the space in main switchboard for future growth. 11. Obtain written approval from the electric utility company for new electrical services planned for the facility. 12. Ground fault protection on main for 480/277 volt, 3 phase, 4 wire, 1000 amps or higher main switchboards. 13. Ground fault protection on each feeder of 480/277 volts 3 phase, 4 wire rated at 800 amps or more. 14. Location of existing utility facilities such as power poles to be removed where applicable. 15. Identify electronic grade panel boards intended for computer system power. If these panels are serviced via a step down transformer, then transformer must be K-Rated. 16. Step down transformer are k-rated. **K. Site Plan:** 1. Location of electric utility equipment, concrete pad, vault, power pole, underground conduits, and main switchboard, in compliance with serving utility company	

requirements, industry standards, and applicable codes.

2. Telephone facilities, as per approved requirements.
3. Cable TV facilities, as per approved requirements.
4. Location of existing underground utilities (if applicable), where trenching is required.
5. Underground feeders and branch circuits.
6. Terminal cabinets and underground conduit runs for P.A., fire alarm, TV, CCTV, clock, intrusion detection, and computer systems.
7. Location of other outdoor equipment such as transformers, motor control centers, light standards, etc.
8. Building names or numbers, scale, north arrow and streets.
9. Minimum underground conduit size shall be two inch for power system, two inch for clock system, four inch for fiber optic backbone interduct system, and three inch for all other signal systems, except for end runs to buildings containing maximum two classrooms which are not used as a distribution point to other small buildings.
10. Provide spare underground conduits for power, and signal systems, minimum one 3 inch for power and three inch for signal system, except for end runs to buildings described in item 9.
11. Provide properly sized pull boxes, or manholes and show their locations.
12. Names and telephone numbers of utility service planners.

L. Power Requirements

17. Front elevation of main distribution switchboard.
18. Distribution panel schedules including load calculations for each building.
19. Grounding schematic diagram and details.
20. Feeders and branch circuits clearly shown on plans.
21. Provide conduits, starters and relays shown on mechanical control diagrams as items by Division 16. Coordinate with the mechanical engineer.
22. Equipment ratings are the same as those shown on mechanical and plumbing drawings.
23. Fused disconnects at motorized equipment.
24. Ground fault circuit protection for receptacles located in toilets and outdoor.
25. Provide outdoor receptacles (W.P., GFCI) on new buildings. A switch shall be provided in janitor room to switch all exterior outlets.
26. Separate branch circuits for the supply of lights, fans, and other outlets in or on each elevator car.
27. Feeders and branch circuits sized for the intended load and not less than 125% of continuous loads.
28. Provide main circuit breaker in the distribution panelboard or main panelboard of each building to satisfy code requirements for main service disconnect at each building. Provide main circuit breaker for the main panelboard serving each floor of the building. Subpanels located in the same electrical rooms need not to have main circuit breaker.
29. Properly sized grounding electrode conductors.
30. Properly sized equipment grounding conductors for equipment and raceway systems.
31. Outdoor and underground raceways shall carry a properly sized equipment grounding conductor.
32. Provide adequate ventilations in electrical equipment rooms. Coordinate with

mechanical engineer for the heat dissipation data of equipment such as transformers.

33. Locate data equipment, computer networking racks and all electronic equipment in air conditioned rooms. The air conditioning shall be available 24 hours. Coordinate with mechanical engineer.
34. Indicate circuit designations near outlets and identify all homeruns.
35. Provide required working space, adequate illumination and access to work space for electrical and signal equipment.
36. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit.
37. A building or other structure shall be supplied by only one set of service drop or service lateral conductors; except where electronic grade panel is installed, a second feeder may provide power for computers.
38. Provide weatherproof, GFCI receptacles within 25 feet of all roof mounted equipment.
39. Provide primary and secondary protection for each transformer.
40. Panelboards supplying power to motor loads shall be fully rated for available fault current at the panelboard's bus; series rating is not acceptable per U.L. standards.
41. Provide panel schedules for power showing bus size, feeder size, main circuit breaker/lug size, top/bottom fed, bus bracing, and short circuit rating of circuit breakers.
42. For electronic grade panels provide double sized neutrals, filter and surge suppression modules per specification.

M. Lighting Requirements:

5. Lighting fixture mounting details.
6. Provide emergency lighting in corridor, multi-purpose rooms, auditoriums, gymnasiums, cafeteria, classrooms of larger than 1000 square feet and all other areas required by code. A separate central battery/inverter system shall be sized for each building to provide emergency power for lighting.
7. Provide illuminated exit signs at each exit. Exit signs shall be powered from normal and emergency sources.
8. Show lighting fixture schedule.
9. Use lighting fixtures that are specified in District's standard specification.
10. Lights in classrooms, offices and work rooms shall be controlled by motion sensors with separate light level controller (or built in light sensors) and switches as required by title 24. Separate switches shall be provided for daylight areas. Rooms of more than 100 square feet shall have double switching.
11. Lighting branch circuits shall be sized for 125% of continuous load.
12. Show number of conductors, conductor size, and conduit size for each lighting branch circuit.
13. Show lighting panelboard schedules showing bus size, feeder size, main circuit breaker/lug size, top/bottom fed, bus bracing, and short circuit rating of circuit breakers.
14. Submit lighting calculations and energy compliance forms as required by the California Energy Commission, Title 24.

