



November 20, 2003

Ms. Diane F. Boyer-Vine
Legislative Counsel
State Capitol, Room 3021, B-30
Sacramento, CA 95814

Dear Ms. Boyer-Vine:

Attached is a copy of the "AB 320 Portable Classroom Egress Study" as required by Chapter 634, Statutes of 2002 (AB 320 – Reyes).

The study was conducted under the direction of the Division of the State Architect. It concludes that portable classrooms, like all classrooms, are provided with numerous life safety measures which protect school children from fire and other emergencies.

Additionally, the report recommends that existing regulations be clarified with regard to the location and size of emergency escape or rescue windows for classrooms, to provide even greater safety for school children. The State Architect intends to coordinate with the State Fire Marshal, who promulgates fire and panic regulations for schools, on the development and submittal of a code change proposal to the Building Standards Commission, which will clarify the California Building Code with regard to requirements for emergency escape and rescue windows for new school classrooms.

If you have any questions, please contact Stephan Castellanos, State Architect at (916) 445-4167.

Sincerely,

William J. Jefferds, Ed. D.
Director, Department of General Services

WJJ/ob

Attachments

cc: See Distribution List #2
Stephan Castellanos, FAIA, State Architect

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**AB 320 PORTABLE CLASSROOM
EGRESS STUDY**

Department of General Services
Division of the State Architect
1130 K Street
Suite 101
Sacramento, California 95814

June 25, 2003

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EXECUTIVE SUMMARY OF SIGNIFICANT FINDINGS AND RECOMMENDATIONS

Portable classrooms are used extensively throughout the state of California for Kindergarten through 12th (K-12) grade students. By some estimates, approximately 30 percent of the K-12 students (approximately 2 million students statewide) are housed in portable classrooms. Beginning in 1996, state law required at least 30 percent of the new classrooms on a school site to be portable classrooms. Many portable classroom buildings in use today were added to meet the requirements of the Class Size Reduction (CSR) program of 1996.

The Office of the State Architect was directed by the Legislature, through passage of Chapter 634, Statutes of 2002 (Assembly Bill 320-Reyes), to study the various means currently available for providing emergency exits from portable classrooms. The study included the following tasks:

- research and analyze building and fire codes regulating the design of exiting systems and determine adequacy in protecting occupants of portable classrooms from injury and death;
- research and analyze statutes and codes requiring emergency release hardware on security grilles or screens installed on residential buildings for adaptability to schools;
- research and analyze literature relating to human behavior and movement of individuals during emergency situations;
- research and analyze statistical fire data on schools;
- interview key stakeholders; and
- inspection of portable classrooms in use.

Currently, portable classrooms are provided with numerous life safety features including; 1) human element programs consisting of emergency plans, emergency drills, and trained adult supervision; 2) fire alarm system protection; and 3) limited combustibles. These features create an exceptional level of safety.

Emergency egress windows are not required from non-sprinklered classrooms having a single exit door unless all windows are covered with security grilles or screens. For those portable classrooms requiring emergency escape windows, the code requires a sign identifying the window with an inside release device as an emergency exit.

The statistical fire loss data indicates that fire within educational properties is not a life-threatening problem. The number of fire occurrences in educational facilities in California has decreased significantly between 1980 and 1993. Nationally, the majority (76 percent) of fires in educational facilities occur in non-residential schools (Nursery-12). However, the number of deaths by annual average for these fires is close to zero and the number of injuries is about 2.5 per 100 fires.

As many classrooms have a single exit (occupant load < 50), the infrequent death and injury rate indicates occupants are able to safely egress through one exit during a fire scenario. Safely egressing through a single exit suggests the exit is free of impairments such as blockage or door malfunction.

The statistical fire loss data provides no indicators that the addition of a second exit (when not code required) would lower injury or death rates. To the contrary, the majority of fires and injuries are incendiary or suspicious, occurring during times when the buildings are not normally occupied. Additional exits are, therefore, likely to have little effect on the injury and death rate in the majority of fires.

Evaluation of typical portable classroom egress times using state of the art fire protection engineering methods shows times are sufficiently short to allow all occupants to safely egress the classroom prior to loss of tenability. Intuitively, this makes sense, as the classroom dimensions are quite small (24 feet by 40 feet).

Recommendations

The following is recommended:

1. Continue to permit a single exit door from portable classrooms having floor areas of less than 1,000 square feet.

Discussion: Portable classroom buildings are required to meet the same building and fire code requirements as built-in-place classrooms. All classrooms with an occupant load of 49 persons or less are permitted to have a single exit. Access to at least two exits is only required when the occupant load reaches or exceeds 50 persons (i.e., when a portable classroom is 1,000 square feet or greater in area). Most typical classrooms in California are 960 square feet in area and will have anywhere from 20 to 32 students depending on the grade level.

The occupant load threshold (50 occupants) at which two exits are required from classrooms has been a standard within the Uniform Building Code (UBC) since the 1940s. All other national building codes also permit a single exit from these spaces when the occupant load is less than 50 persons.

Statistically, the infrequent death and injury rate indicates a single exit provides adequate egress capability during fire or other emergency.

2. Continue implementation of current life safety measures, which are specifically designed to protect students during emergency exit situations.

Discussion: Each of the life safety measures play an important part in protecting students during emergency exit situations.

3. Modify existing regulations to clarify when and where an emergency escape or rescue window is required for classrooms. At least one emergency escape or rescue window should be required from portable classrooms when only one exit door is provided.

Discussion: Current regulations found within the California Building Code (CBC) are unclear regarding emergency escape or rescue windows for classrooms. The CBC only requires an emergency escape or rescue window for classrooms when metal grilles or screens cover every window and only one exit door is provided. The window located furthest from the exit door must include an inside release device for the grilles or screens and also be clearly marked as an emergency exit. However, when these security devices

do not cover one or more of these windows, an emergency escape or rescue window is not required. Additionally, the code does not require windows in classrooms for light and ventilation purposes when artificial light and mechanical ventilation is provided.

Most, if not all, of the portable classroom buildings in use today include one or more windows for light and ventilation purposes. Many of these windows are also adequately sized and located for use as an emergency escape or rescue window. For example: the standard specifications issued by the Office of Public School Construction call for a 4 by 8-foot sliding window in the front and back of the portable classroom.

Emergency escape or rescue windows should be located a sufficient distance from the exit door to ensure that an alternate escape route is available if fire or smoke were to block the normal means of egress system from the portable classroom. The minimum distance between the exit door and the emergency window should be at least one-half of the length of the maximum overall diagonal dimension of the portable classroom.

4. Modify existing regulations to specify a minimum net clear openable area of 5.7 square feet for emergency escape or rescue windows serving classrooms. Other requirements for these windows should follow the same provisions found within the CBC for residential occupancies.

Discussion: *The current CBC regulations do not specify a minimum size for classroom windows used as emergency exits. By specifying a minimum opening size and maximum sill height for these windows, both occupants and fire department personnel will be able to adequately utilize them for emergency escape and rescue purposes.*

INTRODUCTION

This study evaluates the safety of the various means currently available for providing emergency exit from portable classrooms serving California public school students from Kindergarten through twelfth grade (K-12). Under the provisions of AB 320 (Chapter 634, Statute of 2002), the Legislature directed the Office of the State Architect to conduct a study and report the results of the study along with recommendations by July 1, 2003.

For this study, only those portable classrooms, which are approved by the Division of the State Architect (DSA), were evaluated. Portable classroom buildings which have been approved by the Department of Housing and Community Development (HCD) represent a small percentage of the overall classroom space and, therefore, were not a focus of this study. Further, HCD approved relocatable structures will no longer be permitted to be used as school buildings after September 30, 2007, unless the Legislature extends that date.

PORTABLE CLASSROOMS

Portable classrooms play an important role for school facility planners in providing adequate classroom space for K-12 students. Accelerated student population growth and legislative mandates over the past several years have increased the demand for the use of these types of buildings. Additionally, student populations at individual schools will continue to expand and contract depending on the changing demographics of the surrounding neighborhoods. These types of buildings offer an alternative to permanent classroom structures. They are generally built and installed at a lesser cost and, in most cases, are placed on a school site in less time. Further, portable classrooms add flexibility to individual school districts since these buildings are also relocatable.

Approximately 6.1 million K-12 students are currently enrolled in California's public school system and the number of schools serving these students is nearly 9,000. The number of students and schools in California, which are ranked highest in the United States, are expected to continue to grow over the next several years. During the past ten years, California's school-age population has grown by more than one million students, an increase of 21 percent. The California Department of Education estimates that over the next five years approximately 41,000 new classrooms (22 per day) will be needed to accommodate the expanding student population. Currently, there are approximately 278,000 classrooms, and of these, approximately 204,000 (73 percent) are over 25 years old. Construction costs for new classrooms and modernization costs for older classrooms over the next five years are estimated at \$22.81 billion. In order to meet the demands for new classrooms, many of the schools will continue to utilize portable classrooms as an alternative to permanent buildings^[1].

Many of the portable classroom buildings currently in existence were added to schools beginning in 1996 due to the CSR program. This program was instituted by the Legislature to ensure that children in public school in Kindergarten and grades 1 to 3, inclusive, receive instruction in classrooms where there are not more than 20 pupils. Additionally, under the Leroy F. Greene School Facilities Act of 1996, at least 30 percent of the new classrooms on a school site were required to be portable classrooms structures in order for the school district to qualify for state facility funds.

The vast majority of public schools in California utilize some percentage of portable classroom buildings on their campuses. Although the precise number of portable classrooms in use today is unknown, some estimates have placed this number close to 30 percent of the total number of

classrooms housing public school students. An article published by EdSource in 1998 estimated that over 86,500 portable school buildings were in use during the 1997-98 school year^[2]. Los Angeles Unified School District, which is the state's largest school district with an enrollment of over 735,000 students, currently utilizes approximately 9,000 portable buildings for classroom use. Based on an average of 25 students in each classroom, this number represents approximately 30 percent of the total classrooms within the district. The second largest school district, San Diego City Unified School District, with an enrollment of over 141,000 students, currently has approximately 2,700 portable classrooms in use. At 25 students per classroom, this represents approximately 47 percent of all classrooms located within the district. Based on the above, it is apparent that many of our K-12 students will continue to be placed within portable classroom buildings.

DEFINITION

For the purpose of this study, "portable classroom" means a classroom building of modular design and construction that meets all of the following criteria:

1. is designed and constructed to be relocatable and transportable over public streets;
2. is designed and constructed for relocation without the separation of the roof or floor from the building; and
3. when measured at the most exterior walls, has a floor area of not in excess of 2,000 square feet.

DSA APPROVED PORTABLE CLASSROOMS

Essentially, there are two types of portable classroom buildings in use today by California's public schools. The first type is approved by DSA for permanent use as a classroom. These structures must be placed on a permanent concrete foundation system or on a wood foundation system, both of which must be approved by DSA. The wood foundation systems are approved by DSA through a conditional certification process for relocatable school buildings. Additionally, DSA approved portable classrooms are required to meet the more stringent standards of California's Field Act. These standards are intended to provide for more earthquake resistive buildings.

Approximately 7,000 of the DSA portables are leased to school districts and county superintendents of schools through the State Relocation Classroom Program. These portables are constructed by modular building manufacturers in accordance with plans and specifications issued by the Office of Public School Construction (OPSC) and are designed to be placed, with few exceptions, throughout all school districts in the state (see Appendix C – OPSC Portable Classroom Specifications). However, the vast majority of the DSA approved portable classrooms, over 90 percent, are obtained directly from manufacturers utilizing plans and specifications developed by the individual school districts.

The second type of portable classrooms are those that bear a commercial coach insignia of approval from HCD. These buildings are designed to meet the less stringent structural requirements of the Uniform Building Code (UBC). Current state law also requires these buildings to be retrofitted according to certain prescribed requirements. The Field Act mandates that all portable classroom buildings be reviewed and certified by DSA for construction and site conditions, including foundations, location and fire and life safety requirements. These HCD

buildings, which account for a very small percentage of the overall portable classrooms in use, will no longer be permitted on schools as classrooms after September 30, 2007. Based on their limited use and the eventual out-phasing of these structures from school campuses, HCD approved buildings were not included as part of this study.

PERMANENT BUILDINGS

Portable classrooms may be considered as either permanent or temporary, but the majority are used as permanent structures. In discussions with several school districts, we found that very few of the portable classroom buildings were being relocated within six years after being placed on a school site. Section 217 of the 2001 CBC defines a portable building as “a classroom building or structure of modular design and construction that houses or serves students from K-12 and is funded pursuant to Education Code (EC) Section 17070.1b and meets all of the following criteria:

1. *is designed and constructed to be relocatable and transportable over public streets;*
2. *is designed and constructed for relocation without detaching the roof or the floor from the building;*
3. *is sited upon a temporary foundation in a manner that is designed to permit easy removal;*
4. *has a floor area of 3,000 square feet or less; and*
5. *shall be removed within three years of installation, or the school administration may request a three year extension pursuant to EC Section 17074.54 a) and b)”.*

With the exception of fire alarm and sprinkler requirements, temporary and permanent portable classroom buildings are required to meet the same building and fire code requirements as built-in-place classrooms.

Most portable classroom buildings are designed and constructed utilizing two modules of 480 square feet in size (12 feet by 40 feet). Each of these modules is transported to a designated school site on wheels. The modules are then assembled together on site with the wheels removed and supported on a DSA-approved foundation system to create a 960 square foot classroom (24 feet by 40 feet). Depending on their design, portable classrooms may be oriented such that either one short side wall (24 feet in length) or one long side wall (40 feet in length) will serve as the front of the building. All portable classrooms designed using OPSC specifications have the short side walls as the front and back of these buildings. Many of the non-OPSC designed buildings will have the long side walls located to the front and rear of the classroom.

The OPSC portable classrooms include a single three-foot wide door and two 4 by 8-foot openable sliding windows. The door and one window are placed at the front with the door located at one corner and the second window is placed within the rear wall of the classroom (see Appendix D - Typical Floor Plan for Portable Classrooms). Portable structures situated with the long sides to the front and back typically include a single three-foot wide door near the corner, two to six windows at the front and louvered grilles for ventilation in the rear wall (see Appendix D). The number and size of windows for these non-OPSC portables varies and is dependant on the requirements specified by the individual school district.

When located a minimum of 20 feet from all other buildings portable classrooms may be grouped together to form a single story building of up to 9,100 square feet or a two-story building of up to 18,200 square feet. The above areas are based on allowable areas permitted by the CBC for these types of buildings without any consideration for allowable area increases due to increased separation distances from other school structures or the use of automatic sprinkler systems.

Individual one-story relocatable buildings with 2,160 square feet or less of floor area may be placed on wood framed foundation systems approved by DSA. Buildings with wood foundations require a minimum separation distance of four-inches from adjacent buildings and the height from the supporting grade to the underside of the lowest floor framing member may not exceed 18-inches.

Permanent (concrete) foundation systems are required for all portable classroom buildings, when the height between the underside of the lowest floor framing members and the supporting grade exceeds 18-inches, or when the building area exceeds 2,160 square feet. The majority of portable classroom buildings today are placed on wood foundation systems with floor levels approximately 12-inches above the adjacent ground surface.

All portable classrooms are required to be accessible to persons with disabilities in accordance with California Title 24 and the Americans with Disabilities Act (ADA). Access is generally provided by a ramp for one-story buildings and an elevator for two-story buildings. Ramps are required to be a minimum of 48-inches in width and have a maximum slope of 1-foot rise in 12 feet of horizontal run. Portable classrooms located at 12-inches or less above grade are generally able to provide a straight run ramp for access, however, when these buildings are placed higher than 12-inches above ground, switchback ramp designs may be necessary depending on the available space provided in front of the structure. Two-story structures will include exterior exit balconies leading to two separate stairways in addition to at least one elevator for disabled access. The exterior balconies are required to be a minimum of 44-inches when serving an occupant load of less than 100 persons and a minimum of 72-inches when serving an occupant load of 100 or more. Stairs are required to be a minimum of 44-inches in width when serving an occupant load of 50 to 99 and a minimum of 60-inches in width when serving an occupant load of 100 or more.

COMBUSTIBILITY

Portable classrooms are modular in design and are constructed primarily of combustible materials. Walls are constructed of two-inch by four-inch wood studs spaced 16-inches on center with plywood sheathing. All interior classroom walls are fire-retardant vinyl-covered insulation tack board (asphalt-free) applied over sheetrock or plywood sheathing.

Wood joists and blocking form the structural components of the roof construction. The roofing system is fire retardant, composed of either pre-finished 26 gauge sheet metal over felt underlay and plywood deck, or 22 gauge steel interlocking panels. Acoustical ceiling panels are mineral fiberboard or vinyl-faced fiberglass panels.

Floors in portable classrooms are constructed of wood joists and blocking with a plywood sheathing sub floor. Most portable classrooms are placed on a wood foundation system comprised of redwood or pressure treated wood.

All weather-exposed surfaces have a weather-resistant moisture barrier to protect the interior wall covering. The moisture barrier protection is equal to the standard for Kraft waterproof building paper or the standard for asphalt-saturated felt rag. Exterior siding is exterior-type plywood. Exterior doors are steel with insulated polyurethane cores.

Interior finish material on walls and ceilings can significantly impact the life safety of any room. Chapter 8 of the CBC limits interior finish material for walls and ceilings by their flame-spread class. This method restricts the application of interior finish material that will allow flames to spread across the material easily.

Interior furnishings such as decorative materials are considered a fire hazard when their quantity or arrangement may obstruct, delay, or hinder the prevention, suppression, or extinguishment of fire.

The interior furnishings found in portable classrooms are similar to those found in regular classrooms. Wood desks with plastic chairs, cabinets and shelving with books and various other school supplies make up a majority of the contents. Various teaching aids and student artwork may be found on the walls and throughout the classroom.

California Code of Regulations (CCR) Title 19, Section 3.08, requires that in classrooms, all drapes, hangings, curtains, drops and all other decorative material that would tend to increase the fire hazard shall be made from a nonflammable material, or shall be treated and maintained in a flame-retardant condition by means of a flame-retardant solution or process approved by the State Fire Marshal. Additionally, unframed rigid combustible decorative material less than ¼-inch in thickness used for folding doors, room dividers, decorative screens and similar applications, which do not create concealed spaces and which are installed with exposed edges, shall be flame resistant in accordance with CCR Title 19, Section 3.21(a). Similarly framed rigid combustible decorative material with protected edges shall conform to CCR Title 19, Section 3.21(b). By regulating interior finish material, the overall combustibility of a classroom is limited.

AUTOMATIC SPRINKLER SYSTEM REQUIREMENTS

New schools, including permanent portable classrooms, constructed after July 1, 2002 are required to be protected with an automatic sprinkler system throughout in accordance with the Green Oaks Family Academy Elementary School Fire Protection Act, Chapter 725, Statutes of 2001 (SB 575, O'Connell). EC Section 17074.54a does not require an automatic sprinkler system to be installed in temporary portable classrooms placed on site for less than three years. The length of time that a temporary portable classroom may remain onsite may be extended up to an additional three years with the approval of the State Allocation Board. Portable classrooms added to an existing school site that were constructed before the above date are generally not required to install automatic sprinkler systems unless these systems are necessary in order to comply with allowable area or type of construction provisions.

The majority of the existing schools in the State of California are not equipped with automatic sprinklers and many of the school buildings in use today do not provide sufficient fire protection in the building construction. These schools were also found to have inadequate fire detection, alarm, or automatic sprinkler systems.

An automatic sprinkler system installed in an educational occupancy provides a means of controlling a fire in its early stages as well as limiting property damage until such time that the fire is extinguished.

FIRE ALARM SYSTEM REQUIREMENTS

An automatic and manual fire alarm system is required in all new schools including permanent portable classrooms, constructed after July 1, 2002. Modernization projects that exceed \$200,000 are required to install an automatic and manual fire alarm system in permanent portable classrooms. If the project is to be completed in separate phases, the installation of the fire alarm may be deferred until the last phase is complete. Portable classrooms sited for less than three years are not required to be protected with a fire alarm system.

Portable classrooms typically contain one automatic smoke detector and one manual pull station. The interconnection of fire alarm systems is not required if the buildings are separated by a minimum of 20 feet. However, based on our research, we found that a majority of these systems were connected to the campus fire alarm system.

Without a means of detecting fire in its early stages, occupant notification and building evacuation is delayed. Instead of evacuating the portable classroom building during the early stages when the occupant exposure is low, building evacuation occurs during a later stage of the fire when hazard to life is significantly increased. When school buildings are unoccupied, an automatic fire alarm system can notify the fire department of an event. Automatic fire alarm systems provide early detection of a fire event allowing occupants to evacuate the building earlier as well as facilitating fire department arrival and operations.

SITE CONSIDERATIONS

Several factors are taken into consideration prior to the placement of portable classrooms. Site locations are selected based on distance to other portable classrooms, property line, and fire department access roads. Careful consideration is given to occupant access and egress routes as well as occupant accessibility areas. Site plans for portable classrooms require approval from DSA and the local fire department prior to installation.

OCCUPANCY

California public schools, which serve K-12 students, are classified as educational occupancies by the CBC. Section 305.1 of the CBC defines a Group E, Division 1 Occupancy as any building used for educational purposes through the 12th grade by 50 or more persons for more than 12 hours per week or four hours in any one day. Group E, Division 2 Occupancies are defined as any building used for educational purposes through the 12th grade by less than 50 persons for more than 12 hours per week or four hours in any one day.

The classroom size standards specified in Title 5, CCR, requires that general classrooms serving grades 1 through 12 are not less than 960 square feet unless approval is obtained by the State Superintendent of Public Instruction. Most general classrooms will have anywhere from 20 to 32 students depending on the grade level. Specialized classrooms, such as Kindergarten classrooms and science laboratories, are required to have larger areas; at least 1,350 square feet for Kindergarten classrooms and at least 1,300 square feet for science laboratories.

EMERGENCY EGRESS

DEFINITION

The CBC defines a means of egress as an exit system that provides a continuous, unobstructed and undiminished path of exit travel from any occupied point in a building or structure to a public way. Such a means of egress system consists of three separate and distinct elements:

- the exit access;
- the exit; and
- the exit discharge.

For the portable classrooms under consideration, the exit access portion is considered to be any location within the building from where a student would start their egress path and includes the aisle or pathway areas leading to the exit door (i.e., travel between desks and/or tables). Once students have traveled through the exit (exterior exit door) to the exterior of the building they are considered to be in the exit discharge portion of the means of egress system. Components within this element, in addition to grade level pathways, may include exterior balconies and exterior stairs for multistory buildings and ramps for single story buildings.

In lieu of providing access directly to a public way, schools are permitted to egress to exterior assembly areas on campus which are located a sufficient distance away from the buildings being evacuated. CBC Section 1007.3.11 permits school grounds to be fenced and gates therein may be equipped with locks, provided that safe dispersal areas are located between the school and the fence and no closer than 50 feet from school buildings. The 2001 California Fire Code (CFC) requires these exterior assembly areas to be arranged so as to avoid interference with fire department operations and to keep each evacuated class or group separated to provide accountability of all individuals involved. State law requires schools that are entirely enclosed by fences or walls to include gates for use by law enforcement and fire-protection agencies. EC Section 32020 states:

“The governing board of every public school district, and the governing authority of every private school, which maintains any building used for the instruction or housing of school pupils on land entirely enclosed (except for building walls) by fences or walls, shall, through cooperation with the local law enforcement and fire-protection agencies having jurisdiction of the area, make provision for the erection of gates in such fences or walls. The gates shall be of sufficient size to permit the entrance of the ambulances, police equipment and firefighting apparatus used by the law enforcement and fire-protection agencies. There shall be no less than one such access gate and there shall be as many such gates as needed to assure access to all major building and ground areas. If such gates are to be equipped with locks, the locking devices shall be designed to permit ready entrance by the use of the chain or bolt-cutting devices with which the local law enforcement and fire-protection agencies may be equipped.”

NUMBER OF EXITS

The number of exits from a portable classroom is dependent on the occupant load. Classrooms with an occupant load of 49 persons or less may have a single exit. Access to at least two exits is required when the occupant load reaches or exceeds 50 persons. The CBC prescribes a

method for determining an occupant load that constitutes the minimum number of persons for which the existing system must be designed. To determine the occupant load of a portable classroom, the floor area is divided by an occupant load factor assigned to classroom use. Table 10-A of the CBC specifies an occupant load factor of 20 square feet per person for classrooms. For portable classrooms of 960 square feet in area, the occupant load is calculated to be 48 persons and only one exit is, therefore, required. A minimum of two exits are required from classrooms of 1,000 square feet or larger since the calculated occupant load will be at least 50 persons.

For classrooms serving Kindergarten, first- or second-grade pupils that are located above the first story, special provisions of the CBC apply. Classrooms for Kindergarten through second-graders are allowed on the second floor only if an automatic sprinkler system is provided throughout and rooms used for Kindergarten, first- and second-grade children or for day-care purposes on the second story are provided with at least two separate egress systems for the exclusive use of such occupants. These separate egress systems may include exit doors, exterior exit balconies, and exterior stairways.

The occupant load of 50 at which two exits are required from classrooms has been a standard within the building code since the 1940s. Most other occupancies, including all assembly uses, have a requirement for two exits when the occupant load within the space reaches 50 persons, rooms with less than 50 occupants are permitted to have a single exit. All other national building codes, including the National Building Code by Building Officials and Code Administrators International, Inc., the Southern Building Code by Southern Building Code Congress International, Inc., and the International Building Code by International Code Council, Inc., permit a single exit from classrooms when the occupant load is less than 50 persons. Although this requirement for two exits from classrooms is common throughout the various national codes, it appears that there is no definitive technical basis for the 50 person threshold.

EMERGENCY ESCAPE WINDOWS

The use of windows as a secondary means of egress from portable classrooms was evaluated. Most, if not all, of the portable classroom buildings in use today include one or more windows for light and ventilation purposes. During hazardous scenarios, windows are primarily used for smoke and heat ventilation and emergency rescue by fire personnel. In some cases, these windows are required by code to be considered as emergency exits. CBC Section 305.2.4 states:

“School classrooms constructed after January 1, 1990, not equipped with automatic sprinkler systems, which have metal grilles or bars on all their windows and do not have at least two exit doors within 3 feet of each end of the classroom opening to the exterior of the building or to a common hallway used for evacuation purposes, shall have an inside release for the grilles or bars on at least one window farthest from the exit doors. The window or windows with the inside release shall be clearly marked as emergency exits.”

Unfortunately, the CBC does not specify a minimum size for these windows. Sleeping rooms in residential occupancies located below the fourth story are required to have escape or rescue windows with a minimum net clear openable area of 5.7 square feet and a maximum sill height of 44-inches above the floor. The minimum net clear width and height for these windows is 20-inches and 24-inches, respectively. These dimensions are based on testing by the City of San

Diego to permit the placement of a ladder and to accommodate a firefighter with full rescue equipment.

Additionally, the CBC does not require windows for light and ventilation purposes. Requirements for light and ventilation in classrooms are found within Chapter 12 of the CBC. In lieu of providing natural light and natural ventilation in these occupancies, the code permits the use of artificial light and mechanical ventilation. Windows are also not required by the code for emergency exit purposes.

Many of the portable classrooms in use today have security grilles or screens placed over their windows. Typically, these are added after the structure has been installed on the school site and after approval is granted by DSA for occupancy. The Los Angeles Unified School District has a policy of installing security screens or grilles on each of their portable classrooms. Additionally, this school district provides emergency release devices on those security screens located furthest from the exit door (see Appendix E – Security Grilles and Screens). In discussions with other school districts, it was discovered that the policy for using security screens or grilles varied not only from school district to school district but also between schools within the same district. An inspection of three separate schools within the County of San Diego found some of the portable classroom buildings without the required emergency release devices (see Appendix F – Example of Portable Classroom Without Emergency Release Device).

DOORS AND LOCKS

Exit doors are a crucial component of an exit system. The size, orientation, and location of an exit door are important characteristics that have a significant impact on the life safety of an area. If an exit door is difficult to locate, valuable time may be lost during a hazardous scenario. The CBC requires exit doors to be readily distinguishable from the adjacent construction and to be easily recognizable. Mirrors or similar reflecting materials shall not be used on exit doors and exit doors shall not be concealed by curtains, drapes, decorations, and similar materials.

Without sufficient width, an exit door can greatly hinder the egress of all occupants. Every required exit doorway serving an occupant load of 10 or more shall be of a size to permit the installation of a door not less than three feet in nominal width and not less than six-foot eight-inches in nominal height. Exit doors shall be capable of opening such that the clear width of the exit is not less than 32-inches.

An exit door should be easily opened and accessed. Doors that are difficult to open can have a catastrophic effect on the ability of the occupants to reach safety. Exit doors serving an occupant load of 10 or more shall be of the pivoted, balanced, or side-hinged swinging type. Exit doors shall swing in the direction of the path of travel where the area served has an occupant load of 50 or more. The door shall swing to the fully opened position when an opening force not to exceed five pounds is applied to the latch side. When fire doors are required, the effort required to open the door shall not exceed 15 pounds. Regardless of the occupant load served, exit doors must be openable from the inside without the use of a key or any special knowledge or effort.

Portable classrooms observed in this study were generally provided with lever-type hardware on the doors that only required a single action to operate and, therefore, were compliant with these requirements.

FURNITURE LAYOUT

The orientation of desks and chairs in a classroom has an impact on the proper egress of occupants. However, unlike an assembly occupancy, occupants of a classroom are very familiar with their surroundings. Additionally, occupants of a classroom practice emergency exiting drills on a regular basis and, therefore, are able to move towards an exit very quickly.

No specific requirements for the spacing of tables and chairs or desks are provided for classrooms. However, CCR Title 19, Section 3.06, requires that any person for whom seating is not available must not occupy aisles. Further, the placement of any object, item or equipment must not block or obstruct the required width of any exit. Also, the placement of any combustible material or equipment in or exposed to any exit is prohibited.

EMERGENCY PROCEDURES

School administrators have the responsibility to ensure the safety of their students and staff in an emergency, whether it is an earthquake, fire, flood, or terrorism incident. Developing emergency plans and training staff in emergency response procedures is required by law (see Appendix G – Sample Emergency Preparedness Manual). Effective incidence response must begin with proper emergency planning where all personnel and operations involved with an emergency evacuation are coordinated.

Emergency plans which are mandated by Title 19 and the CFC must include:

1. the procedure for reporting of emergencies and notifying, relocating, and evacuating occupants;
2. staff member duties during emergencies. All employees shall be assigned duties for emergencies and shall be trained in their duties. Training shall include familiarization with assigned duties, evacuation routes, areas of refuge, exterior assembly areas and procedures for leading groups or assisting individuals to evacuate;
3. floor plans identifying the locations of portable fire extinguishers, other manual fire-extinguishing equipment, manual fire alarm pull stations, and fire alarm control panels;
4. exit plans placed in each classroom or assembly area identifying paths of travel to evacuate the room in case of emergency, including an alternate route;
5. floor plans indicating the locations of interior areas of refuge; and
6. site maps identifying the designated exterior assembly area. Exterior assembly areas shall be designated and shall be located away from the building being evacuated so as to avoid interference with fire department operations. Exterior assembly areas shall be arranged to keep each evacuated class or group separated to provide accountability of all individuals involved in the drill. Areas designated for occupant discharge, dispersal, or refuge shall be maintained unobstructed and clear of storage.

Section 8607 of the Government Code requires that school districts be prepared to respond to emergencies using the Standardized Emergency Management System (SEMS).

SEMS provides a framework for school safety plans by organizing efforts and responses in order to deal with a variety of hazards. SEMS is based on a number of concepts, three of which are pertinent to schools:

1. a management tool called the Incident Command System (ICS);
2. mutual aid systems in which similar organizations assist each other in emergencies; and
3. multiple agency coordination under which diverse organizations work together and communicate with each other.

There are five basic SEMS functions: management, planning/intelligence, operations, logistics, and finance/administration. These are the tasks involved in any emergency response anywhere. They may be performed by a few people or many, depending on the size of the emergency and the human resources at hand. These functions are further defined below:

- **Management** – responsible for overall policy and coordination from a designated Command Post. This function is usually taken on by the school Principal as the Incident Commander who is responsible for directing all emergency operations.
- **Planning/Intelligence** – responsible for collecting, evaluating, and disseminating information, maintaining documentation, and evaluating incoming information to determine the potential situation and actively assess the status of the emergency.
- **Operations** – responsible for actually performing the actions that make up the emergency response. This function is supported by staff performing first aid, crisis intervention, search and rescue, site security, damage assessment, evacuations and the release of students to parents.
- **Logistics** – responsible for providing facilities, services, personnel, equipment, and materials.
- **Finance/Administration** – responsible for activities such as purchasing of all necessary materials, tracking financial records, timekeeping for emergency responders, and recovering school records following an emergency.

Schools may effectively handle an emergency situation by utilizing SEMS. SEMS is designed to take into account that every emergency, no matter how large or small, requires that certain tasks be performed and distributed in accordance with the functions listed above. Also, the system can be expanded or contracted depending on the situation and the immediate needs by allowing one person to perform more than one function. SEMS provides for an Incident Commander since the accepted concept is that every incident needs a person in charge. Further, no one person should be in charge of more than seven people, other than students.

School safety plans consistent with SEMS should address emergencies such as, but not limited to, armed assault on campus, biological or chemical release, bomb threat, earthquake, explosion risk, fire in surrounding areas or on school grounds, and threat of violence.

Once an emergency is identified, school personnel can determine if an immediate response action is required. Some of the most common immediate response actions initiated during school emergencies are:

- Evacuate – This action is taken after the decision is made that it is unsafe to remain in the building. The Incident Commander, or Principal, will make an announcement to all students and staff members to leave the building and initiate the fire alarm. Teachers will assist students in evacuating the building and relocating to the predetermined refuge area where attendance will be taken. All teachers and staff members will remain in the refuge area until they receive further instructions.
- Drop and Cover – This action is taken to protect students and staff from flying or falling debris. The Incident Commander, or Principal, will make an announcement to all students and staff members to drop and cover. When inside, teachers will assist students in dropping under their desks and covering their heads with their arms and hands. When outside, teachers will instruct students to drop to the ground, place their heads between their knees, and cover their heads with their arms and hands.
- Protect-in-Place – This action is taken to protect students and staff from hazardous conditions outside by keeping students indoors in order to provide a greater level of protection that includes the shut down of building HVAC systems. The Incident Commander, or Principal, will make an announcement to all students and staff members to protect in place and for any students or teachers who are outside to move inside. When inside, teachers will hold students in the classrooms until further instructed. When outside, teachers will guide students to a safe indoor location while taking into account the location and proximity of the identified hazard.
- Lock Down – This action is taken when the threat of violence or gunfire is identified and it is necessary to prevent the perpetrator from entering occupied areas. During Lock Down, students are to remain in the classrooms or designated locations at all times. The Incident Commander, or Principal, will make an announcement to all students and staff members to lock down. When inside, teachers will instruct students to lie on the floor, lock the doors, and close any shades or blinds if it is safe to do so. When outside, students will return to their classrooms or an alternate safe indoor location. Staff members and students will remain at their locations until further instructed.

While several types of emergencies may occur at a school, students need only be familiar with a few response actions. Since the number of response actions to practice and become familiar with is limited, staff members and students will become more efficient at executing these responses. Therefore, minimal steps are required to be performed by staff and students in order to safely respond to a variety of emergency threats. SEMS further provides a system in which all appropriate school resources and personnel can quickly react and support efforts to preserve the safety of all staff members and students.

The characteristics of emergency situations in schools are unique. Within the framework of SEMS, students are generally very familiar with their surroundings and will rarely become lost or wander in the wrong direction during an emergency. Also, due to the frequency of emergency drills, staff members and students become very familiar with the necessary emergency procedures to take when instructions are issued. Additionally, the life safety measures already provided for schools are specifically designed to protect young children and young adults.

In addition to the inherent safety measures provided in schools, SEMS provides a systematic approach to emergency situation resolution and maximizes the potential for all students and staff members to safely avert a threat.

EMERGENCY DRILLS

The knowledge and training provided by fire drills give children the tools to react in a timely manner during actual fire events. Section 1303.3.3 of the CFC outlines the requirements for emergency plans and procedures in Educational Occupancies. Emergency plans and employee duty assignments shall be prepared in accordance with the CFC.

Exterior assembly areas are to be designated and located away from the buildings being evacuated. Exterior assembly areas are arranged to avoid interference with fire department operations and provide accountability of all individuals. Fire drills are conducted during school sessions and include complete evacuation of all buildings. The fire drill is initiated by the actuation of the fire alarm system.

EC Section 32001 provides specific parameters for fire drills based on specific age groups. The EC states that fire drills shall be conducted every calendar month at the elementary level and at least four times a year at the intermediate level. Fire drills shall be conducted not less than twice every school year at the secondary level.

During fire drills, emphasis is placed on orderly evacuation rather than speed. The distances from within classrooms to the exterior are so short that time is not as critical as maintaining orderly evacuation. All students are required to participate in fire drills to better simulate an emergency situation. Schools are encouraged to use unique situations when planning drills. A record of each fire drill is maintained on the school grounds for the review by the fire department during annual inspections.

ANALYSIS

STATISTICAL FIRE DATA

Statistical fire data has been provided by DSA and is included in Appendix H. This data has been used as accurate fire statistics within educational facilities in the State of California and throughout the nation.

The educational fire statistic data provided may include information for a number of incident types (e.g., structural, exterior, vehicle, refuse, explosion) and facility types (e.g., non-residential schools, residential [boarding] schools, vocational/trade schools, universities/colleges). The primary focus of this study is on structural fires in K-12 facilities. Non-residential schools are defined as nursery, elementary, middle and high schools without residential/boarding facilities.

In California, the number of reported structural fires in educational properties has decreased in recent years. The yearly fire totals show an overall decline from 925 fires in 1980 to 413 fires in 1993. This result is a decrease of approximately 55 percent in the number of structural fires per year in educational facilities during that period.

To determine the extent of the risk of fires in public schools, non-residential school fires were separated from other school fires. Non-residential school fires account for a majority of all fires

in this category. However, this is nationwide and not exclusive to California. The annual average number of fires in non-residential schools (Nursery-grade 12) from 1993 to 1997 was approximately 6,000 fires, or 76 percent of all educational fires. The available data includes nursery schools. For all educational facilities, these fires resulted in 190 injuries and one death.

The annual average number of injuries in non-residential schools (Nursery-grade 12) from 1993 to 1997 was 139 injuries, or approximately 73 percent of all injuries from structural fires in educational facilities.

The statistics provided include national data of structural fires in educational facilities between 1993 and 1997. The fires are categorized by the area of fire origin and include the associated number of injuries/deaths and the related property damage. Based on this data, the primary areas of fire origin were lavatories, locker rooms, or cloakrooms. Incidents in these areas resulted in 1,800 fires over a five-year span, accounting for approximately 23 percent of all fires reported. Fires originating in the lavatory, locker rooms, or cloakrooms resulted in 29 civilian injuries, or 16 percent of all injuries reported. The second and third most frequent areas of fire origin included hallways/corridors and small assembly areas/classrooms, respectively.

The statistics provided include a breakdown of the causes of fires in educational facilities nationwide. Arson is clearly the leading cause of fires and related damages to educational structures. During 1993-1997, incendiary or suspicious activity accounted for 51 percent of all structure fires in educational facilities, 46 percent of injuries, and 59 percent of property damage.

The cause of fire that corresponds with the highest injury rate is appliances, tools, or air conditioning equipment. Natural causes, according to the National Fire Protection Association (NFPA), result in the highest property loss per fire incident, approximately \$1.9 million dollars per every 100 fires.

California fire statistics are available through the California Fire Incident Reporting System (CFIRS). The CFIRS reports 500-600 incendiary fires per year in non-residential schools from 1986-1993. The reported number of arsons in California schools remained relatively consistent from 1986 through 1992. In 1993, the data show a significant decline in reported fires; however, the data for this year may be incomplete or it may be based on an estimated value for the current year.

The statistics provided include the cause of ignition for educational fires in California for 1995 and 1996. The data is fairly consistent for these two years. As is true nationally, incendiary and suspicious activity accounted for approximately 50 percent of all structural fires in California schools.

The data provided represents the time of fire ignition reported in California schools. The values are the average occurrence rate for 1990, 1991, and 1992. California statistics show that 70 percent of fires in educational occupancies occur between the hours of 8:00 A.M. to 8:00 P.M. Approximately one-half of all structural fire incidents occur after normal business hours, from 4:00 P.M. to 7:00 A.M. This translates to approximately 50 percent of all educational structure fires occurring during times when the building is not normally occupied. The statistical fire loss data referenced in Appendix J indicates that fire within educational properties is not a life threatening problem.

The number of fire occurrences in educational facilities in California has decreased significantly between 1980 and 1993. Nationally, the majority (76 percent) of fires in educational facilities occur in non-residential schools (Nursery-grade 12). However, the number of deaths by annual average for these fires is close to zero and the number of injuries is about 2.5 per 100 fires.

Classrooms are the third most frequent area of fire origin based on a five-year national annual average. However, civilian deaths in these fires are close to zero and there were a total of 10 civilian injuries during this five-year period.

As many classrooms have a single exit (occupant load < 50), the infrequent death and injury rate indicates occupants are able to safely egress through one exit during a fire scenario. Safely egressing through a single exit suggests the exit is free of impairments such as blockage or door malfunction.

The statistical fire loss data provides no indicators that the addition of a second exit (when not code required) would lower injury or death rates. To the contrary, the majority of fires and injuries are incendiary or suspicious, occurring during times when the buildings are not normally occupied. Additional exits are, therefore, likely to have little effect on the injury and death rate in the majority of fires.

FIRE SCENARIOS

To better understand the implications of a fire to the exiting system of a portable classroom, the two most likely fire scenarios were selected. The scenarios selected are an arson fire and an electrical fire. Coincidentally, two such fire events occurred during the course of this study allowing the authors the opportunity for first hand review.

An arson fire is unpredictable in magnitude, time of day, and intent. A student playing with matches or a person with the intent to injure or cause severe property damage could cause an arson fire. Several policies and procedures adopted by school districts provide protection during the hours that the school is occupied. Therefore, it seems likely that an arson fire would occur in the evening or early morning hours when the school is unoccupied.

Such a fire occurred at Tierra Santa Elementary School in the San Diego Unified School District (see Appendix I – Fire Scene Photographs). The fire occurred during the evening hours and was deemed an arson fire by the San Diego Metro Arson Strike Team. The portable classroom was not equipped with an automatic sprinkler system. A smoke detector and audio/visual device were installed.

The arsonist placed combustibles below the entrance to the portable building and used an incendiary device to ignite them. The fire progressed through the floor and caused fire damage to the portable building involved and an adjacent portable classroom to the north prior to suppression by the fire department. Smoke damage occurred in a second portable classroom directly south of the portable building involved with no visible flame extension.

One would conclude that, had sufficient security been provided, the event would have been prevented. Nevertheless, safety to building occupants was never compromised, as the classroom was unoccupied at the time of the fire.

Electrical fires occur for several reasons, such as improper installation, lack of maintenance, and improper use. An electrical fire typically starts by the overheating of a conductor due to a

gradual or prolonged increase in current. Eventually, this conductor will ignite the plastic sheathing or combustibles in close proximity. Once ignition occurs, the fire will react as an ordinary combustible fire, consuming fuels in the immediate area, pre-heating fuels, and spreading. An electrical fire may smolder for an extended period of time before progressing into a fully involved fire event. An electrical fire in a portable classroom would typically be detected by the occupants in its smoldering stage and would not threaten the safe egress of occupants.

An electrical fire occurred at Johnson Elementary School in Lemon Grove (see Appendix H – Fire Scene Photographs). An electrical fault occurred in the portable classroom causing the ignition of combustible products in the immediate area. The fire spread to the ordinary combustibles throughout the room (i.e., paper, wooden shelves, plastics, etc.) and extended into the wooden roof structure. The classroom was not provided with an automatic sprinkler system but was provided with detection and notification appliances. The electrical fire occurred at night when the classroom was unoccupied.

Smoldering is a characteristic of electrical fires where smoke is first produced for a while before flaming occurs. This smoldering is generally accompanied by an odor of burning wire insulation. These characteristics of an electrical fire are strong secondary indicators of a fire. In a portable classroom filled with students, the likelihood of such a slow-burning fire being detected before it grows to more hazardous levels is very good. Even if such a fire had occurred during normal school hours, the chances of safe evacuation of the occupants are high due to the limited travel distance.

HUMAN BEHAVIOR

Human behavior in fire emergencies has been studied from many viewpoints. There are an unlimited number of variables that affect how people react in the face of adversity such as a fire event. In a portable classroom, the visual and olfactory cues of a fire event are immediately present. If the event were in another area, notification would occur via the fire alarm system.^[3]

Young children (elementary students) have cognitive limitations that may hamper their response to a fire event. Inadequate knowledge and faulty mental models cause young children to seek refuge in areas that give them a sense of security such as bedrooms or closets. This situation is quite common in residential fire scenarios. However, in classroom scenarios, trained staff, such as teachers, help direct children toward exits and provide accountability for all students. Administrative programs such as fire drills give children the knowledge and training to react in a positive fashion during fire and other emergencies.

Very little technical data exists on child behavior during fire events, due to their inability to convey their actions after such an event and the lack of tests dedicated to evaluating these situations.

Quite possibly the most misguided comment toward human behavior during fire events is that people panic. The opposite is true; generally people react logically based on the knowledge available to them at the time. The same is true for children.^[4]

Most of the stereotypical techniques that occupants use to determine how they will react to a fire event are not applicable in educational occupancies. A teacher versed in evacuation and emergency procedures constantly supervises children in grades K-12. During an emergency, teachers assume specific roles and direct children toward exits, exterior assembly areas, and also perform specific duties such as closing doors and windows. Due to the protocols

established by school districts and the frequency of fire drills, both students and teachers have a conditioned response that results in efficient evacuation and accountability.

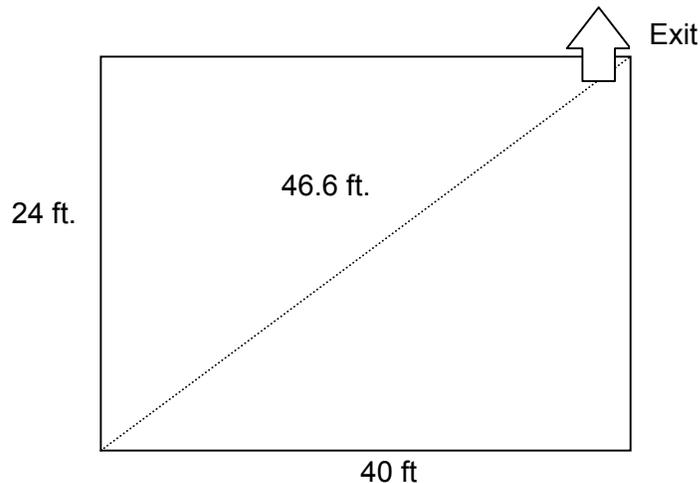
Education, training, and repetition give children the knowledge and confidence to react correctly in a fire event. Activities such as fire drills, fire prevention, education, and fire department presentations prove essential in developing fire safety awareness, decision-making, and rational behavior for children in a fire event.

TIME-BASED EGRESS ANALYSIS

A time-based egress analysis was performed on a typical portable classroom. The purpose of this analysis was to quantify the minimum required egress times in portable classrooms. This analysis utilized accepted principles of human movement and behavior as outlined in the Fire Protection Engineering Handbook (2nd Edition) by the Society of Fire Protection Engineers and the National Fire Protection Association Handbook (19th Edition) by the National Fire Protection Association.

A typical portable classroom measures approximately 24 feet by 40 feet providing a total floor area of 960 square feet. Figure 1 below illustrates the layout of the typical portable classroom considered in this study.

Figure 1. Typical Portable Classroom Area



A time-based egress analysis was performed to evaluate occupant safety during a fire event. The analysis assumed classroom dimensions as shown above, an occupant load of 32 students and a single exit door with a clear width of 32-inches.

Table 1 summarizes the findings of the timed egress analysis.

Table 1. Timed-Based Egress Summary

| Scenario | 32-Person Classroom, 1 Exit |
|---|-----------------------------|
| Egress Speed in Room (ft/min)* | 249 |
| Distance to Exit (ft) | 46.6 |
| Time to Reach Exit (min) | 0.19 |
| Density in Room (person/ft ²) | 0.033 |
| | |
| Egress Speed at Exit Door (ft/min)** | 170 |
| Density at Exit Door** | 0.1 |
| Exit Width (ft)*** | 1.67 |
| Flow (persons/min) | 28 |
| Number of Persons | 32 |
| Egress Time Through Door (min) | 1.13 |
| Total Egress Time (min) | 1.31 |

* NFPA Handbook 19th Edition Volume I, p. 4-42, Equation (1)

** SFPE Handbook 2nd Edition, p. 3-283, Table 3-13.1

*** NFPA Handbook 19th Edition Volume I, p. 4-42, Table 4.2.3

The total egress times shown in Table 1 include two components; egress from within the room to the door, and the egress time through the door. These separate times are calculated differently since different egress characteristics are present in each.

During egress from within the classroom to the exit door, the time to reach the exit door is dependent primarily on the occupant density in the room. Since the occupant load for each classroom is known and the size of the classroom is standardized, the occupant densities in each portable classroom scenario may be calculated by simply dividing the occupant load by the floor area of the classroom. Once the occupant density is determined, the egress time within the room may be calculated using an empirical formula derived from observations and experiments of human movement in crowds.

Once an occupant reaches the exit door, flow through the exit door must be calculated. Since all occupants will be attempting to exit through the same exit door, queuing will occur at the door, thereby increasing the time required for all occupants to egress out of the classroom. This flow will be dependent upon the occupant density at the exit door, the exit width provided, and the egress speed through the exit door.

Each exit door is assumed to provide 32 inches of clear width. Further, studies have shown that exiting crowds typically do not travel right up against a wall or door frame. Occupants will generally travel through an exit element while leaving a free layer of space between the person and the wall or frame, thereby further reducing the width of an exit door. This human behavior phenomenon is taken into account in the flow calculations.^[5]

Compared to the occupant density in a given room, the density at a door while all occupants are in queue while waiting to egress is much higher. The occupant density will obviously also affect the speed of egress through the door, as occupants in a tight crowd are limited to shuffling rather than a full-stride walk. An occupant density of 0.1 persons/ft² is generally regarded as a very tight crowd where the corresponding egress speed is 170 ft/min^[6].

The scenario described in Table 1 is a code-complying scenario with respect to door width, room size and occupant load. As shown in Table 1, the queue time at the door accounts for the majority of the time for occupants to exit from the room. The total egress time was about 79 seconds with the queue time accounting for approximately 85 percent of the total egress time.

It is important to note that when evaluating these egress times, we assume a fire hazard within the room of consideration. While the calculated total egress time is approximately one to two minutes, the duration of the egress time must be further qualified by comparisons to the growth of the design fire. In other words, a one to two minute span when a fire is in the incipient stage is much less hazardous than a one to two minute span when a fire has reached full growth. Therefore, if a fire is detected early, the chances of safe egress are very good.

We can assume that detection and notification of a fire occurs very quickly in classroom fires. Classrooms are generally comprised of a single, large space with several students and a teacher as opposed to an office space where there are several interconnected compartments where a fire could grow undetected for several minutes. Also, the secondary indicators of a fire, such as smoke and heat, will likely be quickly detected by the classroom occupants. Once a fire is detected, students generally evacuate classrooms very quickly since they are well-trained with monthly or bi-annual fire drills. These assumptions are further supported by historical data where civilian deaths in classroom fires are almost non-existent even during normal school hours.

Therefore, due to the size of a portable classroom, the number of occupants present and the emergency drills familiar to all occupants, early detection of a fire and safe egress are highly probable.

Based on the unique characteristics of classroom operations, administrative procedures and life safety requirements, the total classroom egress time is satisfactory. In other words, occupants in portable classrooms can safely egress during a fire situation due to the nature of the classrooms and their occupants.

RECOMMENDATIONS

1. Continue to permit a single exit door from portable classrooms having floor areas of less than 1,000 square feet.

Discussion: Portable classroom buildings are required to meet the same building and fire code requirements as built-in-place classrooms. All classrooms with an occupant load of 49 persons or less are permitted to have a single exit. Access to at least two exits is only required when the occupant load reaches or exceeds 50 persons (i.e., when a portable classroom is 1,000 square feet or greater in area). Most typical classrooms in California are 960 square feet in area and will have anywhere from 20 to 32 students depending on the grade level.

The occupant load threshold (50 occupants) at which two exits are required from classrooms has been a standard within the UBC since the 1940s. All other national building codes also permit a single exit from these spaces when the occupant load is less than 50 persons.

Statistically, the infrequent death and injury rate indicates a single exit provides adequate egress capability during fire or other emergency.

2. Continue to implement current life safety measures that are specifically designed to protect students during emergency exit situations.

Discussion: *Each of the life safety measures play an important part in protecting students during emergency exit situations.*

3. Modify existing regulations to clarify when and where an emergency escape or rescue window is required for classrooms. At least one emergency escape or rescue window should be required from portable classrooms when only one exit door is provided.

Discussion: *Current regulations found within the CBC are unclear regarding emergency escape or rescue windows for classrooms. The CBC only requires an emergency escape or rescue window for classrooms when every window is covered by metal grilles or screens and only one exit door is provided. The window located furthest from the exit door must include an inside release device for the grilles or screens and also be clearly marked as an emergency exit. However, when one or more of these windows is not covered by these security devices, an emergency escape or rescue window is not required. Additionally, the code does not require windows in classrooms for light and ventilation purposes when artificial light and mechanical ventilation is provided.*

Most, if not all, of the portable classroom buildings in use today include one or more windows for light and ventilation purposes. Many of these windows are also adequately sized and located for use as an emergency escape or rescue window. For example: the standard specifications issued by the Office of Public School Construction call for a 4 by 8-foot sliding window in the front and back of the portable classroom.

Emergency escape or rescue windows should be located a sufficient distance from the exit door to ensure that an alternate escape route is available if fire or smoke were to block the normal means of egress system from the portable classroom. The minimum distance between the exit door and the emergency window should be at least one-half of the length of the maximum overall diagonal dimension of the portable classroom.

4. Modify existing regulations to specify a minimum net clear openable area of 5.7 square feet for emergency escape or rescue windows serving classrooms. Other requirements for these windows should follow the same provisions found within the CBC for residential occupancies.