N. Signal Requirements For Public Address, Telephone Fire Alarm, Television, CCTV, Security Intrusion Alarm, Clock And Computer Systems:

4. Install all signal system headend equipment in LAN room. Do not locate electrical equipment and panels in LAN room with the exception of the electronic grade panel feeding equipment in the LAN room.
5. All components, equipment, terminal cabinets, instruments, conduit, wiring and cables must be shown in plans.
6. District standard specifications must be edited to comply with the specific job requirements.
7. Do not combine fire alarm wiring with any other signal wiring.
8. Show riser diagrams of each signal system.
9. Provide main terminal cabinet in administration building and at least one terminal cabinet at each building for each signal system, except for computer networking system, where IDF are installed at each building.
10. Provide two hour uninterruptible power supply for PABX, and PA/Intercom systems.
11. Security intrusion alarm and fire alarm systems shall contain integral emergency power supplies per specification.
12. Computer networking system shall have rack mounted UPS system.
13. Clearly identify all cables (or wires) used for each signal system.
14. Clearly identify all signal system components.
15. Provide zone schedules for security systems on drawings and specifications.
16. Use ¾" conduit as the minimum size for each signal system.
17. Fire alarm system components include:
    a. Control panel.
    b. Annunciator panel.
    c. Bells (part of sprinkler system)
    d. Horns, strobes, combination horns/strobes.
    e. Pull stations.
    f. Smoke detectors.
    g. Duct smoke detectors.
    h. Heat detectors.
    i. Flow switches.
    j. Tamper switches.
    k. Conduit, wiring and terminal cabinets.
    l. Interconnection to Public Address system for interlocking the manual and automatic bell or tone.
    m. Ventilation systems where required for the purpose of fan shutdown.
    n. Damper control or smoke management system.
    o. Water based fire sprinkler system.
    p. Chemical fire extinguisher systems.
    q. Autonomous PA System(s).
    r. List of all interactive components
    s. Connections to PA system, program controller for class change signal.
    t. Fire alarm shall report water flow to central station only.
18. Fire alarm system and all initiating devices shall be addressable.
19. Fire alarm system shall not be interconnected to any of the following systems:
    a. Sump warning systems
    b. Carbon monoxide detection systems.
    c. Methane gas detection systems.
    d. Elevator car alarm bell circuit.
    e. Any other unrelated system.
20. Fire alarm drawings shall include complete submittal information required for DSA

approval including battery calculation for all control and transponder/expander panels and voltage drop calculation for branch circuits as required by specification.

21. The design of the fire alarm system shall be based on a radial system with a main control panel in the administration buildings, and network nodes or slave panels in other buildings, as specified in section 28 3100.
22. Security alarm systems components include:
    a. Control panel.
    b. Annunciator panel.
    c. Motion sensors.
    d. Door switches.
    e. Terminal cabinets.
    f. Cable tray, conduit and cables.
23. Public address intercommunication and telephone systems components include:
    a. P.A. console.
    b. PABX.
    c. Emergency power supply.
    d. Telephone instruments.
    e. Speakers.
    f. Terminal cabinets.
    g. Cable tray, conduit and cables.
24. Television system components include:
    a. Head and equipment installed in rack.
    b. Terminal outlets.
    c. Terminal cabinets.
    d. Line extension amplifiers.
    e. Cable tray, conduit and cables.
25. Clock system components include:
    a. Clock controller.
    b. Boosters.
    c. Clocks.
    d. Terminal cabinets.
    e. Conduit and wires.
    f. Program controller for class change signals.
    g. Interactive components with fire alarm and P.A. systems.
26. Computer system components include:
    a. Server rack, MDF, IDF, and LDF, and CLDF racks with related switching equipment and patch panels.
    b. Cable tray, conduit and cables.
    c. Wall and floor boxes.
    d. Fiber optic backbone system shall be used to connect IDF's, LDF's, and CLDF's to MDF located in LAN room.
    e. Cat 5e cables shall be used for horizontal wiring not to exceed 90 meters.
27. Conductors and cables for fire alarm, and clock systems shall be enclosed in separate conduit systems.
28. Conductors and cables for security intrusion alarm, television, public address, telephone, and computer systems shall be placed in a three section wire mesh cable tray system with dividers where possible, placed in separate conduit sleeves in accessible areas, and in separate underground conduits in duct banks.

O. General Requirements:

1. Symbol list. 2. General notes. 3. Each project must include a site plan. 4. Provide the following details: a. Lighting fixture mounting. b. Floodlight standard and footing. c. Roof receptacle. d. Transformer pad and manhole. e. Precast concrete pull boxes for power and signal systems. f. Ground rod and precast concrete box. g. Underground conduit stub-up. h. Conduit roof penetration. i. Disconnect switch mounting. j. Electrical equipment room. k. Switchboard pad. l. P.A. handset and speaker mounting. m. P.A. rack elevation and mounting details. n. TV elevation and mounting rack details. o. MDF, IDF, LDF, and CLDF rack details. p. Motion sensor mounting. q. Fire alarm system devices point to point connection details, fire alarm control panels, annunciator panel, and remote power supply mounting details. r. Security alarm system control panel, and devices mounting details. s. Television system equipment mounting details. t. CCTV equipment system mounting details. u. Front elevation of P.A. system console. 5. Switchboards, transformers, and motor control Centers shall be installed on 4 inch concrete pads. Main switchboard's concrete pad shall extend 40 inches in front of switchboard. 6. Provide wiring or schematic diagrams for: a. All motor controls and motor control centers, or refer to applicable mechanical drawings in coordination with mechanical engineer. b. Lighting controls. 7. All plans shall indicate the drawing scale, north arrow, the name of the project, school or location name, and address. 8. The signature and registration number of a State of California registered electrical engineer is required on all the electrical plans. The engineer signing the plans shall be a principal or a project manager/director in charge of the electrical design.	