Discussion: *The current CBC regulations do not specify a minimum size for classroom windows used as emergency exits. By specifying a minimum opening size and maximum sill height for these windows, both occupants and fire department personnel will be able to adequately utilize them for emergency escape and rescue purposes.*

APPENDIX A

PORTABLE CLASSROOM PHOTOGRAPHS



Non-OPSC Portable Classroom.



OPSC Portable Classroom.



Typical Portable Classroom.



OPSC Portable Classroom.



Non-OPSC Portable Classroom.



Non-OPSC Portable Classrooms.

APPENDIX B
STAKEHOLDERS SURVEYS

The reader should note that information presented in this Appendix was transcribed directly from stakeholders written (hand or otherwise) responses. Editorial liberty by the author was restricted to format only.

AB 320 – DSA Portable Classroom Egress Study

ANSWERS PROVIDED BY: Jim Watts, District Architect, Maintenance and Operations Center

Interview Questions for Architects

1. What criteria are used when locating portable classrooms on a school campus?

- We try not to impact play areas
- Location of existing utilities
- Where there is no negative impact on the community

2. Are windows required for portable classroom buildings?

There is no code requirement, there are windows, standard build classroom 24' X 40' – wood frame with high and low windows for natural ventilation.

If yes, must these be designed for emergency egress purposes?

Not designed for egress but could be used in the event of an emergency

3. Are windows permitted to have security bars?

Each school district is different, if there is major construction in progress bars are used.

If yes, are the security bars required to have emergency release hardware?

4. May portable classrooms be used for other uses besides classroom use?

Yes, used for construction swing space, right now there are approx. 200 swing space classrooms of all 2,700 portable classrooms. They typically move 25-75% of portables each year.

If yes, what other uses are permitted?

AB 320 – DSA Portable Classroom Egress Study

ANSWERS PROVIDED BY: Don Rice, AIA – WLC Architects

Interview Questions for Architects

1. What criteria are used when locating portable classrooms on a school campus?

- a. Proximity to other educational programs.
- b. Distance required by CBC for side yards.
- c. Total size in floor area of adjacent occupancies.
- d. Path of travel restrictions for accessibility.
- e. Access to buildings required by local Fire Marshall.
- f. Conditions of site in terms of grade, availability of space, etc.

2. Are windows required for portable classroom buildings?

- a. Natural day lighting is always desirable regardless of building type.
- b. According to code, a classroom must be provided with at least one window.

If yes, must these be designed for emergency egress purposes?

A. Yes, if the building doesn't have at least two means of egress and is not provided with a fire sprinkler system. Refer to CBC Section 305.2.4

3. Are windows permitted to have security bars?

A. Yes. But they must have an inside release if the building isn't fire sprinkled and doesn't contain 2 exits.. Refer to question 2 above.

If yes, are the security bars required to have emergency release hardware?

- a. Refer to question 2.

4. May portable classrooms be used for other uses besides classroom use?

A. Yes, but their new use would have to be approved by DSA.

If yes, what other uses are permitted?

A. Any use that would comply with code.

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ANSWERS PROVIDED BY: Kenneth Hall – DSA Advisory Board – Torrance Fire Department

Interview Questions for Fire Department/State Fire Marshal

1. What criteria are used for determining fire department access to portable classroom buildings?

We require all-weather roads meeting the requirements of CFC Section 902.

2. Are the criteria different for temporary versus permanent portable classrooms?

No

3. Are the school districts required to meet with the fire department every time a portable classroom is located on a school site?

Yes

If yes, what about portable classrooms which are relocated on the same site?

Yes

4. Does your fire department require notification prior to each fire drill?

No

5. How often are fire drills performed at public schools?

As required by the State. Also, our Inspectors witness a fire drill during there annual inspection.

6. Are windows required for portable classrooms?

Light air and ventilation are governed by State requirements and enforced by DSA.

If yes, are these required to d be designed as emergency egress windows?
(Request code standard)

7. What criteria are utilized to permit the use of security bars on the windows?

We have not been confronted with this, however, we would follow the requirements as outlined by the State.

8. Are the security bars required to have emergency release hardware?
(Request code standard.)

To my knowledge, emergency release hardware is only required for rooms that are use for sleeping purposes.

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9. Except for automatic sprinkler and fire alarm requirements, are portable classrooms required to adhere to all other building and fire code requirements for Group E Occupancies?

Yes

10. May the portable classrooms be used for other uses beside classroom use?

If yes, what other uses are permitted?

Yes, Day Care.

ANSWERS PROVIDED BY: David Wasmund – Los Angeles County Fire Department

Interview Questions for Fire Department/State Fire Marshal

1. What criteria are used for determining fire department access to portable classroom buildings?

Title 19, Article 3, Section 3.05 and 3.16 address access to classroom buildings.

2. Are the criteria different for temporary versus permanent portable classrooms?

Access requirements are the same for temporary and permanent portable classrooms. Regarding water supply and hydrant requirements, it depends if the classroom is considered short-term (temporary- less than 24 mos., although I think this might have been changed to 36 months) or long-term. Short-term portables are not subject to water supply and fire hydrant requirements. Long -term portables are, although there are some exceptions.

3. Are the school districts required to meet with the fire department every time a portable classroom is located on a school site?

Yes, the architect for the project is required to submit a site plan to the jurisdictional fire dept. prior to constructing a portable classroom on a public school site. Supposedly, DSA won't approve construction until there is proof that this has been done (I'm not sure this is always the case though - Portable classrooms tend to crop up without our knowledge - at least it seems that way).

If yes, what about portable classrooms which are relocated on the same site?

4. Does your fire department require notification prior to each fire drill?

Notification of fire drills to the local fire agency are required.

5. How often are fire drills performed at public schools?

Title 19, Article 3, Section 3.13 covers this. Monthly drills are required for elementary and intermediate schools. High schools are required to have fire drills twice each year.

6. Are windows required for portable classrooms?

No, as best I can tell. Chap. 12 of the CA Building Code, Title 24 Part 2, Chap. 12 "Interior Environments" states that natural or artificial light can be used for Group "E" occupancies.

If yes, are these required to be designed as emergency egress windows? (Request code standard)

7. What criteria are utilized to permit the use of security bars on the windows?

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See California Building Code, Title 24, Part 2, Article 3, Section 305.2.4
There are some exceptions, but reading this section should clarify things.

8. Are the security bars required to have emergency release hardware? (Request code standard.)

See same section as stated above.

9. Except for automatic sprinkler and fire alarm requirements, are portable classrooms required to adhere to all other building and fire code requirements for Group E Occupancies?

Yes, State codes are used for public schools, Local codes can be used for private schools.

10. May the portable classrooms be used for other uses beside classroom use?

If yes, what other uses are permitted?

No, unless approved by DSA - I believe Title 24, Part 1 addresses this question. Portable classrooms on public school sites are designed to be classrooms only used for educational purposes. I have been told that they can't even be used for day care unless approved by DSA.

My best advice is to get copies of The California Code of Regulations, Title 19 and Title 24, Part 2 and Part 9 (Part 2 is the California Building Code, and Part 9 is the California Fire Code) These are the primary sources we use to enforce regulations in public school settings.

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ANSWERS PROVIDED BY: Jim Glew, Assistant Fire Marshal, Santa Monica, CA

Interview Questions for Fire Department/State Fire Marshal

1. What criteria are used for determining fire department access to portable classroom buildings?

CFC, 150' from a building, 20' wide.

2. Are the criteria different for temporary versus permanent portable classrooms?

No

2. Are the school districts required to meet with the fire department every time a portable classroom is located on a school site?

Earthquake may damage single classroom, since foundation is portable.

If yes, what about portable classrooms which are relocated on the same site?

3. Does your fire department require notification prior to each fire drill?

No

4. How often are fire drills performed at public schools?

Monthly, CFC 1303.3.3.2

5. Are windows required for portable classrooms?

Yes

If yes, are these required to be designed as emergency egress windows?
(Request code standard) No

6. What criteria are utilized to permit the use of security bars on the windows?

None, don't care.

7. Are the security bars required to have emergency release hardware? (Request code standard.)

No

8. Except for automatic sprinkler and fire alarm requirements, are portable classrooms required to adhere to all other building and fire code requirements for Group E Occupancies?

Yes

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9. May the portable classrooms be used for other uses beside classroom use?

Yes

If yes, what other uses are permitted?

Offices and adult education.

AB 320 – DSA Portable Classroom Egress Study

ANSWERS PROVIDED BY: Scott Alexander, Mobile Modular Management Corporation
Interview Questions for Manufacturers

1. What are the typical sizes of the portable classrooms?
24 feet X 40 feet
2. What criteria is used to determine the number of exit doors from the portable classrooms?
California Building Code
3. Are the portable classroom buildings required to meet the same building and fire codes of other classrooms?
Yes
4. Are the portable classrooms permitted to be altered (i.e. adding another window or door)?
Yes
If yes, what is the process for adding another door or window?
Submit plans and calculations to DSA for approval.
Would these changes require substantial structural modification to the building?
No. Portable classrooms are designed with moment resistant frames.
5. Are windows required for portable classrooms?
OPSC specifications require two 4 feet X 8 feet window
If yes, what are the requirements for size and sill height above the floor?

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ANSWERS PROVIDED BY: Chief Alan Kirkstein – LA Unified District Police Department

Interview Questions for Police Departments

1. What procedures are in place for non-fire emergencies at the schools?
Environmental Regulations would know more.
Are doors to classrooms required to be locked during these emergencies?
No regulations on whether classrooms are locked or not locked.
How often are emergency drills held?
Each school has their own procedures.
2. Are there any special site location requirements for the placement of buildings, specifically portable classrooms?
No.

ANSWERS PROVIDED BY: Robert S. Martin Lieutenant Administration Supervisor
SDUSD Police Department

Interview Questions for Police Departments

1. What procedures are in place for non-fire emergencies at the schools?
Each school in this district has a state mandated safe school plan. Within that plan are lock-down, evacuation, and parent re-unification plans to address a variety of emergencies. These are updated each year and reviewed by our department for compliance with the state established criteria.
Are doors to classrooms required to be locked during these emergencies?
Yes, that has been the direction in the training provided to administrators.
How often are emergency drills held?
The frequency varies at each site. Frequency also differs between secondary and elementary. Historically, the standard has been at least once a semester.
2. Are there any special site location requirements for the placement of buildings, specifically portable classrooms?
They are placed primarily where there is space available. This issue could be addressed by Facilities Planning, at (619) 574-1487.

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ANSWERS PROVIDED BY: Atwater Elementary School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
24 feet X 40 feet
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
No
3. How often are the portable classrooms moved? (within the same campus or to another school.)
None have been moved in 6 years.
4. What criteria is utilized to permit the use of security bars on the windows?
None.
5. Are the security bars required to have emergency release hardware?
Not used.
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
Not used.
7. Are most portable classroom buildings considered as temporary?
Yes.
8. What percentage of the portable classrooms are temporary vs. permanent?
75%.
9. How long do the portable classrooms typically stay on site?
15 years.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?
Yes.
11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

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No

12. Do all of the portable classrooms have windows?

Yes.

13. Does your school district consider the windows as a secondary means of egress?

Yes.

14. What uses are permitted in these portable classroom buildings?

Teaching stations, libraries

15. How many students/occupants are permitted in each of the portable classrooms?

20 - 30

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

When seen teachers are told.

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Yes.

If yes, how often and by whom?

Monthly head custodian.

18. What procedures do you have in place for emergency events?

- a. Fire
- b. Seismic/Earthquake
- c. Bomb Threat
- d. Gun Threat
- e. Other Acts of Violence

District has policy for these events.

19. Are the portable classrooms separated from other portable classrooms?

Yes.

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20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

State regulations.

21. Does the school district notify the fire department prior to each fire drill?

The district has a security company that monitors fire alarm 24- 7, they are called first.

AB 320 – DSA Portable Classroom Egress Study

ANSWERS PROVIDED BY: Galt High School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?

24 feet X 40 feet.

2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior).

1 portable

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?

36 feet X 40 feet – none

3. How often are the portable classrooms moved? (within the same campus or to another school.)

We are a 1 school district

4. What criteria is utilized to permit the use of security bars on the windows?

N/A

5. Are the security bars required to have emergency release hardware?

N/A

6. What types of emergency drills are required for portable classrooms with and without security bars? How often?

N/A

7. Are most portable classroom buildings considered as temporary?

Yes

8. What percentage of the portable classrooms are temporary vs. permanent?

32% permanent 68% temporary.

9. How long do the portable classrooms typically stay on site?

We currently have all portable classrooms that have been added. Our oldest portable is 20 years old. We do not currently have intentions to remove any buildings.

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10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

Yes

11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

Only in an emergency situation.

If yes, which criteria is used to permit the doors to be locked in this situation?

How are the doors unlocked in an emergency?

By the teacher's key.

12. Do all of the portable classrooms have windows?

Yes.

13. Does your school district consider the windows as a secondary means of egress?

Yes

14. What uses are permitted in these portable classroom buildings?

Classroom instruction.

15. How many students/occupants are permitted in each of the portable classrooms?

Our goal is to have a maximum capacity of 35. This number is sometimes exceeded and can be as high as 40.

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

Inspections by maintenance staff annually. All other staff are trained and aware that a path needs to be clear at all times.

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Yes

If yes, how often and by whom?

Annually by maintenance staff.

18. What procedures do you have in place for emergency events?

- a. Fire
- b. Seismic/Earthquake
- c. Bomb Threat
- d. Gun Threat
- e. Other Acts of Violence

Use the emergency plan – Galt High School, this will be used for a, b, and c emergency events.

19. Are the portable classrooms separated from other portable classrooms?

No

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

DSA Guidelines.

21. Does the school district notify the fire department prior to each fire drill?

No

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ANSWERS PROVIDED BY: El Dorado Unified School District. (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?

24 feet X 40 feet.

2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)

Yes.

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?

48 feet X 40 feet per fire code.

3. How often are the portable classrooms moved? (within the same campus or to another school.)

Rarely. Portables are occasionally moved between campuses but for the most part stay put.

1. What criteria is utilized to permit the use of security bars on the windows?

N/A

2. Are the security bars required to have emergency release hardware?

N/A

3. What types of emergency drills are required for portable classrooms with and without security bars? How often?

Not used.

4. Are most portable classroom buildings considered as temporary?

Yes.

5. What percentage of the portable classrooms are temporary vs. permanent?

55% (69 out of 125 portables).

6. How long do the portable classrooms typically stay on site?

Average is 10 years.

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7. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

Yes

8. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

9. Do all of the portable classrooms have windows?

Yes.

10. Does your school district consider the windows as a secondary means of egress?

No answer.

11. What uses are permitted in these portable classroom buildings?

Student instruction and administrative offices.

12. How many students/occupants are permitted in each of the portable classrooms?

Varies

13. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

14. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

15. What procedures do you have in place for emergency events?

- a. Fire
- b. Seismic/Earthquake
- c. Bomb Threat
- d. Gun Threat
- e. Other Acts of Violence

Each site has developed it's own emergency preparedness manual which includes all of these scenarios.

16. Are the portable classrooms separated from other portable classrooms?

Some are grouped together, some are on their own.

17. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

Handled by architect.

18. Does the school district notify the fire department prior to each fire drill?

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Each site plans their own fire drills and is responsible for notifying the fire department. Most often the fire department is involved in the planning.

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ANSWERS PROVIDED BY: Stephen Newsom, Senior Architect, California Department of Education School Facilities Planning Division

Interview Questions for School Districts

The following answers were provided by Stephen Newsom, Senior Architect, California Dept. of Education, School Facilities Planning Division.

19. What are the typical sizes of the portable classrooms?

Portable classrooms vary in size, just as permanent classrooms do, but a typical classroom is 960 s.f.

20. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)

Yes.

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?

Portable classrooms are required to follow the same code requirements for exits that permanent buildings follow, so if a classroom is larger than 1000 s.f., it requires a second exit.

21. How often are the portable classrooms moved? (within the same campus or to another school.)

Varies from district to district.

22. What criteria is utilized to permit the use of security bars on the windows?

Security bars are not part of the review by state agencies, so the individual districts establish their own criteria.

23. Are the security bars required to have emergency release hardware?

When portables are reviewed by the Division of the State Architect, windows are not considered exits, only doors are legitimate exits, just like in permanent school construction.

24. What types of emergency drills are required for portable classrooms with and without security bars? How often?

The Education Code establishes requirements for emergency drills, depending on the grade level, not the type of building. Therefore, students and staff in portables would follow the same drill requirements as someone in a permanent building. See Question 5 for security bar information.

25. Are most portable classroom buildings considered as temporary?

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Depends on the situation. Some “portables” have been in place for over 20 years. The Education Code states that they should be used for a maximum of 3 years, with a possible 3 year extension, but this is not always followed.

26. What percentage of the portable classrooms are temporary vs. permanent?

This varies from district to district and school to school.

27. How long do the portable classrooms typically stay on site?

This varies from district to district and school to school

28. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

I don't know, but this will vary from school to school.

29. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

This is a question for the school district, but the Division of the State Architect reviews the locksets proposed for portables, just as they do for permanent buildings, and a required exit should not have a function that would prevent exiting in an emergency regardless of the type of building it is.

If yes, which criteria is used to permit the doors to be locked in this situation?

How are the doors unlocked in an emergency?

As stated above, no required exit should prevent quick, easy exiting in an emergency situation, regardless of building type.

30. Do all of the portable classrooms have windows?

I would not say “All”, but I've never seen one that does not have at least one window.

If no, how many or what percentage are without windows?

31. Does your school district consider the windows as a secondary means of egress?

I hope no district considers this, because of the code requirements stated above.

32. What uses are permitted in these portable classroom buildings?

The Division of the State Architect reviews the use or occupancy of portables the same way that they review permanent building occupancies. The fire rating and number of exits required based on the proposed use is defined in the building code, regardless of the construction type.

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33. How many students/occupants are permitted in each of the portable classrooms?

This is defined by the building code, just like permanent buildings.

34. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

The district staff should be monitoring this, as well as the local fire dept.

35. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

They should, just as they would for permanent buildings.

If yes, how often and by whom?

Contact individual districts for this information.

36. What procedures do you have in place for emergency events?

- a. Fire
- b. Seismic/Earthquake
- c. Bomb Threat
- d. Gun Threat
- e. Other Acts of Violence

Contact the individual districts for this information.

22. Are the portable classrooms separated from other portable classrooms?

This varies, but the site plan is reviewed by the Division of the State Architect for code compliance. Part of this review involves size and proximity to other buildings, based on fire ratings and other factors. This review occurs for portables and permanent buildings, alike.

23. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

Local fire dept. approval and Division of the State Architect approval based on current building code requirements.

24. Does the school district notify the fire department prior to each fire drill?

Contact the individual school districts for this information.

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ANSWERS PROVIDED BY: Camino School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
960 square feet
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
Yes, 17-34

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
3. How often are the portable classrooms moved? (within the same campus or to another school.)
Very rare.
4. What criteria is utilized to permit the use of security bars on the windows?
N/A.
5. Are the security bars required to have emergency release hardware?
N/A.
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
Monthly
7. Are most portable classroom buildings considered as temporary?
No.
8. What percentage of the portable classrooms are temporary vs. permanent?
30%.
9. How long do the portable classrooms typically stay on site?
20-30 years.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?
No

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11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

No.

12. Do all of the portable classrooms have windows?

Yes

13. Does your school district consider the windows as a secondary means of egress?

No

14. What uses are permitted in these portable classroom buildings?

Classrooms

15. How many students/occupants are permitted in each of the portable classrooms?

Maybe 35

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

Monthly checklist

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

If yes, how often and by whom?

Yes, monthly by Roy Hardy.

18. What procedures do you have in place for emergency events?

- f. Fire
- g. Seismic/Earthquake
- h. Bomb Threat
- i. Gun Threat
- j. Other Acts of Violence

Note "Leave Building Action" Attachment

19. Are the portable classrooms separated from other portable classrooms?

No.

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

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21. Does the school district notify the fire department prior to each fire drill?

No.

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ANSWERS PROVIDED BY: Elverta Elementary School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
 1. 32 feet X 32 feet
 2. 23 feet X 40 feet
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)

Yes, all of them do.

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
3. How often are the portable classrooms moved? (within the same campus or to another school.)

Never.
4. What criteria is utilized to permit the use of security bars on the windows?

We do not use security bars.
5. Are the security bars required to have emergency release hardware?

N/A
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?

Fire Drill/ Lock Down/ Duck and Cover
7. Are most portable classroom buildings considered as temporary?

Permanent.
8. What percentage of the portable classrooms are temporary vs. permanent?

100% permanent.
9. How long do the portable classrooms typically stay on site?

Until they are non-usable.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

Ours are current in meeting permanent.

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11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

No.

12. Do all of the portable classrooms have windows?

Yes.

13. Does your school district consider the windows as a secondary means of egress?

Yes.

14. What uses are permitted in these portable classroom buildings?

Typical classroom activities.

15. How many students/occupants are permitted in each of the portable classrooms?

35

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

During drills the path of egress is monitored.

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Monthly inspections/ drills

If yes, how often and by whom?

The custodian administers monthly safety inspections, drills by maintenance/supervisor and assistant principal.

18. What procedures do you have in place for emergency events?

- k. Fire – monthly fire drills
- l. Seismic/Earthquake – quarterly duck and cover drills
- m. Bomb Threat – emergency exit drills monthly
- n. Gun Threat – lock down drill
- o. Other Acts of Violence – above listed drills

19. Are the portable classrooms separated from other portable classrooms?

Leonaxis and Beaumont Architectural firm surveyed and determined placement of the modulsars.

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20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

See Question 19.

21. Does the school district notify the fire department prior to each fire drill?

No, we notify the alarm company but we keep a monthly record of drills we perform, along with comments of the drill.

AB 320 – DSA Portable Classroom Egress Study

ANSWERS PROVIDED BY: Claremont Unified School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
24' X 40' and 30' X 32'
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
Yes
If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
48' X 40' and 60' X 32'
3. How often are the portable classrooms moved? (within the same campus or to another school.)
Very seldom.
4. What criteria is utilized to permit the use of security bars on the windows?
More than 2 computers in classroom.
5. Are the security bars required to have emergency release hardware?
On back window opposite door exit
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
None at this time, people in rooms with bars are shown how to operate bar release.
7. Are most portable classroom buildings considered as temporary?
Not really
8. What percentage of the portable classrooms are temporary vs. permanent?
90% permanent, 10 % portable
9. How long do the portable classrooms typically stay on site?
Forever

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10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?
- Yes
11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?
- No – they don't have locks on inside.
- If yes, which criteria is used to permit the doors to be locked in this situation?
- How are the doors unlocked in an emergency?
12. Do all of the portable classrooms have windows?
- Yes.
- If no, how many or what percentage are without windows?
13. Does your school district consider the windows as a secondary means of egress?
- Yes.
14. What uses are permitted in these portable classroom buildings?
- Regular classroom activities, computer labs
15. How many students/occupants are permitted in each of the portable classrooms?
- Up to 35
16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?
- Inspected by school personnel , SIA inspectors and Fire Marshal Inspectors
17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?
- Yes
- If yes, how often and by whom?
- Daily by custodians, annually by maintenance staff

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18. What procedures do you have in place for emergency events?
- p. Fire
 - q. Seismic/Earthquake
 - r. Bomb Threat
 - s. Gun Threat
 - t. Other Acts of Violence

All in place with District policies and procedures

19. Are the portable classrooms separated from other portable classrooms?

No

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

DSA approval, Fire Marshal approval and Architect approval

21. Does the school district notify the fire department prior to each fire drill?

Alarm company is notified

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ANSWERS PROVIDED BY: Latrobe School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?

No.

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
3. How often are the portable classrooms moved? (within the same campus or to another school.)

Never.
4. What criteria is utilized to permit the use of security bars on the windows?

None.
5. Are the security bars required to have emergency release hardware?

N/A.
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?

Evacuation/lock down/duck and cover
7. Are most portable classroom buildings considered as temporary?

Yes.
8. What percentage of the portable classrooms are temporary vs. permanent?

All.
9. How long do the portable classrooms typically stay on site?

10 plus years.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

Yes.

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11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

No.

If yes, which criteria is used to permit the doors to be locked in this situation?

How are the doors unlocked in an emergency?

With a key.

12. Do all of the portable classrooms have windows?

Yes.

If no, how many or what percentage are without windows?

13. Does your school district consider the windows as a secondary means of egress?

No.

14. What uses are permitted in these portable classroom buildings?

K-8 Classrooms

15. How many students/occupants are permitted in each of the portable classrooms?

30 plus

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

Regular maintenance/safety standards.

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

If yes, how often and by whom?

Yes, maintenance/ regular by a custodian/ daily.

18. What procedures do you have in place for emergency events?

- u. Fire – regular drills
- v. Seismic/Earthquake - drills
- w. Bomb Threat – emergency plan
- x. Gun Threat – emergency plan
- y. Other Acts of Violence

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19. Are the portable classrooms separated from other portable classrooms?
No.
20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?
21. Does the school district notify the fire department prior to each fire drill?
No.

ANSWERS PROVIDED BY: Richard Luke – Los Angeles Unified School District

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?

LAUSD has approximately 9,000 classrooms housed in portable buildings. About 4,000 of those classrooms are old “bungalow” type structures and 5,000 are conventional “portable” buildings. For the latter, the typical classroom size is 24 feet x 40 feet or 960 sq.ft. The typical building configurations are either 24 feet x 40 feet (one classroom) or 48 feet x 40 feet (double classroom)

2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)

Yes. Approximately 100 classrooms have two exit doors to the exterior.

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?

They are 24 feet x 40 feet classrooms.

Given the occupancy and the loading it has been determined that our typical 960 sq.ft. classroom does not, by code, require a second exit. When we purchase double classroom buildings, we order them with a connecting door between classrooms.

3. How often are the portable classrooms moved? (within the same campus or to another school.)

Under normal circumstances, portable classroom buildings are rarely moved from their original location. They occasionally need to be moved to accommodate planned construction on a campus as is the case for nearly 600 portable classrooms throughout the district in response to our current building program.

4. What criteria are utilized to permit the use of security bars on the windows?

Security grilles are installed on all of the permanent portable classrooms placed on LAUSD campuses. They are installed in full compliance with all local Fire Department’s regulations. Grilles are not installed on temporary portables (see question #8 below).

5. Are the security bars required to have emergency release hardware?

Each classroom has two windows, one on the exit door wall and one on the opposite wall. The window on the wall opposite the door wall is the one equipped with emergency release hardware.

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6. What types of emergency drills are required for portable classrooms with and without security bars? How often?

LAUSD does not have any specific drills exclusively for portables (with or without security grilles). Students in portable classrooms participate in the normal series of drills scheduled for the school. These are outlined in LAUSD Bulletin No. N-25, Emergency Drills and Procedures, dated 12/16/02.

7. Are most portable classroom buildings considered as temporary?

They are called “portable” but once placed they become a permanent part of a school’s classroom count. In the case of “bungalow” type buildings, some have been on a campus for as long as 50 years.

8. What percentage of the portable classrooms are temporary vs. permanent?

Classrooms used for class-size reduction and to accommodate growth are considered permanent (as stated above, we have 9,000 classrooms in this category). Classrooms used to house students during a construction project, the repair of fire damage or other emergencies would be considered temporary. The district currently has approximately 700 temporary classrooms.

9. How long do the portable classrooms typically stay on site?

Historically, portable buildings have remained on site as long as they are structurally sound. As mentioned above, for some of our older bungalow types, this can be as long as 50 years.

The district is currently involved in Phase I of a multi-phased building program. It is one of the goals of the program to replace some of our portable classroom stock with permanent structures. Consequently, it is anticipated that over the next 5 to 10 years more portable classrooms will be removed and/or moved from our campuses than has been typical in the past.

10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

The DOH (Department of Housing) portable is the portable type that has time restrictions for use. LAUSD uses this type primarily for temporary, “interim” housing. For that purpose an extension is not necessary. The district has some DOH portables that are being used for non-interim purposes. In those cases, we are trying to either (1) substitute a DSA portable and remove the DOH or (2) comply with the requirements to allow for their extended use.

The majority of the portable buildings purchased by the district are DSA approved. These do not have a time limitation for use at a site.

11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

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No.

12. Do all of the portable classrooms have windows?

Yes.

13. Does your school district consider the windows as a secondary means of egress?

Emergency egress only.

14. What uses are permitted in these portable classroom buildings?

Classrooms, office space, parent centers, professional development, libraries.

15. How many students/occupants are permitted in each of the portable classrooms?

Secondary level classrooms are loaded at 37 students / classroom. Primary level is loaded at 27 students / classroom. A class size reduction classroom is loaded at 20 students / classroom.

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

This is the responsibility of the on-site administrator. There are periodic inspections to ensure compliance (see answer to question #17 below).

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Yes

If yes, how often and by whom?

Once a year every school campus has an Annual Safety Inspection. This is a coordinated effort between the Complex Project Manager from the Facilities Division and the Safety Officer from OEHS assigned to each specific school.

In addition, a school's staff (usually its Safety Committee) performs school site inspections twice a year in compliance with OSHA's Injury Illness Prevention Program (#3202). To help in these inspections, OEHS has prepared a check list.

18. What procedures do you have in place for emergency events?

z. Fire

aa. Seismic/Earthquake

bb. Bomb Threat

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- cc. Gun Threat
- dd. Other Acts of Violence

Every school has a formal Emergency Contingency Plan that addresses the above listed events. This plan is coordinated with the Office of Emergency Services. In addition, each school posts its Emergency Evacuation Plan.

19. Are the portable classrooms separated from other portable classrooms?

Yes. The minimum distance between portable buildings is 2'-0".

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

Portable buildings are sited in compliance with the requirements of the Uniform Building Code.

Portables are typically sited a minimum of 20'-0" away from any existing structure on a campus.

When portable buildings are grouped (placed 2'-0" apart), the maximum grouping is 9 classrooms (under 9,100 sq.ft.) before a 20'-0" separation is introduced.

21. Does the school district notify the fire department prior to each fire drill?

Yes.

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ANSWERS PROVIDED BY: North Sacramento School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
36 feet X 40 feet
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
Yes

If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
36 feet X 40 feet – class size reduction
3. How often are the portable classrooms moved? (within the same campus or to another school.)
None
4. What criteria is utilized to permit the use of security bars on the windows?
Two exits
5. Are the security bars required to have emergency release hardware?
No
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
Fire drills, once a month
7. Are most portable classroom buildings considered as temporary?
Yes
8. What percentage of the portable classrooms are temporary vs. permanent?
95% permanent, 5 % temporary
9. How long do the portable classrooms typically stay on site?
Indefinite

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10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

Yes

11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

Yes

If yes, which criteria is used to permit the doors to be locked in this situation?

Doors can be located from inside and outside, and can be opened from the inside at any time.

How are the doors unlocked in an emergency?

With a key.

12. Do all of the portable classrooms have windows?

Yes.

13. Does your school district consider the windows as a secondary means of egress?

Yes.

14. What uses are permitted in these portable classroom buildings?

Instruction, support services.

15. How many students/occupants are permitted in each of the portable classrooms?

20 – class size reduction.

26-30 – regular size portables.

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

Regular inspection of classrooms

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Yes

If yes, how often and by whom?

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Custodians are instructed to report blockages to principal or myself.

18. What procedures do you have in place for emergency events?
- ee. Fire
 - ff. Seismic/Earthquake
 - gg. Bomb Threat
 - hh. Gun Threat
 - ii. Other Acts of Violence

District crisis management program SB198 – Binder at each site also addressed in District Strategies Plan.

19. Are the portable classrooms separated from other portable classrooms?

The required distance.

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

DSA regulations and the above mentioned items.

21. Does the school district notify the fire department prior to each fire drill?

We notify our notifying company (Dial One) reason being, to make sure that they receive a signal during a fire drill.

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ANSWERS PROVIDED BY: Pollock Pines School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
960 square feet (24 feet X 40 feet)
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
Yes
If yes, what size are these portable classrooms? What criteria is currently used by the school district to require (2) exits?
Anything over 1,000 sq. ft.
3. How often are the portable classrooms moved? (within the same campus or to another school.)
5-7 years.
4. What criteria is utilized to permit the use of security bars on the windows?
N/A.
5. Are the security bars required to have emergency release hardware?
N/A.
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
N/A.
7. Are most portable classroom buildings considered as temporary?
Not by our district.
8. What percentage of the portable classrooms are temporary vs. permanent?
75% / 25%.
9. How long do the portable classrooms typically stay on site?
10 –15 years.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?

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?

11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?

Only in a lock down situation

If yes, which criteria is used to permit the doors to be locked in this situation?

Dangerous or unknown condition on campus

How are the doors unlocked in an emergency?

All doors can be opened whether locked from the inside or not

12. Do all of the portable classrooms have windows?

Yes.

If no, how many or what percentage are without windows?

0

13. Does your school district consider the windows as a secondary means of egress?

No

14. What uses are permitted in these portable classroom buildings?

Teaching classes

15. How many students/occupants are permitted in each of the portable classrooms?

Never more than 40

16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?

Rooms inspected monthly

17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?

Yes

If yes, how often and by whom?

Monthly by maintenance personnel

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18. What procedures do you have in place for emergency events?
 - jj. Fire – monthly fire drills
 - kk. Seismic/Earthquake – yearly drills
 - ll. Bomb Threat - ?
 - mm. Gun Threat - ?
 - nn. Other Acts of Violence - ?

19. Are the portable classrooms separated from other portable classrooms?

Yes

20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?

Local Fire Regulations

21. Does the school district notify the fire department prior to each fire drill?

Usually

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ANSWERS PROVIDED BY: Don Haase, San Juan Unified School District

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
960 sq. ft.
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
No
3. How often are the portable classrooms moved? (within the same campus or to another school.)
Never.
4. What criteria is utilized to permit the use of security bars on the windows?
On computer rooms only but never on portables.
5. Are the security bars required to have emergency release hardware?
No.
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
In accordance with fire code.
7. Are most portable classroom buildings considered as temporary?
No.
8. What percentage of the portable classrooms are temporary vs. permanent?
13% Temporary.
9. How long do the portable classrooms typically stay on site?
Indefinite.
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?
Yes

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11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?
12. Do all of the portable classrooms have windows?
Yes.
If no, how many or what percentage are without windows?
13. Does your school district consider the windows as a secondary means of egress?
No.
14. What uses are permitted in these portable classroom buildings?
Education.
15. How many students/occupants are permitted in each of the portable classrooms?
30
16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?
17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?
If yes, how often and by whom?
18. What procedures do you have in place for emergency events?
 - oo. Fire
 - pp. Seismic/Earthquake
 - qq. Bomb Threat
 - rr. Gun Threat
 - ss. Other Acts of Violence
19. Are the portable classrooms separated from other portable classrooms?
No
20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?
Wherever needed

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21. Does the school district notify the fire department prior to each fire drill?

No

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ANSWERS PROVIDED BY: Natomas Unified School District (Individual Unknown)

Interview Questions for School Districts

1. What are the typical sizes of the portable classrooms?
960 sq. ft.
2. Do any of the portable classrooms have two exits? (i.e., two separate doors to the exterior.)
No
3. How often are the portable classrooms moved? (within the same campus or to another school.)
I've moved 7 portables in 5 years to a new high school site.
4. What criteria is utilized to permit the use of security bars on the windows?
Must have interior release.
5. Are the security bars required to have emergency release hardware?
Yes
6. What types of emergency drills are required for portable classrooms with and without security bars? How often?
Regular fire drills.
7. Are most portable classroom buildings considered temporary?
No
8. What percentage of the portable classrooms are temporary vs. permanent?
N/A
9. How long do the portable classrooms typically stay on site?
Indefinite
10. Do most portable classroom buildings obtain an extension of time beyond the three-year period?
N/A

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11. Are the exit doors serving the portable classroom buildings ever locked from the inside when students occupy the classroom?
No
12. Do all of the portable classrooms have windows?
Yes.
13. Does your school district consider the windows as a secondary means of egress?
Yes.
14. What uses are permitted in these portable classroom buildings?
Educational
15. How many students/occupants are permitted in each of the portable classrooms?
30
16. What steps are taken to ensure that the means of egress path is maintained clear and unobstructed?
Normal evacuation.
17. Does the school district perform inspections of each portable classroom to ensure that the exits are safe?
Normal fire drill procedures.
18. What procedures do you have in place for emergency events?
tt. Fire - yes
uu. Seismic/Earthquake - yes
vv. Bomb Threat - yes
ww. Gun Threat - yes
xx. Other Acts of Violence - yes
19. Are the portable classrooms separated from other portable classrooms?
Yes
20. What criteria is used to site the portable classrooms (i.e., distance from other buildings, number permitted in a row, size of yard or court outside of building, etc.)?
DSA

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21. Does the school district notify the fire department prior to each fire drill?

Yes.

APPENDIX C

OPSC PORTABLE CLASSROOM SPECIFICATIONS

EXHIBIT F

**STATE OF CALIFORNIA
Bid Specification**

**Prefabricated Relocatable Classroom Building
General Requirements**

Office of Public School Construction (OPSC)

1.0 SCOPE: This specification establishes the general requirements for a prefabricated, relocatable, clear span, 2-module classroom building. The building shall be installed on assigned site within the State of California, complete and ready for use. All costs of transportation and installation at the site, together with snow load and wind load requirements shall be included in the bid price. All of the provisions of this specification shall apply except as indicated in the Invitation for Bid (IFB).

Not in Contract: The electrical service drop and connection will be supplied by others. The school district will prepare a location on the school site that is cleared and graded. The elevation on the short axis of the 30' x 50' pad will be level. The long axis may be a maximum of 9" from level grade (diagonally).

Definitions:

Agency: The Department of General Services.

Agency Architect: Consulting architect retained by the Office of Public School Construction (OPSC). Contact OPSC at (916) 445-3160 for name and address.

Contractor: The company responsible for performance on the purchase order (contract) issued by the State. May be the same as the manufacturer.

Manufacturer: The company who manufactures the modules. May be the same as the Contractor.

OPSC: Office of Public School Construction, Department of General Services, State of California.

PD: Procurement Division, Department of General Services, State of California.

DSA: Division of the State Architect, Department of General Services, State of California.

Owner: OPSC.

IFB: Invitation for Bid.

2.0 SPECIFICATION AND STANDARDS: Specifications and standards referenced in this document in effect on the opening of the Invitation for Bid form a part of this specification where referenced.

2.1 SUBSTITUTIONS: All substitutions for specified items must be approved in writing in advance by PD and OPSC.

3.0 REQUIREMENTS:

3.1 Dimensions: Building shall consist of two modules designed so that the modules may be joined together to form a complete structure that maintains a positive alignment of floors, walls, and roof and that permits simple non-destructive detachment for future relocation. The building shall occupy an area of 960 square feet with a tolerance of minus 5 square feet. The buildings shall be 24' x 40'. All buildings shall meet the square footage requirement. Linear dimensions shall be vertical trim finish line to vertical trim finish line. Fascia and required overhangs are not included in the calculation of the area the building occupies. The entrance wall shall have a minimum 5'-0" roof overhang. The rear wall shall have a minimum 2' overhang except over rear landings where it shall be minimum 5'-0". Full length gutters and downspouts shall be furnished on the sides of each overhang and each roof edge where drainage occurs. The interior height, floor to ceiling shall be minimum 8'-6". Nothing shall protrude more than 1" below the ceiling level.

3.2 Load Criteria:

3.2.1 Modules intended for delivery to locations requiring roof live loads or wind loads greater than the minimums required by Title 24, California Code of Regulations (C.C.R.) shall meet the live load criteria established by the IFB. Building shall be clear span type except where roof live loads are 80 pounds or greater, where one column may be included in their design. All buildings must be designed to meet exposure "C" rating (Title 24) and seismic Zone 4.

3.2.2 Each module shall be capable of resisting all vertical and lateral loads during transportation and relocation. Normal industry practice for bracing modules during transportation and relocation is acceptable. When modules are assembled, joints shall be sealed with removable closing strips or another equivalent method to present a finished appearance and be permanently weatherproof. Each 12' x 40' module shall be sufficiently rigid to be jacked up at the front and back corners for relocation without damage or the module shall have lifting lugs at front and back located as required so that the module may be jacked up for relocation in one piece without additional supports of any type. Evidence of excessive bowing during the installation of the modules which, in the opinion of the Agency Architect or Structural Engineer, causes excessive working at any joint or compromises the structural integrity of the module shall be sufficient reason for rejection of the module.

3.3 Foundations:

3.3.1 All structural members below the subfloor, i.e., girders, joists, headers, blocking, shall be either steel or wood. If wood, it shall be pressure treated as specified below. Markings shall be legible on each pressure treated structural member or certification of treatment shall be supplied for each bundle.

3.3.2 All wood foundation materials below subfloor shall be pressure treated Douglas fir, except shims may be redwood or cedar. The building(s) shall be set on pressure treated Douglas fir (PTDF) plywood or pads and PTDF blocks. Pressure treated Douglas fir pads, plywood, etc., shall be verified by a Certificate of Treatment stating, "the material in this unit was treated per Uniform Building Code Standard Section 25-12".

- 3.3.3 All lumber and plywood for use in ground contact shall be pressure treated with waterborne preservative in accordance with American Wood Preservers' Association (AWPA) Standard C2 (Lumber, Timbers, Bridge Ties and Mine Ties -Preservative Treatment by Pressure Process) or C9 (Plywood - Preservative Treatment by Pressure Process), inspected in accordance with American Wood Preservers' Bureau (AWPB) Procedure LP-22 (Quality Control and Inspection Procedures for Softwood Lumber, Timber, and Plywood Pressure Treated with Waterborne Preservatives for Ground Contact), and stamped with AWPB quality mark "Ground Contact LP-22".
- 3.3.4 All lumber and plywood not used in ground contact shall be pressure treated with waterborne preservative in accordance with AWPA Standard C2 or C9, inspected in accordance with AWPB Procedure LP-2 (Quality Control and Inspection Procedures for Softwood Lumber, Timber, and Plywood Treated with Waterborne Preservatives for Above Ground Use), and stamped with AWPB quality mark "Above Ground LP-2".
- 3.3.5 The in-plant inspector shall verify that all pressure treated foundation material is cut from AWPB stamped stock and that all cuts and holes are retreated per specifications. LP-2 and LP-22 material shall be banded separately for shipment to the job site. The in-plant inspector's verification of each banded unit shall be attached to the material.
- 3.3.6 Concrete or concrete block foundations are not allowed. The footing design shall provide for shims and blocks necessary to permit installation on sites not level, but within the tolerance allowed in Section 1.
- 3.3.7 Installation shall be permitted on soil, concrete or asphalt concrete paving, having suitable design bearing capacity and 2% drainage. The buildings shall be securely fastened to the foundations. The foundations and the method of fastening shall be subject to approval by the Agency Architect and DSA. Pads shall be designed for a maximum load of 1000 PSF. Foundation pads shall not be placed on turf.

3.4 Framing:

- 3.4.1 Wood or steel studs shall be on maximum 16" centers. Wood frame construction and roof and floor sheathing shall meet the following minimum requirements:

Roof:

| | |
|--------------------------|---|
| <u>Joists</u> | Douglas Fir/Larch, No. 2 grade. |
| <u>Blocking</u> | Douglas Fir/Larch, No. 3 grade; or Hem/Fir No. 3 grade. |
| <u>Plywood Sheathing</u> | American Plywood Association (APA) rated sheathing, Exposure 1. |

Walls:

| | |
|--------------------------|---|
| <u>Studs</u> | Douglas Fir/Larch, No. 2 grade. Minimum 2" x 4" at max. 16" O.C. |
| <u>Sill (Sole Plate)</u> | Douglas Fir/Larch, No. 2 grade. |
| <u>Top Plates</u> | Double, Douglas Fir/Larch, No. 2 grade. |
| <u>Headers</u> | Douglas Fir/Larch, No. 2 grade, minimum 2-2" x 4" on edge with 1/2" APA rated plywood, Exposure 1 filler. |
| <u>Door and Window</u> | Double Stud/cripples, Douglas Fir/Larch, No. 2 grade. |
| <u>Openings</u> | |
| <u>Blocking</u> | Douglas Fir/Larch, No. 3 grade or Hem/Fir No. 3 grade. |

Floor:

| | |
|--|--|
| <u>Joists</u> | Pressure treated Douglas Fir/Larch, No. 2 grade. (Joist hangers shall be used in the design) |
| <u>Rim Joists</u> | Double, 2x min.; pressure treated, Douglas Fir/Larch, No. 2 grade, Minimum 8' lap. |
| <u>Blocking</u> | Pressure treated Douglas Fir/Larch, No. 3 grade; or Hem/Fir No. 3 Grade. |
| <u>Plywood Sheathing/ Subfloor</u> | 1-1/8" APA rated STURD-I-FLOOR 48" O.C., T & G, Exposure 1 |

3.4.2 Moisture content of framing lumber shall not exceed 19%. Framing lumber shall be stamped "S-Dry" or "MC15".

3.4.3 MSR 1650 E1.6 may be substituted for No. 2 grade if it meets the structural requirements for floor and roof members.

3.4.4 Lumber grades and machine stress-rated (MSR) lumber requirements are defined in Standard Grading Rules for Western Lumber, latest edition.

3.5 **Exterior:**

3.5.1 Siding: Exterior siding shall be medium density overlay plywood (MDO) or Duratemp plywood siding produced by Miller Redwood Company. PD and OPSC must approve alternate sidings prior to submittal of bid. The medium density overlay plywood shall be APA rated exterior type per APA 303-O/L. MDO siding shall be Simpson "Guardian", K-Ply "Royal Rough Sawn", or equivalent approved in advance and in writing by PD and OPSC. The Duratemp plywood siding shall consist of 4 layers of wood veneers and a textured oil-tempered 1/8" thick hardboard face. Product shall be APA rated exterior type. Both the MDO and Duratemp siding shall meet the following requirements:

- A. Each panel shall be identified with the grade mark of the grading association and shall meet the requirements of Product Standard PS 1-83.
- B. Siding shall be 19/32" (minimum) thick x 4' x 8' minimum with shiplap at long edges and of one of the following styles: plain, V-grooved, grooved or reverse board and batten.
- C. All panel edges and ends shall be sealed with a heavy coat of high grade exterior house primer or an aluminum primer formulated for wood before installation. All horizontal joints in siding and between skirting and siding must be flush and protected with a galvanized iron "Z" type flashing. All vertical shiplapped joints shall have 1/16" clearance between panels. A 3d or 4d galvanized finish nail may be used as a gauge between panels and left in place.

3.5.2 Moisture Barrier: All weather-exposed surfaces shall have a weather-resistive barrier to protect the interior wall covering. Such barrier protection shall be equal to that provided for in U.B.C. Standard No. 17-1 for kraft waterproof building paper or U.B.C. Standard No. 32-1 for asphalt-saturated rag felt. Barrier shall be free from holes and breaks other than those created by fasteners and construction system due to attaching of the building paper, and shall be applied over studs or sheathing of all exterior walls. Barrier shall be applied weatherboard fashion, lapped not less than 2 inches at horizontal joints and not less than 6 inches at vertical joints, including corners. Moisture barrier as described above shall not be applied to Type III (Snow Load) buildings.

- 3.5.3 Exterior Trim: All windows, corners, and door openings shall receive trim of at least 1" x 4" size. The roof edge shall receive at least 2" x 6" size. The trim shall be rough or resawn D select Douglas fir, Hem-fir, or spruce. Trim shall be sealed at all edges with polyurethane based one part (no mixing required) caulking. Caulking shall be painted to match siding or trim color unless it is the transparent type. At roof edge only, 7/16" thick minimum embossed weatherboard siding with MDO surface may be used in lieu of 2" x 6". Back of trim and fascia shall be kirk sawn to prevent cupping. At roof edge and building corners only, exposed steel roof beams and columns are acceptable in lieu of wood trim.
- 3.5.4 Skirting: Skirting shall be the same thickness and type of plywood used for siding except that plain ungrooved material shall be used where the long direction of the sheet runs horizontal. If grooved plywood is used for skirting, the grooves shall match and line up with the grooves in the siding. All edges and the bottom of the skirting shall be supported and the entire space below the building shall be closed off. Minimum 1-1/2" clearance shall be maintained from the bottom of plywood skirting to finish grade. Skirting shall not be nailed to ends of boards or edges of plywood. Minimum 18 gauge expanded galvanized metal fresh air vents or approved vandal resistant equal with a minimum net area of 7.5 square feet shall be provided.
- 3.5.5 Doors and Frames:
- 3.5.5.1 Doors and frames shall meet the requirements of ANSI (American National Standards Institute)/SDI-100-91 (Recommended Specifications-Standard Doors and Frames) for heavy duty, full flush type (Grade II, Model 1). One complete coat of metal primer shall be applied after doors are chemically treated for paint adhesion. Doors and frames shall be provided by the same manufacturer and primed and finished at the door manufacturer's facilities.
- 3.5.5.2 Doors shall be swing out type, 1-3/4" thick, fully insulated, minimum R-14 polyurethane core, with minimum 18 gauge steel face sheets. Doors shall be factory prepared and reinforced for indicated finish hardware, including reinforcement on both faces for closers. Doors for snowload buildings shall be swing in type.
- 3.5.5.3 Frames shall be pressed steel, knock down or welded type. Thickness of metal shall be minimum 16 gauge with depth to suit wall thickness. A minimum of 3 concealed anchors per jamb and adjustable floor anchor at bottom of each jamb shall be provided. Frames shall be prepared and reinforced for required hardware, including strike box and reinforcement for closers. Metal frame cavity shall be completely filled with insulation. One complete coat of metal primer shall be applied in the door manufacturer's shop after frames are chemically treated for paint adhesion.
- 3.5.5.4 Size and number of hinges shall be as recommended by door manufacturer. Hinges shall be full mortise type; solid brass or bronze, with set screw in barrel and minimum of two ball bearings. A Stanley FBB191, Hager, or equivalent approved in advance in writing by PD and OPSC may be used.
- 3.5.5.5 A closer shall be provided that is recommended by manufacturer for door size. Closer shall be Norton series 8500DA, LCN 1460 DEL or equivalent approved in advance and in writing by PD and OPSC.
- 3.5.5.6 A classroom lever handle lockset, mortise or cylindrical type with US26D finish, shall be provided. Lockset shall be Schlage D70PD or L9070 or equivalent approved in advance and in writing by PD and OPSC.

- 3.5.5.7 Threshold saddle shall be extruded aluminum, minimum 5" wide. Door shoe shall be extruded aluminum with vinyl insert. Saddle shall be PEMKO 271A or 272A or equivalent approved in advance and in writing by PD and OPSC. Door shoe shall be PEMKO 216AV or equivalent approved in advance and in writing by PD and OPSC.
- 3.5.5.8 All exterior doors shall be weatherstripped at doorjamb and head with PEMKO S88 or equivalent approved in advance and in writing by PD and OPSC.
- 3.5.5.9 Doorstop shall be Quality #44 or equivalent approved in advance and in writing by PD and OPSC.
- 3.5.6 Sealants & Caulking: Section includes joint sealants for all exterior surfaces and primers and joint backup materials and accessories. Sealants and Caulking shall comply with and be applied as noted:
- A. Comply with ASTM C1193 - Standard Guide for Use of Joint Sealants and ASTM C920 - Specification for Elastomeric Joint Sealants.
 - B. Apply all sealants in accordance with manufacturer's printed instructions.
 - C. Do not apply sealants at temperatures below 40 degrees F or when surfaces are wet.
 - D. Materials for exterior joints in vertical surfaces:
 - Sealant: Pecora Corporation Dynatrol 1-XL, single component polyurethane or approved equal.
 - Primer: Pecora Corporation P120 or approved equal.
 - Backer Rod: Denver Foam open-cell polyurethane or reticulated (soft) polyethylene rod. Use size that will compress 25% and provide ¼" sealant depth. In joints too shallow for backer rod, use a polyethylene bond-breaker tape to prevent three-sided adhesion.
 - E. Execution:
 - Clean joints and surfaces to receive sealant.
 - Remove rust, oil and grease and allow surfaces to dry completely before applying primer or sealant.
 - Mask joints as necessary to protect surfaces adjacent to joints.
 - Apply primer to steel surfaces. No primer necessary on wood surfaces.
 - Size joints in accordance with sealant manufacturer's instructions. Minimum joint dimensions: ¼" wide by ¼" deep.
 - Install backer rod with a blunt instrument; prevent puncturing surface skin.
 - Apply sealant with caulking gun using proper nozzle. Use sufficient pressure to completely fill joints and ensure full contact of sealant to joint sides.
 - After joints have been filled, tool to eliminate air pockets and voids. Dry tooling is preferred; tooling agents such as xylol may be used if necessary. Tool surface smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities.
 - Remove sealant from adjacent surfaces immediately.
 - Sealant may be painted only after completely cured (7-8 days).

3.5.7 Windows:

- A. Anodized aluminum (8040) frame 5/8" minimum dual pane window units shall be provided on opposite walls. One window shall be in the same wall and a minimum of two feet from the door. Interior window opening shall be completely cased with solid wood molding or pre-finished paneling with pre-finished trim. Window frame shall be the 50%, double sliding sash type (XOX). Glazing materials shall be:
- Exterior lite – 3/16" minimum tempered glass or laminated AS-1 glass.
 - Interior lite – 1/8" minimum clear tempered "Cardinal Glass Co., LOE² 172" or equivalent.
 - Space – Bent or sealed corner aluminum with desiccant fill.
 - Sealer – Butyl primary seal and polysulfide or silicone secondary seal.
- B. Certification-All glazing shall be certified in accordance with ASTM E-773 Test Method for Seal Durability of Sealed Insulating Glass Units) and E-774 (Specification for Sealed Insulating Glass Units).
- C. Header height shall be the same as the door. All operable sash shall have aluminum screens. Windows shall not be mounted to the exterior plywood surface.
- D. Windows shall be dual-commercial type (HS-C30) meeting requirements of the American National Standard Institution (ANSI)/American Architectural Manufacturers Association (AAMA) 101, Voluntary Specification for Aluminum Prime Windows and Sliding Glass Doors.
- E. A minimum of 6" of shingle style kraft paper flashing shall be installed around all windows. Minimum 26 gauge G.I. flashing shall be installed at head.

3.5.8 Roof:

3.5.8.1 The roofing system shall be fire retardant per U.B.C. Standards. Test results showing the roofing system will withstand the uplift of an 80-mph wind shall be submitted with the plans and specifications. Built-up roof systems are not acceptable. Roof construction shall be one of the following:

- A. Pre-finished minimum 26 gauge galvanized sheet metal over 30 pound saturated felt underlayment and minimum 1/2" CDX plywood deck. Panels shall be unpenetrated, interlocking, mechanically crimped standing seam or ribbed type. For roofs with snow loads, each lap shall have a full-length polyurethane or equivalent sealant applied.
- B. Building manufacturer's standard pre-finished, minimum 22 gauge, galvanized steel, standing seam or ribbed type, interlocking roof panels. Provisions shall be made for the control of condensation on the underside of the panels. For roofs with snow loads, each interlock shall have a full-length polyurethane or equivalent sealant applied.

3.5.8.2 Design and installation of the deck and/or roof substrate shall result in the roof draining freely. Areas where water ponds for more than 24 hours are unacceptable and shall be corrected by the manufacturer.

- 3.5.8.3** All overhangs shall present a finished appearance. Soffits shall be enclosed with no framing members visible. Soffit material shall be minimum 3/8" plywood of the same type as used for siding. If grooved material is used, grooves shall match the grooves on the exterior siding. Plywood soffit material shall be applied with long direction running parallel to the length of the building. Soffit shall be neatly and closely fitted and trimmed to cover gaps. All enclosed soffit areas shall be ventilated per the U.B.C. If an all-metal roof is employed, the bottoms of the metal roof pans are acceptable in lieu of the enclosed soffit.
- 3.5.9** Entry Stoop and Ramp:
- 3.5.9.1** Each door shall be provided with a stoop and ramp conforming to Title 24, C.C.R. Section 2-3307. The stoop and ramp structure, including handrail and wheel guides shall be prefabricated metal in sections that are demountable for moving and reinstallation at a new site. There shall be sufficient cross bracing under the ramp surface to prevent bounce or oil canning of the ramp surface. Design shall be such that height adjustment can be made at the installation site. At all site installations, the ramp shall be completely installed. The ramp shall be of sufficient length to transition from finish floor to within 1-1/2" of the grade elevation on a level site when building is set at it's lowest possible finish floor elevation. The ramp shall comply with DSA regulations and Title 24, C.C.R. before the building will be accepted by the state.
- 3.5.9.2** The ramp and landing surface shall be a minimum 12 gauge steel deck with non-skid finish applied. Non-skid finish shall be AMCO GRIP II by American Chemical Company, Monochem Dex-Coat or Monochem Floorcoat or equivalent approved in advance and in writing by PD and OPSC.
Alternate Ramp Surface: Perforated and dimpled metal decking, "Dimple Plate" by Duss Perforating Co. Inc. or equivalent may be used in lieu of solid decking with applied non-skid finish. Dimple plate shall be minimum 14 gauge steel plate with dimples on 3/4" staggered centers. Dimples shall be 1/4" high x 3/8" wide with 1/8" hole.
- 3.5.9.3** All ramp and landing surfaces shall be painted. Ramps shall have handrails on both sides. Wall mounted handrails shall be of similar construction to the integral ramp handrail.
- 3.5.9.4** Ramp and landing shall be fully skirted to the ground with the same material used for building skirt. All edges of the plywood skirt shall be supported and protected from weather. Foundation members shall be the same as those used for building foundation. Only the foundation pad resting on grade may extend beyond the outside face of the skirt by a maximum of 1".
- 3.6** Interior:
- 3.6.1** Walls: All classroom interior walls shall be vinyl-covered tackboard applied in one continuous length from floor to ceiling. The tackboard shall be industrial insulation board manufactured specifically as a substrate for vinyl covered wall panels. The board shall be asphalt free, shall have an ironed-on coating and shall have a minimum density of 16 pounds per cubic foot. The vinyl coating shall be made of virgin vinyl, weighing a minimum of 8 ounces per square yard. The coating backing shall be sheeting or non-woven fabric. The vinyl coating shall be mechanically laminated, with the long edges wrapped, to the tackboard. Tackboard shall be applied over 1/2" sheetrock or 3/8" plywood sheathing. The vinyl wall covered panel shall have a Class III flame spread rating. Care shall be taken in mounting the tackboard so that the texture of all panels will have the same orientation and color match. Tackboard shall be manufactured by Domtar Gypsum America, Chatfield-Clark, De'Cor Gravure Corporation, or equivalent approved in advance and in writing by PD and OPSC.

- 3.6.2 Suspended Acoustical Ceiling and Acoustical Panels: Ceiling that supports light fixtures or grills shall have a minimum classification of Heavy Duty per American Society for Testing and Materials (ASTM) C635 (Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings). Grid shall be direct hung in strict accordance with Title 21 C.C.R. and Title 24 C.C.R. and I.R. #47-4 issued by DSA. Acoustical panels shall be minimum 5/8" thick x 24" x 48" square edged mineral fiberboard or vinyl-faced fiberglass lay-in panels. Panels shall have a maximum flame spread index of 24 (ASTM E84) and a minimum noise reduction coefficient of 0.65. Contractor shall inspect after installation and replace exposed members with dents or defects.
- 3.6.3 Markerboard(s): Markerboards shall have minimum 28-gauge metal facing sheet with porcelain enamel finish suitable to accept dry erase felt markers. The facing sheet shall be laminated, using a hot melt adhesive, to a medium density particleboard substrate with a minimum density of 45 pounds per cubic foot. The panel shall have a foil backing, extruded aluminum molding, and chalk rail with a minimum projection of 2.75" from the face of the panel. A full-length map rail shall be provided with cork insert and end stops. The map rail and chalk rail shall incorporate a channel to wrap around the panel. Three map hooks with clips shall be provided on each panel. One 1/2" flag holder shall be provided for each classroom. Markerboards shall be manufactured by Chatfield Clarke, Tri-Best Products, Nelson Adams (NACO) or equivalent approved in advance and in writing by PD and OPSC. Care and use instructions shall be provided with each markerboard.
- 3.7 Electrical:
- 3.7.1 Lighting:
- 3.7.1.1 The Contractor shall furnish an interior fluorescent lighting system that includes the following:
- A. Overall illumination at desk level (30" above the floor) of an average of 50 foot-candles.
 - B. Clear acrylic prismatic lens.
 - C. Built-in reflector housing. Must be full length and width of the fixture.
 - D. Lamps shall be energy saving type, bi-pin rapid start, T8, 32 watt, 48", with 3500K phosphor, a CRI of 75, initial output of 2850 lumens and a minimum life expectancy of 20,000 hours. A preprinted sticker shall be provided inside each fixture indicating: "Re-lamp only with T8 32 watt lamps with 3500K phosphor."
 - E. Ballasts for fluorescent lamps shall be rapid-start energy saving high-frequency electronic type, Class P, high power factor (greater than 0.95), sound rating A, current crest factor less than 1.70, harmonic distortion less than 10%, lamp flicker less than 2% and a ballast factor of 0.85 or greater.
- 3.7.1.2 An exterior light shall be provided at each exit. Light shall be fluorescent, minimum 13 watts, surface mounted with 120-volt ballast. Lens shall be minimum 1/8" thick, gasketed, and provided with tamper-proof stainless steel screws. Light shall be Kenall 3714, Lithonia 202 2/7PL LP, Lithonia TWL 13TT or equivalent approved in advance and in writing by PD and OPSC. Exterior lights shall be controlled by a wall switch on the interior wall adjacent to the door and by a photoelectric cell mounted in a weatherproof junction box with weatherproof cover.
- 3.7.1.3 Light switches for exterior lights shall be Hubbell Premium Grade, Bryant Heavy Duty Grade, or Leviton 1221.

- 3.7.1.4** Automatic Wall Switch Sensor: Control of interior fluorescent lighting shall be by automatic wall switch sensor, Watt Stopper WI-300, or approved equal, per the following requirements:
- Passive infrared sensor shall be completely self-contained grounded switching mechanism with dual air gap relays, compatible with electronic ballasts.
 - Sensor coverage: 180 degrees.
 - Load carrying capacity: Each relay, no minimum, capable with of switching 0 to 800 watts fluorescent.
 - Built in light level feature shall be trimpot adjustable from 10 to 150 foot-candles.
 - Time delay shall be trimpot adjustable from 30 seconds to 30 minutes.
 - All adjustments shall be concealed under removable tamperproof cover.
 - In case of open circuit in the AC line such as ballast or lamp failure, sensor shall automatically switch to OFF mode.
 - Sensor shall be UL and CUL listed and have 5-year warranty.
- 3.7.2** Convenience outlets shall be specification or hospital grade. Convenience outlets, computer outlets, data junction boxes, intrusion alarm junction box, telephone/intercom junction box, and conduit shall be provided as indicated on attached "Power and Data Plan" for Types I, III, and IV and on Floor Plan for Type II buildings.
- 3.7.3** Contractor shall provide panel schedule with electrical load calculations on drawings.
- 3.7.4** An Eagle, Bryant, Slater, or Leviton clock outlet and 12" wall clock shall be installed as indicated on Floor Plan or Power and Data Plan.
- 3.7.5** All electrical wiring 110V and greater shall be in conduit systems and shall meet or exceed the requirements of National Electrical Code. Minimum conduit size shall be minimum 1/2". Conduit shall be galvanized thin wall electrical metallic tubing (EMT) or galvanized steel flex (with factory applied PVC jacket for exterior applications). All conduits shall be continuous from outlet to outlet and shall be secured in conformance with Part 3, Title 24 of the California Code of Regulations. Field bends shall be avoided wherever possible. Where bends must be made, an appropriate "Hickey" or bending machine shall be used. All conduit shall be reamed and deburred prior to installation and shall terminate in appropriate bushings or conductors.
- 3.7.6** Wiring shall be minimum #14 copper type TW, THW, THHN or THWN as applicable. Conduit fill shall not exceed requirements of Part 3, Title 24 of the California Code of Regulations. A separate grounding conductor shall be pulled throughout the entire system. Care shall be taken to avoid damage to wire or insulation during pull-in. Powdered soapstone or a pulling compounds such as "Yellow 77" lubricant shall be used if necessary.
- 3.7.7** Electrical supply connection shall be located on wall opposite door. Hook-up shall be performed by others.
- 3.7.8** Contractor shall be responsible for providing necessary connectors and conductors to ground the metal portions of the building (i.e., frame, ramp, etc.). Grounding rod, wires, and testing shall be provided by others and meet the requirements of I.R. #8-1 issued by DSA.
- 3.7.9** All electrical circuit breakers shall be identified by permanent typed or computer printed adhesive label fixed to the inside of panel.

3.8 Painting:

3.8.1 All exposed surfaces shall be painted except aluminum window frames, thresholds, and prefinished items such as HVAC equipment. All painting shall be done per manufacturer's printed instructions.

3.8.2 Exterior Wood: Wood siding, trim and skirting shall be painted with 100% ACRYLIC LATEX PAINT that meets the requirements of State Specification 8010-xxx-098 with additional requirement that it be 100% acrylic latex paint. One coat of primer and at least one finish coat shall be applied. Prime coat shall be brushed on or sprayed and back brushed into all grooves in the siding. If necessary in the opinion of the inspector, an extra coat shall be applied to all grooves so that the finish coat will have a uniform appearance. Prime coat shall be allowed to dry according to manufacturer's recommendation. Prime and finish coats shall be compatible and manufactured by the same company. Exterior fascia and trim shall be backprimed to prevent cupping.

3.8.3 Interior Trim: All trim not precoated shall be painted with two coats of 100% acrylic semi-gloss latex over primer.

3.8.4 Metal: All ferrous metal surfaces shall be painted with two finish coats over rust inhibitive metal primer. Prior to application of primer, surfaces shall be clean, dry, and free of rust, scale, grease, oil, dirt, and all other contaminants. Any surface oil and grease shall be removed by solvent wiping with mineral spirits. Acceptable metal primers are:

| | |
|---------------------------------|---|
| Ferrous Metal Primer Red Oxide: | Sherwin Williams B50NZ6 Kelley Moore 1710 Dunn Edwards 43-4 Fuller O'Brien 621-04 Sinclair 15 Ameritone 54 |
|---------------------------------|---|

| | |
|-------------------------------|---|
| White Rust Inhibitive Primer: | Sherwin Williams B50W1 Kelley Moore 1711 Dunn Edwards 43-5 Fuller O'Brien 621-05 Sinclair 14 Ameritone 13201 |
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PD and OPSC must approve other equivalent metal primers in advance and in writing before being used.

3.9 Heating, Ventilating, Air Conditioning (HVAC):

3.9.1 Heat Pumps

3.9.1.1 All work shall be in full accordance with applicable editions of American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standards and Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Standards.

3.9.1.2 Type IV buildings shall be provided with one primary and one auxiliary heat pump. All other buildings shall be provided with a single primary heat pump.

- 3.9.1.3** Contractor shall furnish and install one-piece, wall mounted, factory-assembled, precharged, prewired, tested and ready-to-operate heat pump unit(s). The unit(s) shall be approved and listed by Underwriters' Laboratories, Inc. or other nationally recognized testing organization. Performance of units shall be certified in accordance with Air Conditioning and Refrigeration Institute Standard 210/240 for Unitary Air-Source Heat Pumps, latest edition. The same company shall manufacture primary and auxiliary heat pumps. All units shall be a minimum 12 SEER, 230/208 volt, 1 phase system, and meet current energy standards.
- 3.9.1.4** The HVAC system shall maintain an automatically controlled indoor classroom temperature of 78°F in summer and 68°F in winter with a 60% relative humidity when the outdoor temperatures vary as indicated below:

| <u>Building Type</u> | <u>SUMMER</u> | <u>WINTER</u> |
|----------------------|-------------------|---------------|
| Type I | 92°F db/72° F wb | +10°F db |
| Type II | 92°F db/72° F wb | +10°F db |
| Type III | 92°F db/72° F wb | - 10°F db |
| Type IV | 114°F db/72° F wb | +10°F db |

Calculations shall be based on 32 occupants. The primary mechanical ventilation system shall provide a minimum of 15 cubic feet of outside air per minute per occupant and a minimum of 40 cubic feet of circulated air per minute per occupant at 230 volts.

- 3.9.1.5** Compressors shall be welded hermetic type with built-in thermal and over-current protective devices and a 5-year warranty on all parts.
- 3.9.1.6** Coils shall be of copper tube construction with mechanically bonded aluminum plate fins.
- 3.9.1.7** Indoor coil blower shall have a direct drive forward curved centrifugal impeller that delivers a minimum of 1350 cfm (primary heat pump) or 700 cfm (auxiliary heat pump) of air through a wet coil with an external static pressure of 0.20 esp at high speed. Twin blowers are acceptable.
- 3.9.1.8** Propeller type outdoor coil fan shall discharge horizontally and be direct driven.
- 3.9.1.9** Controls shall be factory wired and located in a readily accessible location on the unit. Fan motors shall have both thermal and current sensitive overload devices. Control circuit transformer shall be factory installed. Line voltage circuit breaker or pull disconnect with lockable cover shall be supplied on each unit and shall be easily accessible without removing any unit panels.
- 3.9.1.10** Cabinet shall be a single, enclosed, weatherproof casing constructed of minimum 20 gauge galvanized steel. Each exterior casing panel shall be finished with enamel paint prior to assembly. Cooling section shall be fully insulated with 1-inch fiberglass to prevent sweating and to muffle sounds. Openings shall be provided for power connections. Access openings for all fan motors and compressor shall be designed so that repairs and removal of internal components can be accomplished without removing the unit from its permanent installation. Full-length side mounting brackets shall be provided. Fresh air intake and outdoor coil shall be protected from intrusions by a sturdy metal grating.

3.9.1.11 Primary heat pumps shall be equipped with an internally mounted damper system that will intake a minimum of 480 cfm of outdoor air and exhaust the equivalent volume of conditioned air. System shall be electrically controlled with a minimum of four different damper settings. Damper system shall automatically open to admit outdoor air when unit is on and automatically close when unit is off or power is lost. Damper system shall be approved by U.L. or other nationally recognized testing agency. Outdoor air shall be filtered through the replaceable filtering system. Each building shall be tagged with a minimum 4" x 2" engraved plastic adhesive-backed label mounted on face of the primary thermostat with the following information:

- The OPSC recommends the replacement of the 20" x 30" x 2" pleated heat pump filter every thirty days.
- Type IV secondary unit 16" x 30" x 2" pleated filter.

Auxiliary heat pump shall have no provision for admitting outdoor air.

3.9.1.12 Primary heat pump shall have a minimum total cooling capacity of 58,500 BTU/HR with an outdoor temperature of 90°F and a returning air temperature of 80°F db/67°F wb (no outdoor air). Auxiliary heat pump shall have a minimum total cooling capacity of 23,300 btu/hr with an outdoor temperature of 115°F and a returning air temperature of 80°F db/67°F wb (no outdoor air).

3.9.1.12 For Types I, II, and IV buildings, a minimum of 10Kw electric resistive heating shall be provided on primary heat pump. The resistive heating shall be configured so that it can be changed to approximately 5 Kw capacity or 0 Kw capacity by adding or removing a few easily accessible wires. Controls shall be configured so that heat pump compressor and resistive heating can operate simultaneously. For Type III (Snow Load) buildings, a minimum of 20 Kw electric resistive heating shall be provided.

3.9.1.14 The unit shall be installed in strict accordance with manufacturer's instructions with particular attention to required flashing. Manufacturer's literature, certified ventilation tables, operating instructions and guarantee shall be delivered to the school district of child care agency at the time the building is delivered.

3.9.2 **Ductwork**

3.9.2.1 Ductwork shall be constructed of galvanized sheet metal in accordance with Uniform Mechanical Code and SMACNA Low Velocity Duct Construction Manual, latest editions. All ductwork shall be designed at .2 esp and insulated with minimum 1" thick fiberglass duct wrap with vapor barrier. A minimum of 1" duct noise attenuation material shall be provided at all ductwork within 8'-0" of HVAC unit. Air handling ducts and plenum shall be sealed in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, latest edition. Primary and auxiliary heat pumps shall each be provided with their own duct systems. Primary and auxiliary duct systems shall not be connected.

Non-Metallic Ductwork Option: In accessible concealed portions of duct system, rigid 1" fiberglass or insulated "Flexduct" with vapor barrier may be substituted for sheet metal ductwork. All ductwork within 5' of the HVAC unit and all interface connections shall be metal. Ductwork and reinforcement shall be designed for 2" static pressure. If used, ducts shall be Owens-Corning Fiberglass Duct Board, Manville Micro-Aire Type 475, or equivalent approved in advance and in writing by PD and OPSC. Non-metallic ductwork shall conform to NFPA 90-A and 90-B and SMACNA Class I rating. If "flexduct" is used, a minimum of three 12" or (2) 14" round ducts shall be required.

- 3.9.2.2 Each duct system shall be provided with 4-way throw commercial grade supply diffusers with opposed blade volume control as manufactured by Carnes, Hart & Cooley, Barber-Coleman, Kruegar, Shoemaker, Titus or Air Mate. Return air grille shall be heavy-duty bar grille with 45-degree blades similar to Carnes model RSHAH.
- 3.9.3 Thermostat: Contractor shall provide a White Rodgers 1F92 or Honeywell T8611M electronic programmable thermostat for the primary heat pump with the following functions: 5 and 2 weekday/weekend programming with minimum of 4 separate time/temperature settings per 24-hour period, keyboard lockout switch, programmable display, minimum 2 hour override, status indicated LEDs, and battery back-up or EEPROM memory. A locking clear thermostat cover with access hole for program override shall be provided. A 9-wire thermostat cable shall be supplied between thermostat and heat pump.
- 3.9.4 Auxiliary Heat Pump Timer: Contractor shall provide a 4 hour maximum manual time switch wired in series with an "Off-Heat-Cool" control switch that will allow cooling and heating by auxiliary heat pump. Timer and control switch shall be flush mounted on wall on which heat pump is hung.
- 3.9.5 Ventilation Controller: A ventilation controller shall be provided that monitors the carbon dioxide level in the classroom air and controls the ventilation by opening or closing the damper. Controller shall display CO₂ levels on a built-in display from 0-5,000 ppm. Unit shall be designed so those users can set point at which damper opens and point at which damper closes. Controller shall be initially set so that damper opens at 800 ppm and closes at 600 ppm. Unit shall be certified by the California Energy Commission and shall have a recommended calibration interval of at least 5 years. Controller shall be located on an interior wall and provided with a wire bail guard that is screwed to wall. Controller shall be Telaire 8002 or Honeywell C7242A or equivalent approved in writing by Procurement Division after June 1, 1999.
- 3.9.6 Air Balance Test: For each building type, Contractor shall perform an air balance test on a completed building. Test shall determine optimum position of diffuser dampers and position of ventilation damper that will provide 480 cfm of outside air. All buildings shall be supplied with dampers set in positions determined by test. Test shall be witnessed and verified by the inspector of record.
- 3.10 Fire Alarm and Extinguisher:
- 3.10.1 Fire Alarm: Contractor shall provide conduit and junction boxes for future connection to school fire alarm system by others. Junction boxes shall be galvanized sheet metal, square or rectangular, with blank covers. One box shall be located externally at rear of building near main electrical panel at 18" above finish floor. One square 2-gang junction box shall be located internally near exit door at 48" above finish floor for future pull station. One square 2-gang junction box shall be located at exterior front wall at minimum of 96" above finish floor for alarm horn. Finish covers shall be installed at all locations. At exterior locations, covers shall be gasketed, metal and weatherproof. Conduit shall be installed from alarm pull switch junction box to horn junction box and from junction box mounted near electrical panel to horn junction box. Conduit shall be minimum 1/2" galvanized thin wall electrical metallic tubing (EMT). Continuous pull cord shall be installed for future wire installation. Fire alarm conduit shall not be connected with any other electrical conduit.

3.10.2 Fire Extinguisher: Each portable classroom shall be equipped with one pressure type fire extinguisher with 2A10BC UL rating mounted on an interior wall near a doorway at a height of four feet. Fire extinguisher shall be totally charged and have a dial indicating the state of charge. Mounting hardware shall include a strap with quick release device to hold the extinguisher in place.

3.11 Materials and Workmanship:

3.11.1 Asbestos containing building materials that exceed State and Federal mandated safe asbestos levels shall not be used in the construction of relocatable facilities. The manufacturer shall provide a statement of compliance on the plans.

3.11.2 All materials used, unless otherwise specified, shall be new and of the types and grades specified. The Contractor shall, if requested, furnish evidence satisfactory to the Agency Architect that such is the case.

3.11.3 All workmen shall be skilled and qualified for the work that they perform. Contractor's crews assigned to any work performed under this contract shall include a competent and fully experienced person designated as the responsible person in charge. Responsible person shall be identified by name to OPSC in advance of any work. If requested, the Contractor shall furnish to the Agency Architect information relating to any employee's experience.

3.11.4 Workmanship shall be equal or better in quality to that required by the construction trades for a finished product. A quality control supervisor, designated by the manufacturer, shall review all work in progress and shall review the finished building prior to final inspection to assure it is complete and correct. The quality control supervisor shall have the authority to have materials replaced and work redone in order to correct faulty materials or workmanship.

3.12 Inspection

In-plant inspection services shall be provided by independent contractors retained by OPSC. In-plant inspection and material testing shall be accomplished under the supervision of the Agency Architect. The contractor shall notify OPSC at (916) 445-3160 and the Agency Architect at least 5 working days prior to beginning of production. The OPSC, Agency Architect and inspector shall have full access to all plant operations involving work under this contract. The inspector shall be notified in advance of the time and place of operations that the inspector wants to observe. Before the building is removed from the plant for delivery to the storage facility or from the storage facility to the site, the inspector and Agency Architect shall determine that they are acceptable and issue a written release which shall be in the form of a Verified Report (Form SSS-6). A COPY OF THE INSPECTOR'S VERIFIED REPORT INDICATING THERE ARE NO PUNCH LIST ITEMS SHALL ACCOMPANY EACH BUILDING TO STORAGE OR TO THE SITE.

3.13 General:

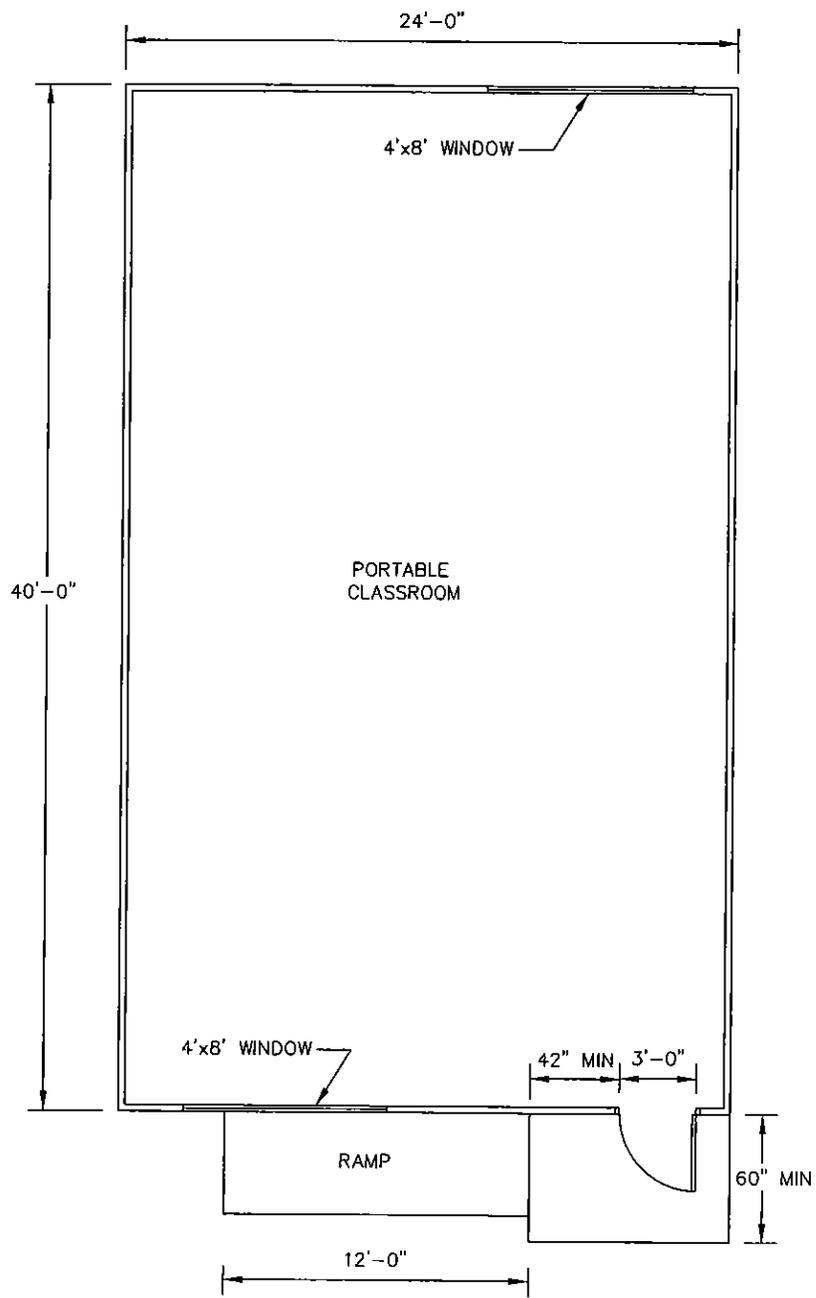
3.13.1 Energy Conservation: Building shall comply with Title 24, Part 2, and Chapter 2-53 of the California Code of Regulations. These regulations are also contained in California Energy Commission Publication P400-92-001 (Building Energy Efficiency Standards for New Buildings). Title 24 documentation shall be provided for plancheck and submittal to DSA.

- 3.13.2 Tagging: Each module shall be permanently identified with a minimum 3" x 1-1/2" stamped metal (not foil) identification tag with the following information: 1) OPSC building number, 2) Design wind load, and 3) Design roof live load. This tag may be in addition to or to be combined with the identification tag required by the Division of the State Architect. An additional tag indicating the OPSC number and the DSA number shall be installed inside the electrical panel.
- 3.13.3 Finish and base materials at each module, except roofing, carpet and suspended ceiling, shall terminate at interior module joints in a manner to join flush and tight with same material in adjacent module so that modules may be relocated with minimum cutting and patching.
- 3.13.4 Each module placed in storage for ANY length of time (either in storage yard or on site) shall be closed up in a secure and weathertight manner protecting them from all damage. Modules shall be maintained in this manner until State acceptance at designated school site.
- 3.13.5 Submittal of engineering data or drawings by the Contractor and subsequent authorization to proceed by the owner or owner's representative shall not relieve the Contractor from responsibility for compliance with all applicable specifications. Deviations from any specification is acceptable only where authorized in advance in writing by the owner or owner's representatives. Where deviations were agreed to on an earlier contract, it shall not be assumed that these deviations will be accepted on the current contract.
- 3.13.6 Color Sample Submittals: Color samples shall be submitted to OPSC for selection for all items for which there are color options. Samples shall be submitted at an appropriate time so those color requirements are incorporated into drawings or reference documents prior to construction.
- 3.13.7 Special Permits or Fees: Any special fees required by city, county, or State agencies for the delivery and/or installation of these modules shall be the responsibility of the contractor.
- 3.13.8 Production/Installation Reporting: Contractor shall be responsible for reporting weekly progress for manufacturing, delivery, and installation phases. Forms will be provided by OPSC and shall be due each Monday. After a module is physically delivered to site, contractor shall designate one person that will be responsible for notifying OPSC each day of work accomplished that day. This information shall also be reflected accurately on the weekly report.
- 4.0 Site Erection:
- 4.1 Once modules are delivered at the site, installation shall commence immediately and be pursued in a timely manner until complete. All modules called for at that site shall be scheduled for delivery and installation in one continuous time frame, at least two per week (Saturdays, Sundays and Holidays excepted). Failure to begin installation within 24 hours after delivery (Saturdays, Sundays and Holidays excepted) or failure to complete building installation to the approval of the State within ten calendar days after building delivery shall be considered a default of the Contract. The contractor shall furnish materials and equipment in ample quantities and at such times to assure uninterrupted progress of the work. Failure to provide adequate working force or material of proper quality, or failure in any other respect to prosecute the work specified herein shall be grounds for declaring default on the contract.

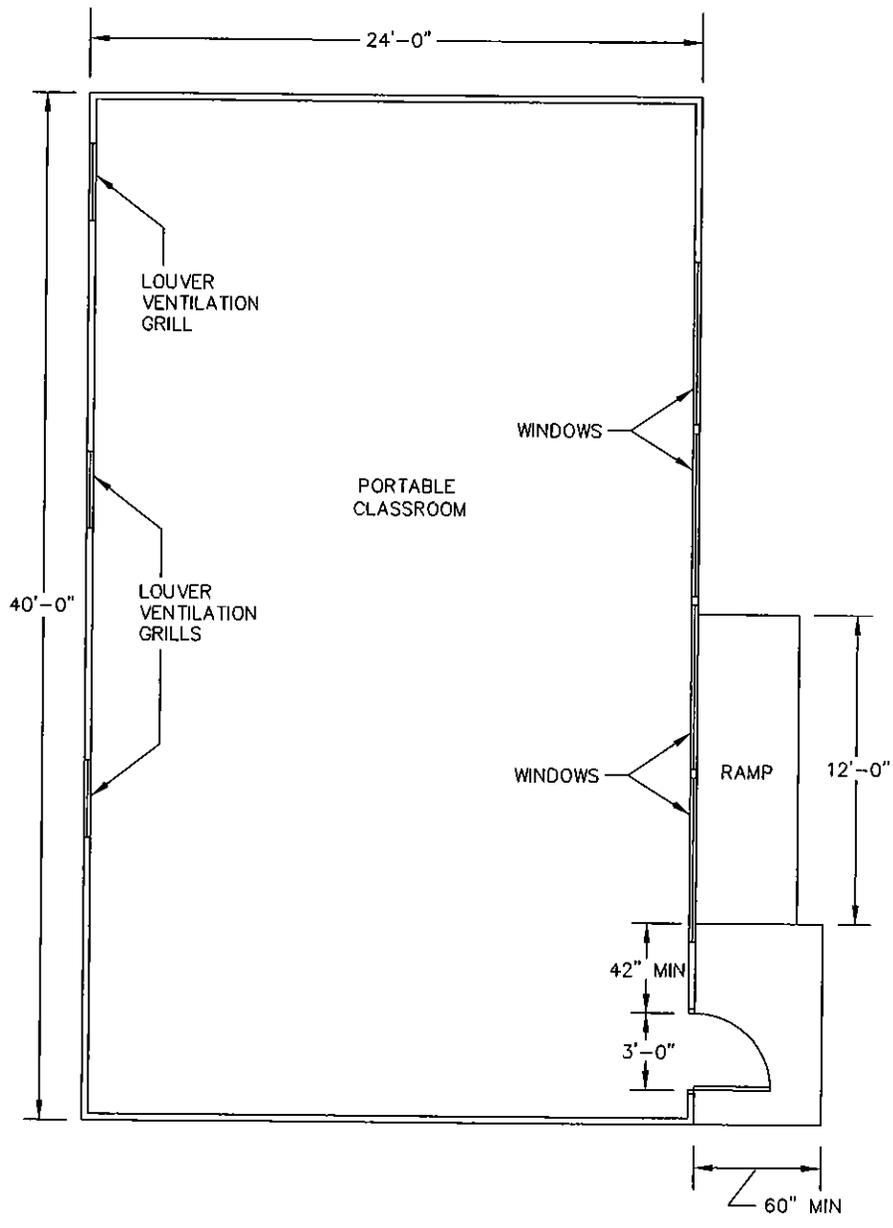
- 4.2 Security of the buildings against vandalism is the sole responsibility of the contractor until installation of the buildings, according to the terms of this contract, has been completed and the buildings have been accepted by the State or accepted for occupancy by the School District with State approval. The Contractor shall lock up all materials and equipment at the end of the day's work. All scrap material shall be removed from the site at the end of each day's work. The building site and the building shall be clean and ready for occupancy prior to acceptance by the State.
- 4.3 Coordination of Work and On-Site Inspection: It shall be the Contractor's responsibility to make all necessary arrangements with the School District's Authorized Representative for access to grounds and removal of equipment, if necessary. The representative's name and address is available from OPSC. This contact shall be made at least 48 hours prior to delivery of any module. The site inspector hired by the district shall do on-site inspection. All work, which the manufacturer or his subcontractors perform at the site, shall be subject to the inspection of the site inspector. The manufacturer shall furnish the site inspector with a full set of approved plans and such information as may be necessary to keep him fully informed as to progress of work and dates when site work will occur. The contractor shall notify DSA and the District's designated Inspector/Inspection Agency at least 48 hours prior to commencing work. **THE CONTRACTOR SHALL VERIFY THAT THE DISTRICT'S SITE IS READY TO RECEIVE THE CLASSROOM (S) PRIOR TO THE DELIVERY OF ANY CLASSROOM (S) BY VISITING EACH SITE.** In the event buildings are delivered to any site that is not in condition to receive buildings, the contractor shall be responsible for all costs incurred including, but not limited to, INSPECTOR'S time.
- 4.4 Temporary Facilities: Contractor shall make arrangements for and provide his own temporary water, electric light and power, field office, corporation yard, parking and toilet facilities as may be required for each of the sites.
- 5.0 GUARANTEE: Contractor shall unconditionally guarantee that work will be done in accordance with requirements of contract, and that the work will remain free of defects in workmanship and materials for a period of one year from date of acceptance by the State. Contractor shall agree to repair or replace any and all work, together with any other adjacent work which may have been damaged or displaced in so doing, that may prove to be not in accordance with requirements of contract or that may be defective in its workmanship or material within guarantee period specified, without any expense whatsoever to the State. Contract bonds shall be in full force and effect during guarantee period. Within ten calendar days after being notified in writing by the agency of any work not in accordance with requirements of contract or any defects in the work, contractor shall commence and prosecute with due diligence all work necessary to fulfill terms of this guarantee, and to complete the work within a reasonable period of time. In the event the contractor fails to comply, the agency shall proceed to have such work done at contractor's expense and contractor shall pay cost thereof upon demand. State shall be entitled to all costs, including reasonable attorney's fees, necessarily incurred upon contractor's refusal to pay above costs.

APPENDIX D

TYPICAL FLOOR PLANS FOR PORTABLE CLASSROOMS



TYPICAL FLOOR PLAN FOR OPSC PORTABLE CLASSROOM
 SCALE: N.T.S.



TYPICAL FLOOR PLAN FOR NON-OPSC PORTABLE CLASSROOM
 SCALE: N.T.S.

APPENDIX E

SECURITY GRILLES AND SCREEN PHOTOGRAPHS



Non-OPSC portable classroom with security screens.



OPSC portable classroom with security screens.



Non-OPSC portable classroom with security screens.



Non-OPSC portable classroom with security screens.



Emergency Release Device



Emergency Exit With Emergency Release Device

APPENDIX F

**PORTABLE CLASSROOM WITHOUT EMERGENCY RELEASE DEVICE
PHOTOGRAPHS**



OPSC Type portable classroom without emergency release device.



Portable classroom without emergency release device and emergency exit sign.

APPENDIX G

SAMPLE EMERGENCY PREPAREDNESS MANUAL



**EMERGENCY
PREPAREDNESS
MANUAL**

**FOR
CLASSROOM TEACHERS**

**This document is of extreme importance.
It contains specific instructions to be followed in the
event of real or potential disasters.**

Review contents and keep for instant access and review.

**WHEN YOU MUST HAVE HELP IMMEDIATELY
AND YOU CANNOT CONTACT YOUR PRINCIPAL . . .**

- 1. DIAL 9-1-1 OR 9-9-1-1**
- 2. STATE YOUR EMERGENCY**
- 3. GIVE YOUR NAME AND ADDRESS**
- 4. BE PREPARED TO ANSWER QUESTIONS IN
A CLEAR, CALM MANNER**
- 5. REMAIN ON THE TELEPHONE. DO NOT HANG UP
UNTIL THE DISPATCHER SAYS THAT YOU MAY.**

WHEN TO DIAL 9-1-1

TEACHER RESPONSIBILITIES

- Teach emergency procedures to all students and review the evacuation plans for your classroom at the beginning of each quarter.
- Participate in emergency drills in a manner that conveys to all students the necessity for following procedures.
- Identify students in your classroom who would require special assistance in the event of an emergency. Assign someone to be responsible for assisting these students.
- After each evacuation drill, allow a few minutes of class time to review how the students followed procedures and participated in the drill. Discuss what students should do if they were not in a class setting during an evacuation, i.e., cafeteria, media center, home, to/from school, etc.
- All personnel are required to stay on campus to assist in emergency procedures until dismissed by site administration.

TEACHER SAFETY

- Keep door locked when working in classroom either before or after regular school day.
- Make sure that someone knows you are on campus.
- Know how you will communicate your need for assistance in case of emergency.
- Know your school code.

TEACHER RESPONSIBILITIES/TEACHER SAFETY

- **RETURN TO OR REMAIN IN THE BUILDING.**
- **DO NOT LEAVE BUILDING UNTIL TOLD TO SO.**
- **WHEN NOTIFIED, EVACUATE THE BUILDING.**
- **STAY WITH YOUR CLASS.**
- **TAKE ROLL AND REPORT MISSING/INJURED STUDENTS.**
- **IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR ADMINISTRATOR.**
- **IF EVACUATION OCCURS BETWEEN INSTRUCTIONAL PERIODS, MEET YOUR NEXT CLASS.**

FLOOD

- **KEEP STUDENTS IN THE CLASSROOM.**
- **IF INCIDENT OCCURS BETWEEN INSTRUCTIONAL PERIODS, MEET YOUR NEXT CLASS.**
- **CLOSE ALL DOORS, WINDOWS AND DRAPES.**
- **NOTIFY ADMINISTRATION OF INCIDENT.**
- **HOLD STUDENTS UNTIL NOTIFIED TO DISMISS THEM.**
- **REPORT INJURED STUDENTS TO THE ADMINISTRATOR.**
- **IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR ADMINISTRATOR.**
- **KNOW YOUR SCHOOL CODE.**

RIOT/CIVIL DISORDER/THREATENING INDIVIDUALS

- IF NOTIFIED, EVACUATE THE BUILDING.
- STAY WITH YOUR CLASS.
- TAKE ROLL AND MAKE LIST OF ABSENT/INJURED STUDENTS.
- REPORT MISSING OR INJURED STUDENTS TO ADMINISTRATOR.
- DO NOT TOUCH ANY SUSPICIOUS OBJECTS. REPORT THEIR LOCATION TO ADMINISTRATOR.
- DO NOT USE ANY ELECTRICAL DEVICES SUCH AS RADIOS OR WALKIE-TALKIES.
- DO NOT ENTER BUILDING UNTIL TOLD TO DO SO.
- IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR SITE ADMINISTRATOR
- IF EVACUATION OCCURS BETWEEN INSTRUCTIONAL PERIODS, MEET YOUR NEXT CLASS.
- KNOW YOUR SCHOOL CODE.

BOMB THREAT

- FOLLOW DIRECTIONS FROM THE INTERCOM SYSTEM.
- EVACUATE THE BUILDING WHEN ALARM SOUNDS.
- TAKE ROLL AND MAKE LIST OF ABSENT/INJURED STUDENTS.
- REPORT INJURED OR MISSING STUDENTS TO ADMINISTRATOR.
- STAY WITH YOUR CLASS.
- IN THE EVENT STUDENTS MUST BE MOVED FURTHER AWAY FROM THE BUILDING THAN REGULAR ASSIGNED AREA, MAKE SURE ALL STUDENTS IN YOUR CHARGE STAY TOGETHER.
- MOVE AS DIRECTED BY ADMINISTRATOR.
- IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR ADMINISTRATOR.
- IF ANY OF THESE EMERGENCIES OCCUR BETWEEN INSTRUCTIONAL PERIODS, MEET YOUR NEXT CLASS.

HAZARDOUS MATERIALS

- **WARNING BY SOUND OR SIGHT. GIVE COMMAND: DROP - COVER - HOLD.**
- **ALL PERSONS SHOULD IMMEDIATELY CROUCH UNDER DESKS/TABLES WITH HEAD DOWN, HANDS CLASPED ON DESK OR AT BACK OF NECK AND FOREARMS COVERING EARS, WITH BACKS TOWARD NEAREST WINDOW.**
- **DO NOT SOUND FIRE ALARM, UNLESS THERE IS A FIRE. INFORM OFFICE BY PHONE OR MESSENGER.**
- **STAFF MEMBER MUST ASSESS DANGER TO STUDENTS UNDER HIS/HER CONTROL IF DANGER OF:**
 - A. **FURTHER EXPLOSION**
 - B. **FIRE**
 - C. **UNSAFE BUILDING****FOLLOW FIRE EVACUATION PROCEDURE. MOVE STUDENTS UNTIL EITHER DISTANCE OR COVER INSURES SAFETY.**
- **TEACHERS HAVE THE RESPONSIBILITY OF KEEPING ALL STUDENTS AND PERSONNEL OFF ACCESS ROADS WHICH MAY BE NEEDED FOR MOBILE FIRE TRUCKS, AMBULANCES, ETC.**
- **TAKE ROLL AND MAKE A LIST OF ABSENT/INJURED STUDENTS.**
- **RENDER FIRST AID, IF NECESSARY.**

EXPLOSION/FALLEN AIRCRAFT

- **SURPRISE ATTACK, WARNING: INTENSE FLASH OF LIGHT, SOUND OR SHOCK WAVE.**
- **TEACHER SHOULD GIVE COMMAND: DROP - COVER - HOLD**
ALL PERSONS SHOULD IMMEDIATELY CROUCH UNDER DESKS/TABLES
WITH HEAD DOWN, HANDS CLASPED ON DESK OR AT BACK OF NECK
AND FOREARMS COVERING EARS, WITH BACKS TOWARD NEAREST
WINDOW.
- **WHEN SHOCK WAVE PASSES (MAY TAKE AS LONG AS THREE MINUTES)**
DRAW CURTAINS. IF ROOM HAS SUFFERED ENOUGH DAMAGE
TO MAKE IT DANGEROUS FOR STUDENTS TO REMAIN, MOVE INTO
HALLS OR NEAREST GYM. DO NOT GO OUTSIDE UNTIL ADMINISTRATION
SAYS IT IS SAFE TO DO SO.
- **WITH SHORT WARNING, ATTACK IMMINENT, WARNING: TAKE COVER.**
- **TAKE COVER WARNING: REPEATED SHORT TONES ON THE REGULAR**
BELL SYSTEM.
- **ACTION:**
 - A. **CLOSE ALL CURTAINS.**
 - B. **ALL STUDENTS WILL MOVE INTO ENCLOSED HALLS AND**
SIT DOWN OR REMAIN IN CLASSROOM, AS APPROPRIATE.
 - C. **TEACHERS WILL REMAIN WITH CLASSES.**
 - D. **ALL DOORS (CLASSROOMS, HALLS, FIRE DOORS, ETC.)**
WILL BE CLOSED.
 - E. **REMAIN UNTIL PRINCIPAL DIRECTS FURTHER ACTION.**
- **WITH EARLY WARNING: PRINCIPAL ORDERS GO HOME.**
STUDENTS WILL BE ESCORTED BY SUPERVISING PERSONNEL TO
BUSES OR PARKING LOT.

NUCLEAR ATTACK

- UPON DETECTING A FIRE, PHONE (OR SEND MESSENGER WITH) THE LOCATION OF THE FIRE TO THE OFFICE.

OFFICE STAFF WILL NOTIFY THE:

A. FIRE DEPARTMENT, TELEPHONE 9-1-1 OR 9-9-1-1

B. HAYWARD POLICE OR SHERIFF'S DEPARTMENT,
TELEPHONE 9-1-1 OR 9-9-1-1

- EXTINGUISH SMALL FIRES, IF SAFE. KEEP STUDENTS CLEAR OF AREA.
- EVACUATE THE BUILDING VIA ROUTE ON FIRE DRILL MAP.
- ASSEMBLE WELL CLEAR OF THE FIRE.
 - A. KEEP CLEAR OF ANY FIRE FIGHTING EQUIPMENT.
 - B. KEEP STUDENTS AND PERSONNEL OFF ACCESS ROADS.
- TAKE ROLL AND MAKE A LIST OF INJURED AND/OR ABSENT STUDENTS.
- REPORT MISSING OR INJURED STUDENTS TO ADMINISTRATOR.
- FURTHER ACTION WILL BE DETERMINED BY THE PRINCIPAL OR SUPERINTENDENT.
- DO NOT ENTER BUILDINGS UNTIL TOLD TO DO SO.
- IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR ADMINISTRATOR.
- IF FIRE OCCURS BETWEEN INSTRUCTION PERIODS, MEET YOUR NEXT CLASS.

FIRE

IF INSIDE BUILDING

- **THE WARNING IS WHEN THE EARTH BEGINS TO SHAKE. OCCASIONALLY THIS IS PRECEDED BY A LOW PITCHED RUMBLING NOISE.**
- **TEACHER SHOULD GIVE COMMAND: DROP - COVER - HOLD**
- **ALL PERSONS SHOULD IMMEDIATELY CROUCH UNDER DESKS/TABLES WITH HEAD DOWN, HANDS CLASPED ON DESK OR BACK OF NECK AND FOREARMS COVERING EARS, WITH BACK TOWARD NEAREST EXIT OR WINDOW.**
- **EVACUATE BUILDING VIA ROUTE ON EARTHQUAKE DRILL MAP.**
- **ASSEMBLE IN DESIGNATED EVACUATION AREA.**
- **DO NOT ENTER BUILDINGS UNTIL TOLD TO DO SO.**
- **AVOID FALLEN WIRES.**
- **KEEP CLEAR OF ACCESS ROUTES AND EMERGENCY EQUIPMENT.**
- **TAKE ROLL AND REPORT MISSING/INJURED STUDENTS.**
- **RENDER INITIAL FIRST AID, IF NECESSARY.**
- **STUDENTS SHOULD REMAIN IN A GROUP UNDER SUPERVISION UNTIL NOTIFIED TO RE-ENTER BUILDING OR GO HOME. IF THE PRINCIPAL ORDERS GO HOME, STUDENTS WILL BE ESCORTED BY SUPERVISING PERSONNEL TO BUSES OR PARKING LOT.**

IF OUTSIDE BUILDING

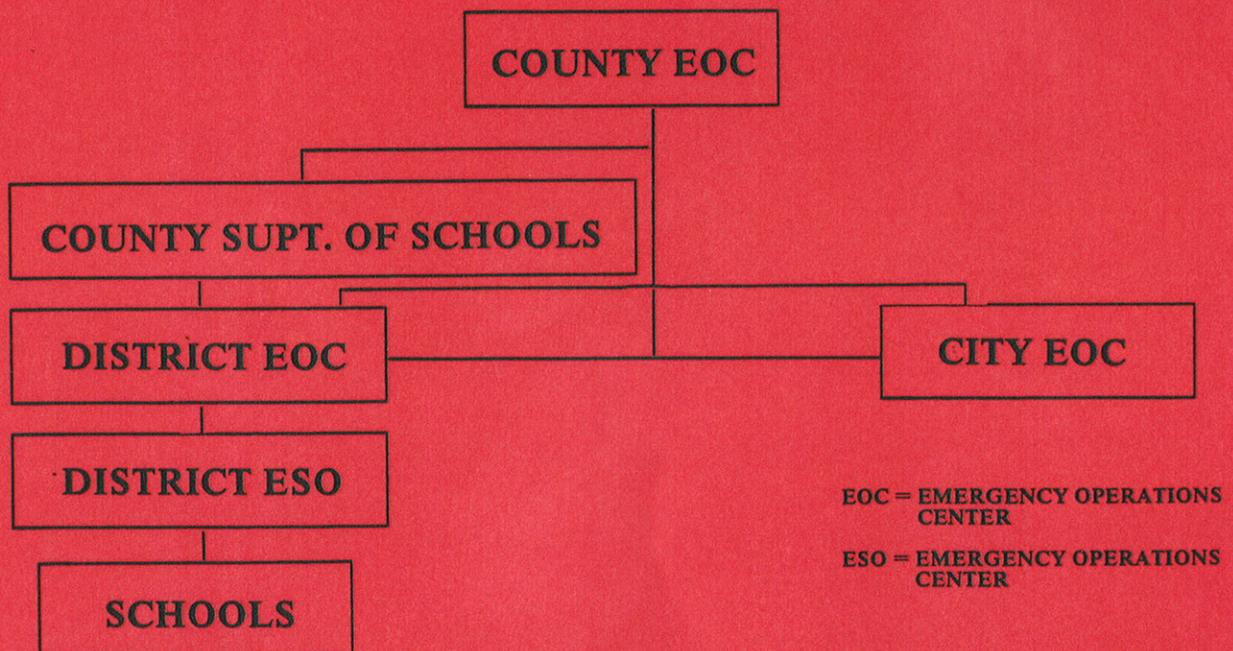
- **STAY OUTSIDE AND STAY CALM.**
- **STAY IN THE OPEN AND ASSEMBLE IN DESIGNATED EVACUATION AREA.**
- **DO NOT ENTER BUILDING UNTIL TOLD TO DO SO.**
- **IF YOU ARE ON A PREPARATION PERIOD, REPORT TO YOUR ADMINISTRATOR.**
- **IF EARTHQUAKE OCCURS BETWEEN INSTRUCTIONAL PERIODS, MEET YOUR NEXT CLASS.**

EARTHQUAKE

OTHER EMERGENCIES — SEVERE STORMS, WIND, ETC.

- RETAIN THE STUDENTS IN THE CLASSROOM UNTIL THE NATURE AND EXTENT OF THE DAMAGE IS JUDGED; THEN STAFF AND STUDENTS WILL BE NOTIFIED OVER THE INTERCOM OR BY MESSENGER AS TO ANY ACTION NECESSARY.
- SHOULD THERE BE EXTENSIVE DAMAGE TO THE SURROUNDING AREA, THE SCHOOLS COULD BE ORGANIZED AS EMERGENCY CENTERS AND THE STAFF MAINTAINED UNTIL THE CENTER IS NO LONGER NEEDED.
- THE ADMINISTRATORS WOULD AUTOMATICALLY BECOME EMERGENCY CONTROL CENTER DIRECTORS, AND ALL STAFF MEMBERS WOULD BE ASSIGNED TO THAT CENTER.

STAFFING PATTERN:



OTHER EMERGENCIES

APPENDIX H
STATISTICAL FIRE DATA

CHAPTER 2 - STATISTICAL ANALYSIS

2.1 The Overall Fire Problem

Table 2.1 provides a ranking of the overall fire death rate in the United States, by state. In 1996, the most recent year for complete statistics, California experienced approximately one third fewer fire fatalities than the national average. This ranking is based on the total number of deaths related to fires in all occupancies and does not necessarily reflect the trend associated with fires in educational facilities. Table 2.1 provides a comparison of the overall fire problem by state.

Table 2.1 - Rank Order of States by Fire Death Rate in 1996 (National)

| <i>State</i> | <i>Rate</i> | <i>State</i> | <i>Rate</i> |
|---------------|-------------|----------------|-------------|
| Hawaii | 3.4 | North Dakota | 15.6 |
| Utah | 5.5 | Virginia | 16.2 |
| Idaho | 5.9 | Ohio | 16.4 |
| California | 6.0 | Iowa | 17.2 |
| Wisconsin | 6.8 | Kansas | 17.4 |
| Florida | 7.8 | Oregon | 17.5 |
| Colorado | 7.9 | Pennsylvania | 18.8 |
| Rhode Island | 8.1 | South Dakota | 19.0 |
| Wyoming | 8.3 | Georgia | 20.6 |
| Washington | 9.2 | Michigan | 21.1 |
| Arizona | 10.1 | Montana | 21.7 |
| Nevada | 10.6 | Oklahoma | 23.7 |
| Minnesota | 10.8 | West Virginia | 24.7 |
| New Jersey | 10.9 | Arkansas | 25.1 |
| Nebraska | 10.9 | Illinois | 25.3 |
| Connecticut | 11.0 | Louisiana | 25.6 |
| New Mexico | 11.7 | North Carolina | 26.1 |
| New York | 12.0 | Delaware | 30.4 |
| Maryland | 12.3 | Alabama | 32.2 |
| Indiana | 12.5 | Tennessee | 32.6 |
| Massachusetts | 13.1 | Kentucky | 35.5 |
| Maine | 13.7 | South Carolina | 36.9 |
| Missouri | 13.8 | Mississippi | 36.9 |
| Texas | 13.9 | Washington DC | 40.8 |
| Vermont | 15.3 | Alaska | 49.6 |
| New Hampshire | 15.5 | US AVERAGE | 18.8 |

USFA - National Fire Data Center

Figure 2.1 provides a national picture of fire deaths by state. The states depicted in the lighter blue shade fall at or below the national average, while those states in the darker red shade have a higher fire death rate than the national average. Based on this information, it appears that specific regions of the United States experience similar fire death rates. In 1996, a majority of the southeastern states ranked above the national average. This phenomenon is addressed in greater detail in the "Relation Between Statistics and Code Analysis" section of the report (Section 3.5).

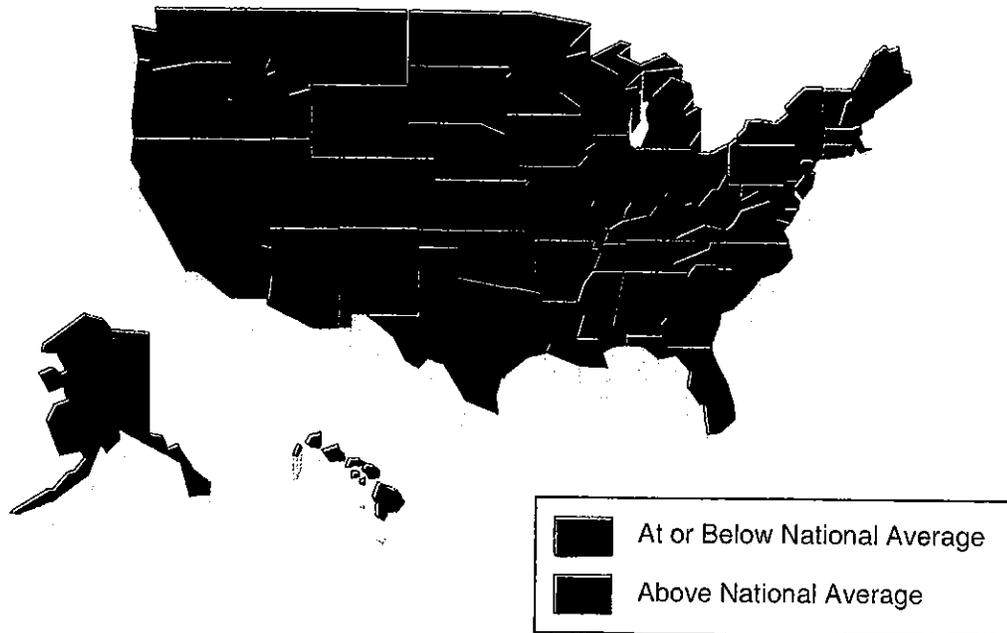


Figure 2.1 - Fire Death Rate by State (1996, Nationwide)

2.2 Educational Facilities

Educational fire statistics may include data for a number of incident types (e.g., structural, exterior, vehicle, refuse, explosion) and facility types (e.g., non-residential schools, residential [boarding] schools, vocational/-trade schools, universities/colleges). The primary focus of this study is on structural fires in Kindergarten through high school (K-12) facilities.

2.2.1 Structural Fires

This section presents the statistical data and comparison of structural fires in the nation as well as California.

2.2.1.1 Nationwide Data

The number of reported structural fires in educational properties nationwide decreased between 1980 and 1990. Figure 2.2.1.1(a) displays the yearly fire totals (rounded) and shows an overall decline of approximately 8,100 fires per year¹. This results in a decrease of approximately 54 percent in the number of structural fires per year (1980 to 1990). The data from 1990 through 1997 depict a constant average of approximately 7,800 fires per year. The overall variation in the number of fires between 1980 and 1997 is a decrease in fire occurrences of approximately 48 percent.

¹ 15,100 fires in 1980; 7,000 fires in 1990

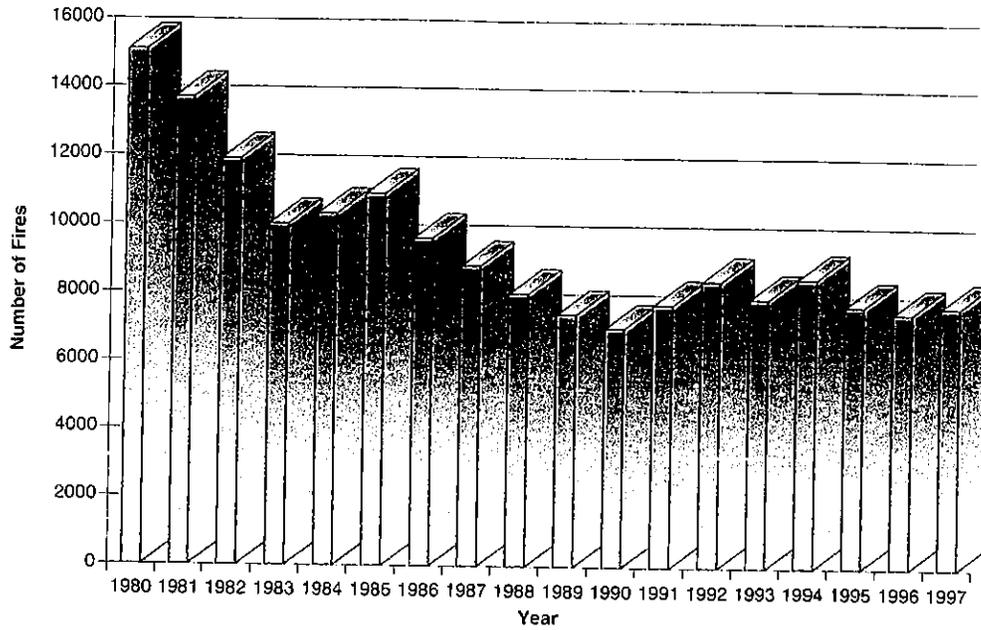


Figure 2.2.1.1(a) - Number of Structural Fires in Educational Properties (1980-1997, Nationwide)

In 1999, the NFPA reported an annual average of approximately 8,500 structural fires in educational occupancies in the United States (Figure 2.2.1.1(b)). These fires accounted for 1.6 percent of all structural fires that year.

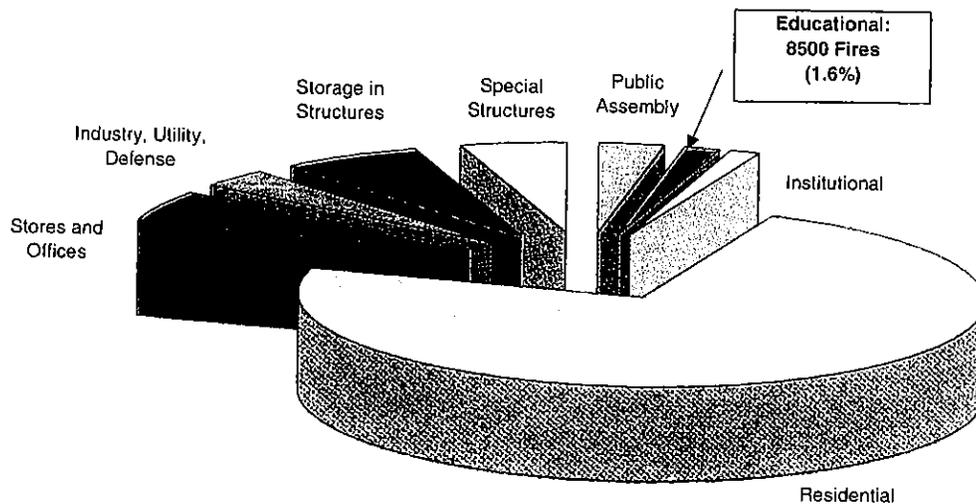


Figure 2.2.1.1(b) - Number of Structural Fires (1999, Nationwide)

Figure 2.2.1.1(c) provides a breakdown of the property loss associated with these structural fires. The estimated average direct property loss from the 8,500 educational structural fires occurring in 1999 was \$71 million. This accounts for 0.8 percent of the total property loss from all structural fires in the United States during that year.

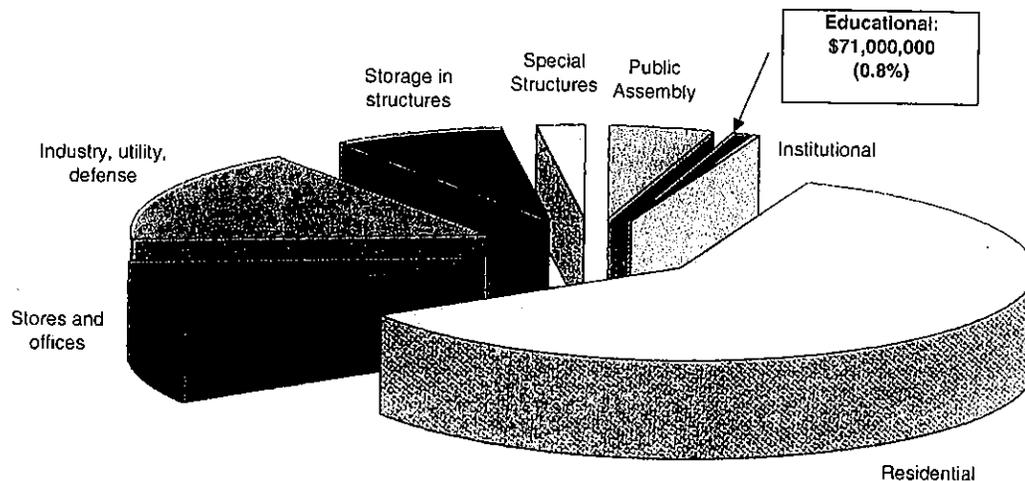


Figure 2.2.1.1(c) - Property Loss (\$) of Structural Fires (1999, National)

2.2.1.2 California Data

As was the case nationally, the number of reported structural fires in educational properties in California has decreased in recent years. Figure 2.2.1.2 (following page) displays the yearly fire totals and shows an overall decline- from 925 fires in 1980 to 413 fires in 1993. This results in a decrease of approximately 55 percent in the number of structural fires per year in educational facilities during that period.

2.2.1.3 Comparison between California and the Nation

Figures 2.2.1.1(a) and 2.2.1.2 show a declining trend in the number of fire incidents occurring nationally and in California. Figure 2.2.1.3(a) compares the trend in fire occurrence rates between 1980 and 1993 in the nation and California. Nationally, there was a decrease of approximately 48 percent in the number of structural fires in educational facilities during this period, while there was a decrease of approximately 55 percent for structural fires in educational facilities in California.

Figure 2.2.1.3(a) shows the declining trend in the number of fire incidents and the similarity in this trend between the California and the nation.

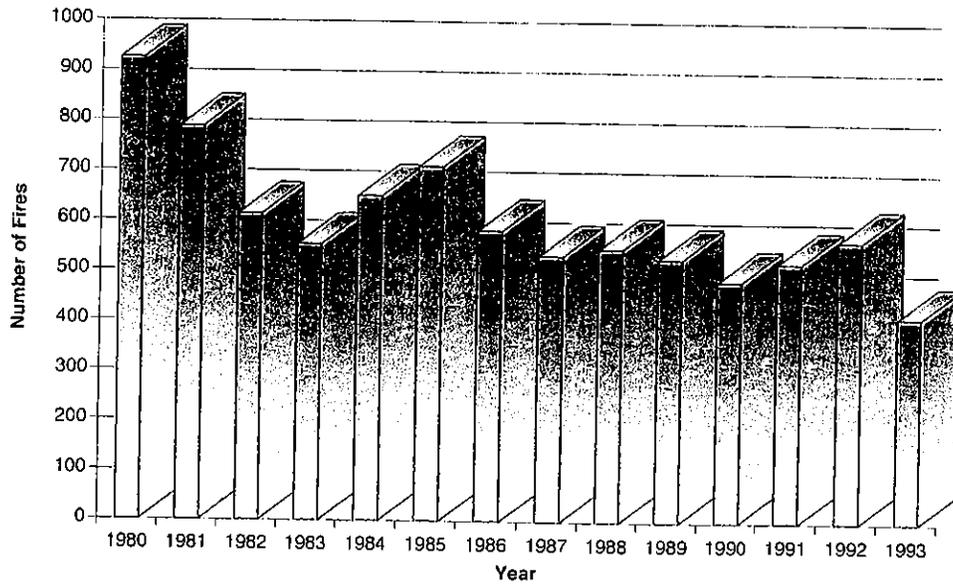


Figure 2.2.1.2 - Number of Structural Fires in Educational Properties, by Year (1980-1993, California)

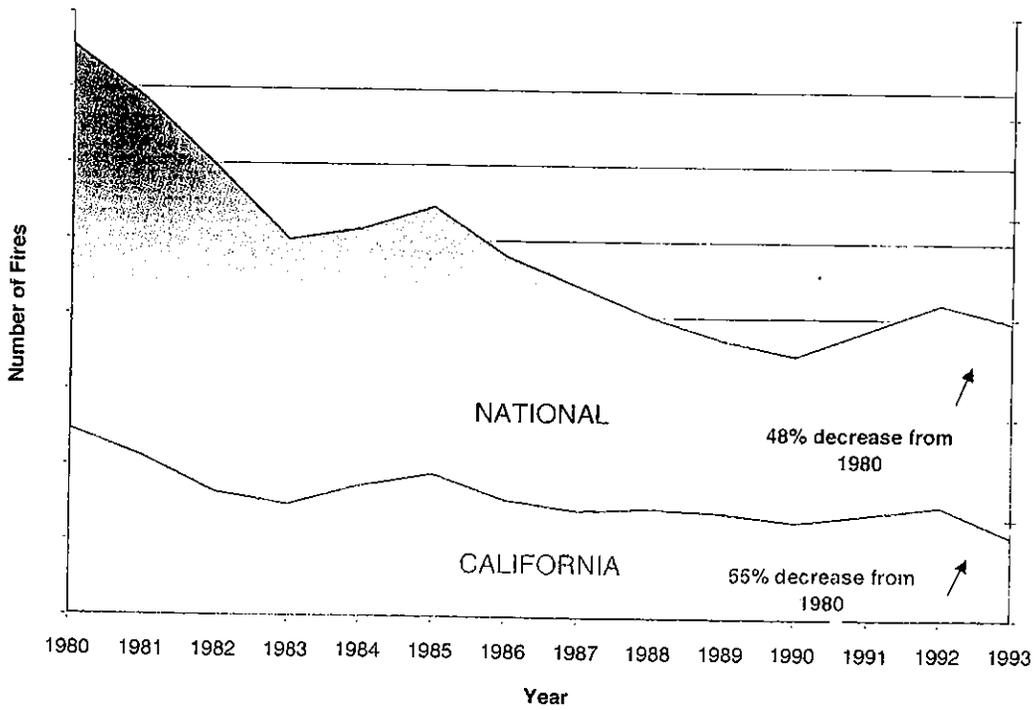


Figure 2.2.1.3(a) - Comparison of Structural Fires in Educational Properties (1980-1993)

Figure 2.2.1.3(b) provides linear trendlines corresponding to the values presented in Figure 2.2.1.2(a). The slopes of the trendlines indicate that the rate of decrease in the number of fires for California is consistent with the national fire occurrence data.

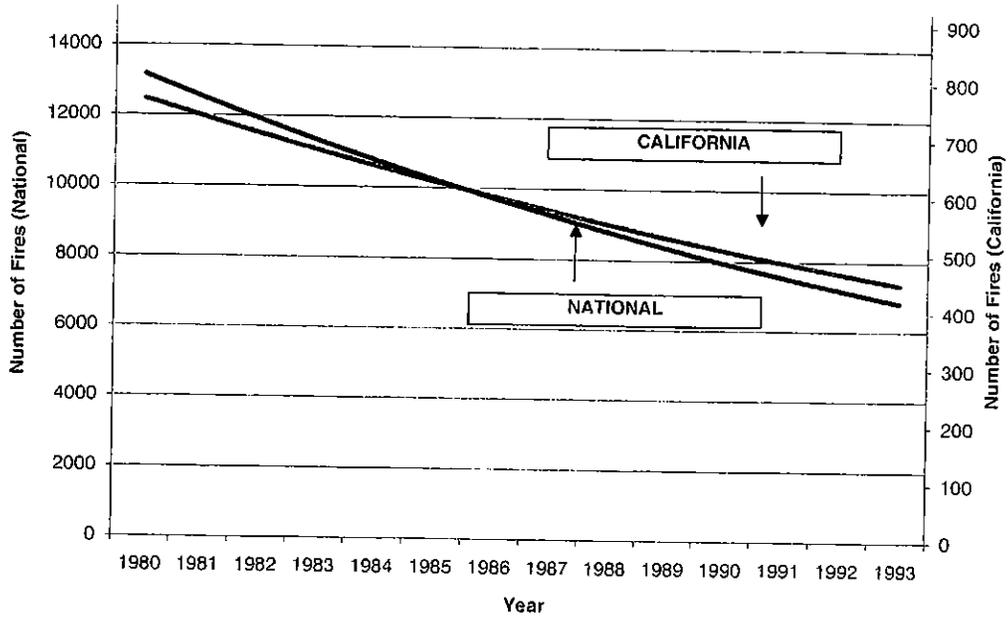


Figure 2.2.1.3(b). Comparison of Structural Fires in Educational Properties (1980-1993)

Similarly, we can compare the number of injuries resulting from structural fires in educational facilities. Figure 2.2.1.3(c) provides California and national injury data for 1980 through 1993.

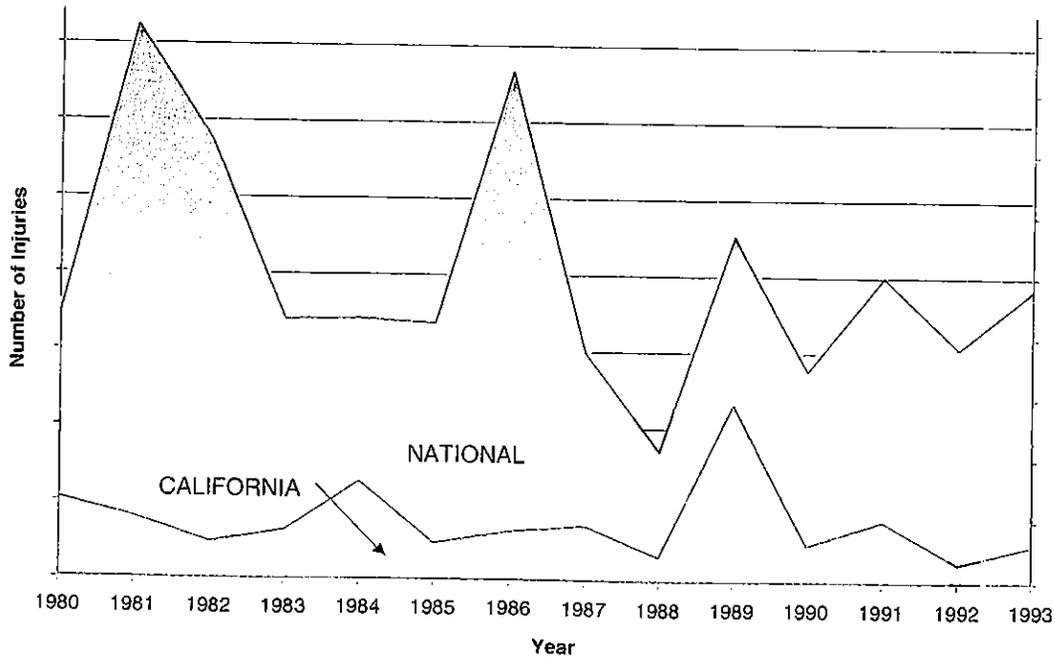


Figure 2.2.1.3(c) - Number of Injuries in Educational Structural Fires (1980-1993)

The injury rates, both nationally and for California, are extremely dynamic. For the most part, the data sets maintain similar fluctuation patterns. Figure 2.2.1.3(d) provides linear trendlines that correspond to the values presented in Figure 2.2.1.3(c). This data indicates that the rate of decrease in the number of injuries is slightly less for California than for the nation.

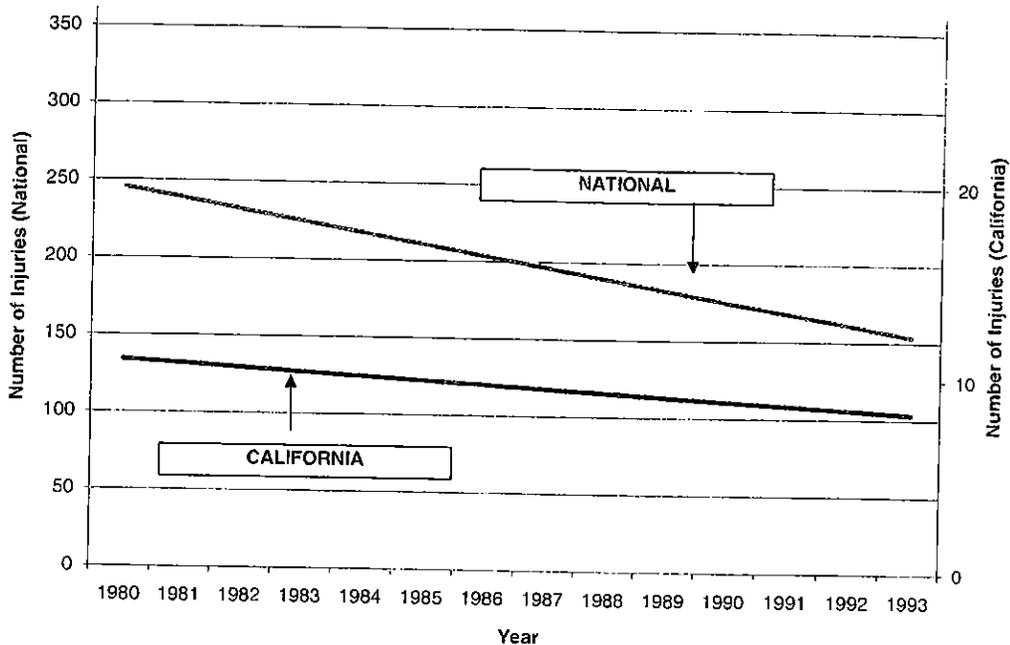


Figure 2.2.1.3(d) - Comparison of Number of Injuries in Educational Structural Fires (1980-1993)

As Figure 2.2.1.3(b) shows, the number of reported structural fires in educational properties, both nationally and in California, experienced a substantial decrease between 1980 and 1993. The number of injuries per year also decreased, but at a lesser rate.

2.2.2 Non-Residential School Facilities

To determine the extent of the risk of fires in public schools, we separated non-residential school fires from all school fires. The study found that non-residential school fires account for a majority of all fires in this category. Figure 2.2.2(a) shows the national distribution of fires according to educational use group. The annual average number of fires in non-residential schools (nursery—grade 12) from 1993 to 1997 was approximately 6,000 fires, or 76 percent of all educational fires. The available data includes nursery schools.*

* National data is N-12 whereas California data is K-12.

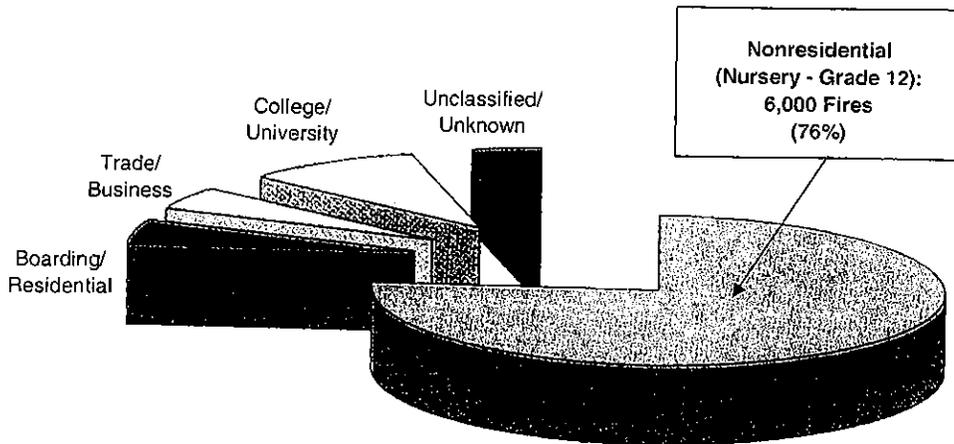


Figure 2.2.2(a) - Percentage of Non-residential Structural Fires (1993-1997, National)

The structural fires represented above for all educational facilities resulted in 190 injuries and one death. Figure 2.2.2(b) shows the distribution of injuries nationwide, by educational property type. The annual average number of injuries in non-residential schools (nursery-grade 12) from 1993 to 1997 was 139 injuries, or approximately 73 percent of all injuries from structural fires in educational facilities.

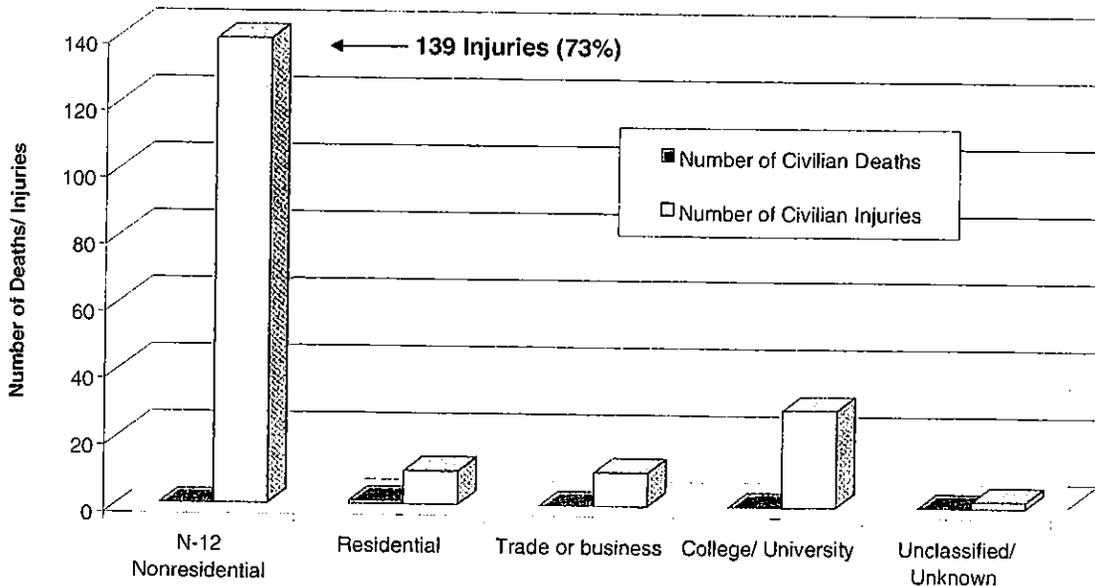


Figure 2.2.2(b) - Annual Average Number of Deaths & Injuries from Structural Fires in Educational Properties (1993-1997, National)

The data provided in Figures 2.2.2(a) and 2.2.2(b) is combined in Figure 2.2.2(c) and evaluated as an incident rate of the number of injuries per 100 fires. This method of analysis demonstrates the risk involved with a single fire event in each of the educational facilities. Non-residential (nursery-grade 12), residential (boarding school), and

trade/business facilities experience a similar level of hazard per fire event of approximately 2.5 injuries per 100 fires. In comparison, colleges and universities experience the greatest level of hazard per fire event.

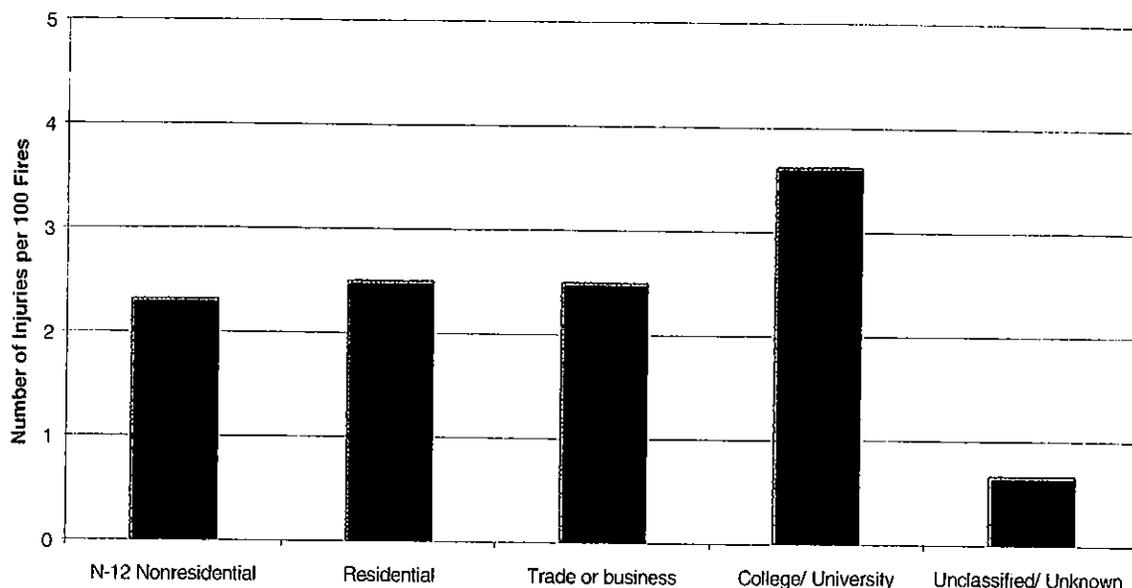


Figure 2.2.2(c) - Injuries per 100 Structural Fires in Educational Properties (1993-1997, National)

Figure 2.2.2(d) examines non-residential school fires in more detail. The number of fires associated with elementary schools, junior high schools, and high schools are reported separately, including both 1982-1986 and 1990-1994 statistics.

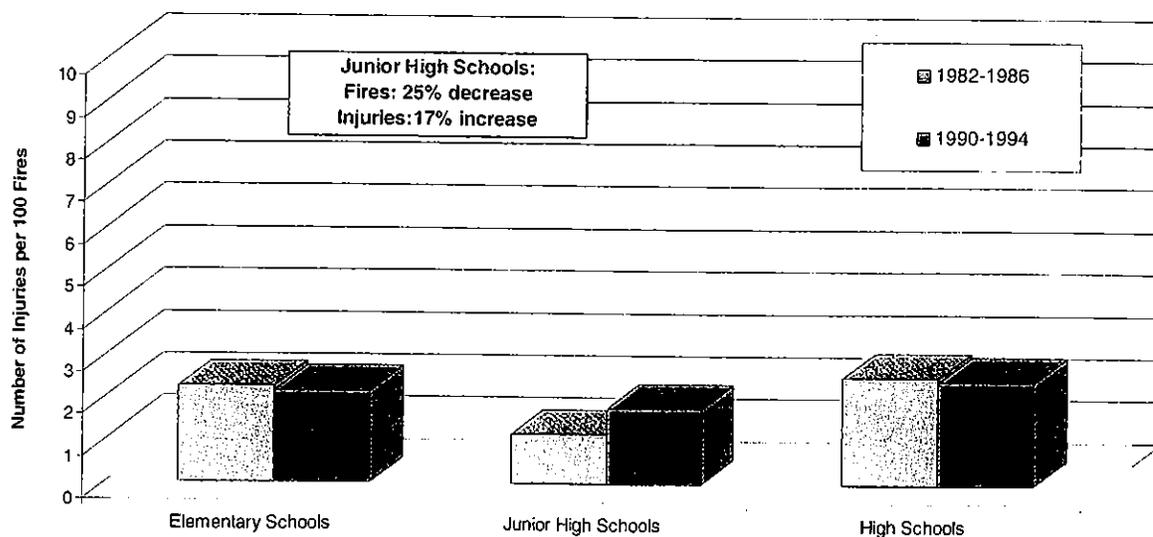


Figure 2.2.2(d) - Injuries per 100 Structural Fires, Selected Properties(1982-1986, National)

The annual average number of injuries per 100 fires is relatively consistent between the three types of facilities, ranging between one and two per 100 structural fires. There is a

notable increase in the rate of injuries experienced in junior high schools between the 1980 and 1990 data. However, the values remain within the one to two percent range.

Figure 2.2.2(e) provides a breakdown of the property loss associated with Figure 2.2.2(a). The estimated average direct property loss from the 6,000 educational structural fires, occurring between 1993 and 1997 nationally was \$63.8 million. This accounts for 70 percent of the total property loss from all structural fires in educational facilities during this time period.

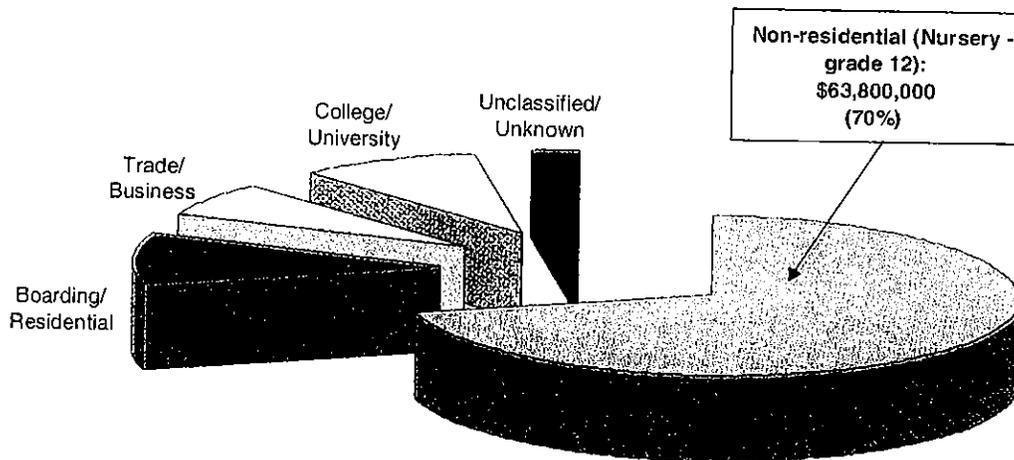


Figure 2.2.2(e) - Distribution of Direct Property Damage (\$) from Structural Fires in Educational Properties (1993-1997, National)

Figure 2.2.2(f) provides the average direct dollar loss per fire associated with Figure 2.2.2(e) above. This method of analysis demonstrates the property damage involved with a single fire event in each of the educational facilities. Nonresidential (nursery-grade 12) facilities experience a lower average direct dollar loss per fire than do residential (boarding), trade/business, and college/university facilities. The average direct loss per fire in nonresidential (nursery-12) facilities is approximately \$11,500. In comparison, residential schools experience the greatest level of hazard per fire event.

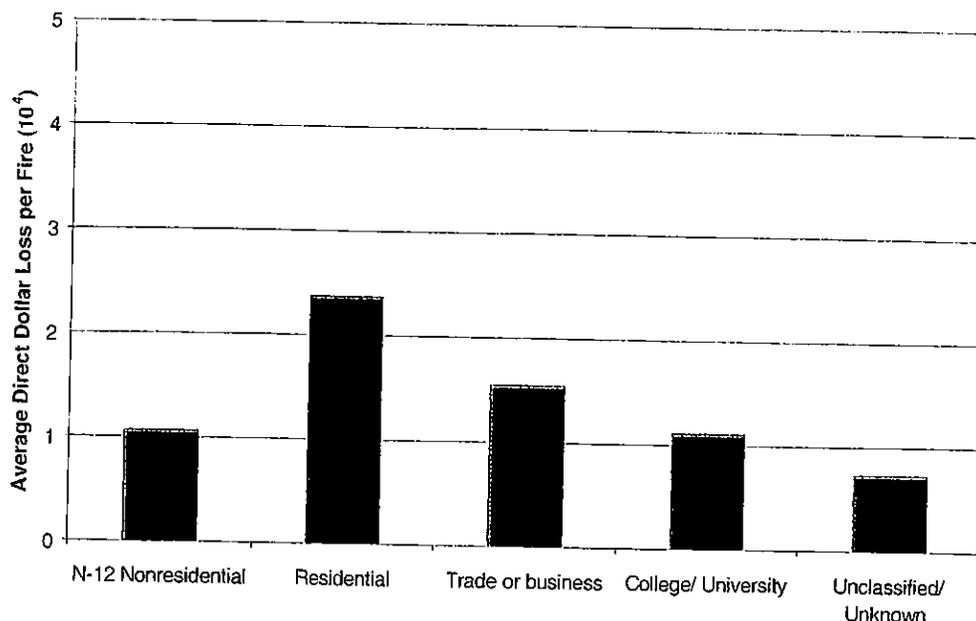


Figure 2.2.2(f) - Average Direct Dollar Loss (\$) per Structural Fire in Educational Properties (1993-1997, National)

2.3 Incident Particulars

Any fire protection system must be designed for the anticipated degree of hazard presented. Identifying the incident particulars, including Area of Fire Origin, Cause of Ignition, and Time of Event, are critical to the determination of an effective fire protection program.

2.3.1 Area Of Fire Origin

Table 2.3.1 provides national data of structural fires in educational facilities between 1993 and 1997. The fires are categorized by the area of fire origin and include the associated number of injuries/deaths and the related property damage. Based on this data, the primary areas of fire origin were lavatories, locker rooms, or cloakrooms. Incidents in these areas resulted in 1,800 fires over a five-year span, accounting for approximately 23 percent of all fires reported. Fires originating in the lavatory, locker rooms, or cloakroom resulted in 29 civilian injuries, or 16 percent of all injuries reported. The second and third most frequent areas of fire origin included hallways/corridors and small assembly areas/classrooms, respectively.

The area of origin that corresponds with the highest injury rate is the laboratory. Large assembly areas without fixed seating experience the highest property loss per fire incident, approximately \$3.2 million dollars per every 100 fires.

**Table 2.3.1 - Structure Fires in Educational Properties by Area of Origin 1993-1997
Annual Averages (Nationwide)**

| <i>Area of Origin</i> | <i>Fires</i> | <i>Civilian Deaths</i> | <i>Civilian Injuries</i> | <i>Property Damage (\$M)</i> |
|---|--------------|------------------------|--------------------------|------------------------------|
| Lavatory, Locker Room or Cloak Room | 1,800 | 0 | 29 | 6.3 |
| Hallway, Corridor or Mall | 800 | 0 | 23 | 9.3 |
| Small Assembly Area/Classroom (<100) | 700 | 0 | 10 | 14.9 |
| Kitchen | 500 | 0 | 11 | 1.3 |
| Heating Equipment Room | 300 | 0 | 19 | 4.5 |
| Supply Storage Room or Area | 200 | 0 | 6 | 5.4 |
| Exterior Wall Surface | 200 | 0 | 0 | 1.6 |
| Trash or Rubbish Area | 200 | 0 | 2 | 0.6 |
| Office | 200 | 0 | 1 | 4.5 |
| Laundry Room or Area | 200 | 0 | 5 | 0.2 |
| Attic/Ceiling/Roof Assembly (concealed) | 200 | 0 | 1 | 5.5 |
| Exterior Roof Surface | 100 | 0 | 1 | 1.6 |
| Large Assembly Area, w/o Fixed Seating | 100 | 0 | 4 | 3.2 |
| Laboratory | 100 | 0 | 15 | 0.3 |
| Bedroom | 100 | 0 | 9 | 1.2 |
| Machinery Room or Area | 100 | 0 | 4 | 1.6 |
| Unclassified Area of Origin | 100 | 0 | 2 | 0.5 |
| Lounge or Den | 100 | 0 | 3 | 2 |
| Closet | 100 | 0 | 1 | 1 |
| Lobby or Entrance Way | 100 | 0 | 2 | 0.3 |
| Unclassified Storage Area | 100 | 0 | 2 | 1.1 |
| Dining Room, Lunchroom or Cafeteria | 100 | 0 | 1 | 0.1 |
| Large Assembly Area w/Fixed Seating | 100 | 0 | 4 | 2.6 |
| Interior Stairway | 100 | 0 | 2 | 0.1 |
| Wall Assembly or Concealed Space | 100 | 0 | 0 | 2.1 |
| Unclassified Function Area | 100 | 0 | 7 | 0.7 |
| Other Known Areas | 1,200 | 0 | 24 | 17.5 |
| Total (Annual Average)* | 7,900 | 1 | 18990 | 90.56 |
| | 8,000 | | | |

NFPA - US Fire Problem Overview*

* When reading these data tables from NFPA, it is important to note that the numbers represent annual averages. For data that represent a five-year annual average, any number of deaths from three to seven during that five-year period would result in one death per year when the number is rounded.

2.3.2 Cause Of Incident

The following section displays information related to the cause of fires in the nation and California, including data on arson fires.

2.3.2.1 Nationwide Data

Table 2.3.2.1(a) gives a breakdown of the causes of fires in educational facilities nationwide. Arson is clearly the leading cause of fires and -related damages to educational structures. During 1993-1997, incendiary or suspicious activity accounted for 51 percent of all structure fires in educational facilities, 46 percent of injuries, and 59 percent of property damage.

The cause of origin that corresponds with the highest injury rate is appliances, tools, or air conditioning equipment. Natural causes, according to NFPA, result in the highest property loss per fire incident, approximately \$1.9 million dollars per every 100 fires.

**Table 2.3.2.1(a) - Causes of Fires and Related Damages 1993-1997
Annual Averages (Nationwide)**

| <i>Cause</i> | <i>Fires</i> | <i>Civilian Deaths</i> | <i>Civilian Injuries</i> | <i>Property Damage (\$M)</i> |
|---------------------------------|--------------|------------------------|--------------------------|------------------------------|
| Incendiary or Suspicious | 4,000 | 0 | 87 | 53.5 |
| Electrical Distribution | 700 | 0 | 14 | 11.7 |
| Other Equipment | 600 | 0 | 8 | 5.6 |
| Cooking Equipment | 500 | 0 | 4 | 1.1 |
| Appliance, Tool or A.C.* | 400 | 0 | 38 | 1.8 |
| Heating Equipment | 400 | 0 | 13 | 5 |
| Open Flame, Ember or Torch | 400 | 0 | 11 | 7.4 |
| Child Playing | 300 | 0 | 6 | 0.2 |
| Smoking Materials | 300 | 0 | 5 | 0.6 |
| Natural Causes | 100 | 0 | 4 | 1.9 |
| Other Heat Sources | 100 | 0 | 2 | 0.8 |
| Exposure | 100 | 0 | 1 | 1.2 |

*When reading these data tables from NFPA, it is important to note that the numbers represent annual averages. For data that represents a five-year annual average, any number of deaths from three to seven during that five-year period would result in one death per year when the number is rounded.

| | | | | |
|------------------------|-------|---|-----|------|
| Total (Annual Average) | 7,900 | 0 | 191 | 90.6 |
|------------------------|-------|---|-----|------|

NFPA - US Fire Problem Overview

The western region of the United States experiences fewer structural fires and related deaths, injuries, and property loss from incendiary and suspicious activity than the remainder of the country. Table 2.3.2.1(b) gives the 1991-1995 annual averages of the number of fires per 1,000 people, civilian deaths and injuries per million people, and property loss per capita associated with such activity.

Between 1991 and 1995, the reported number of incendiary or suspicious structural fires in the West was 4.6 per 1,000 people, below the national average of 6.7 incidents per 1,000 people. The number of civilian deaths and injuries related to this cause of origin was 7.4 and 65.2 per million people, respectively. The casualty rates are notably lower than those values for other regions of the country. The property loss per capita is 23.9, again, significantly below the national average of 36.8 per capita.

**Table 2.3.2.1(b) - Incendiary and Suspicious Structure Fires and Losses
1991-1995 Annual Averages (National)**

| <i>Region</i> | <i># of Fires per 1,000 people</i> | <i>Civilian Deaths per Million People</i> | <i>Civilian Injuries per Million People</i> | <i>Property Loss per Capita</i> |
|---------------|--|---|---|---|
| NATIONWIDE | 6.7 | 13.1 | 80.4 | 36.8 |
| Northeast | 7.6 | 13.4 | 103.7 | 38.3 |
| North-central | 6.3 | 14.2 | 81.2 | 45.4 |
| South | 7.8 | 15.1 | 79.7 | 38.5 |
| West | 4.6 | 7.4 | 65.2 | 23.9 |

Arson - NFPA

The national data for 1991-1995 shows that incendiary and suspicious fires in educational occupancies account for 4.2 percent of all such structural fires. Table 2.3.2.1(c) gives the contribution of incendiary and suspicious structural fires and the related dollar loss per occupancy type. Such fires in educational occupancies account for 3.3 percent of the total dollar loss.

* When reading these data tables from NFPA, it is important to note that the numbers represent annual averages. For data that represent a five-year annual average, any number of deaths from three to seven during that five-year period would result in one death per year when the number is rounded.

Table 2.3.2.1(c) - Incendiary and Suspicious Structure Fires and Losses, by Major Property Type 1991-1995 Annual Averages (National)

| <i>Property Type</i> | <i>Fires (%)</i> | <i>Dollar Loss (%)</i> |
|----------------------------|------------------|------------------------|
| Public Assembly | 3.3 | 5.8 |
| Education | 4.2 | 3.3 |
| Health Care, Correctional | 2.6 | 0.8 |
| Residential | 54.7 | 43.9 |
| Stores, Offices | 5.8 | 19.1 |
| Industry, Utility, Defense | 0.4 | 0.8 |
| Manufacturing | 0.9 | 7.3 |
| Storage | 10.1 | 7.0 |
| Special Structures | 14.3 | 6.2 |
| Unknown Type Structures | 1.8 | 2.9 |

Arson – NFPA

Figure 2.3.2.1(a) provides the percentage of fires and property loss associated with incendiary and suspicious activity per occupancy type. The data reflect the 1991-1995 annual averages nationwide. Educational facilities exceed all other occupancy types, save special structures, regarding both the number of fires and the total dollar loss attributed to incendiary and suspicious activities. Educational occupancies experience such activity at a rate of 53.7 percent of all fires and 65.5 percent of all property loss.

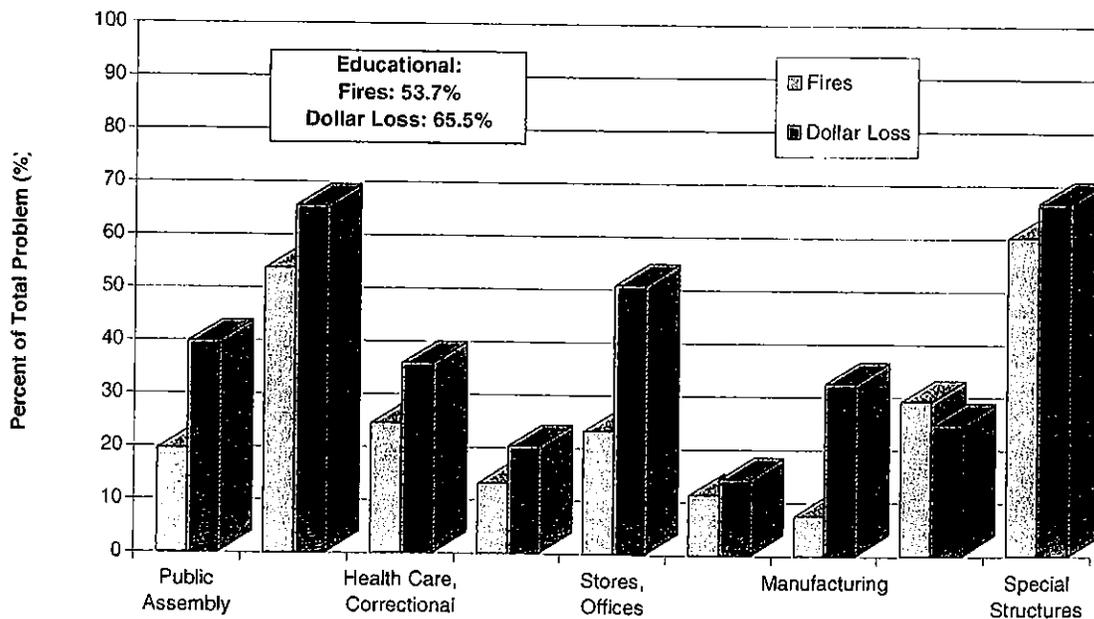


Figure 2.3.2.1(a) - Incendiary and Suspicious Percentage of Total Fire Problem (1991-1995, National)

Figure 2.3.2.1(b) shows the percentage of fires, civilian injuries, and property damage associated with individual causes of fire origin in educational occupancies. This data is based on the nationwide annual averages from 1993-1997. The number of fires, civilian injuries, and property damage from incendiary or suspicious causes significantly exceed the values associated with all other causes of fire origin in educational occupancies. Approximately 50.2 percent of all fires during this five-year time span are attributed to incendiary or suspicious causes. Civilian injuries depict a similar trend at 45.8 percent, while property damage associated with incendiary or suspicious activity account for approximately 59.1 percent of the total dollar loss from all fires in educational occupancies.

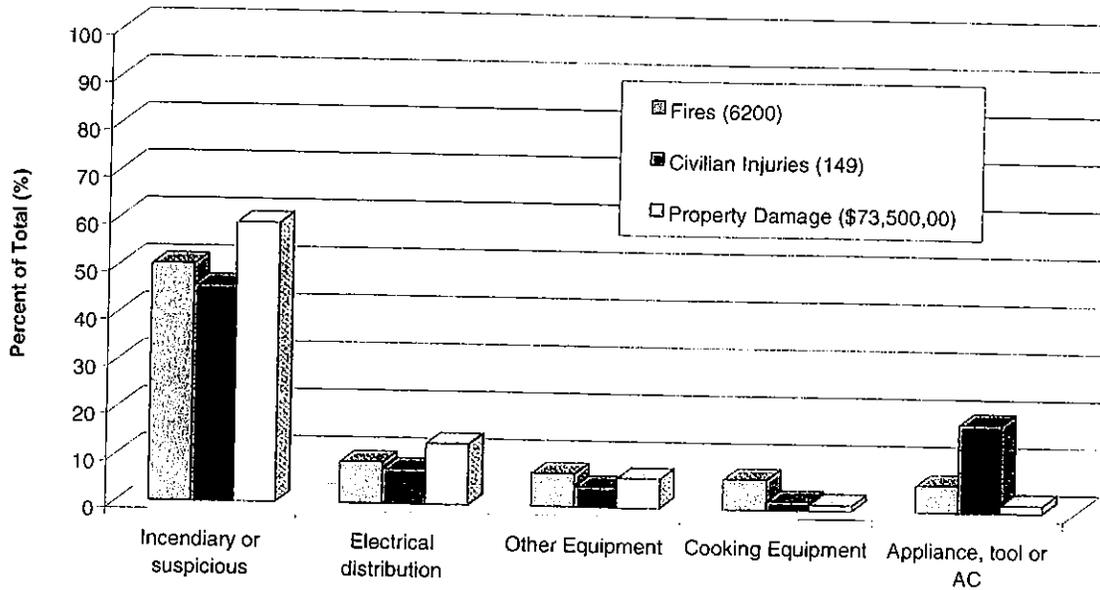


Figure 2.3.2.1(b) - Percent of Fires, Civilian Injuries, and Property Damage (1993-1997, National)

2.3.2.2 California Data

The CFIRS reports 500-600 incendiary fires per year in non-residential schools from 1986-1993. Table 2.3.2.2(a) presents the number of fires during these years. The reported number of arsons in California schools remained relatively consistent from 1986 through 1992.

In 1993, the data show a significant decline in reported fires; however, the data for this year may be incomplete or it may be based on an estimated value for the current year.

**Table 2.3.2.2(a) - Incendiary Non-Residential School Fires 1993-1997
Annual Averages (California)**

| <i>Year</i> | <i>Fires</i> | <i>Variation from Previous Year (%)</i> |
|-------------|--------------|---|
| 1986 | 583 | ----- |
| 1987 | 549 | (-5.8) |
| 1988 | 571 | +4.0 |
| 1989 | 537 | (-5.9) |
| 1990 | 546 | +1.6 |
| 1991 | 583 | +6.7 |
| 1992 | 620 | +6.3 |
| 1993 | 507 | (-18.2) |

SFM - CFIRS

Figure 2.3.2.2(a) displays the cause of ignition for educational fires in California for 1995 and 1996. The data is fairly consistent for these two years. As is true nationally, incendiary and suspicious activity accounted for approximately 50 percent of all structural fires in California schools.

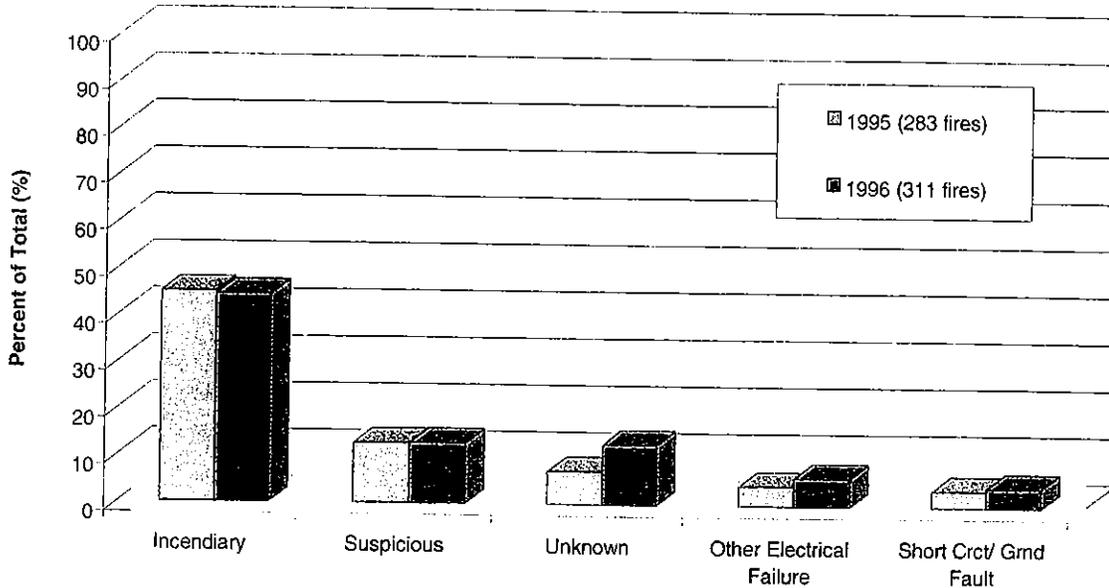


Figure 2.3.2.2(a) - Percentage of Total Fire Problem: Cause of Fire Origin in California Schools (1995, 1996)

Figure 2.3.2.2(b) identifies the content loss and property loss resulting from incendiary non-residential fires in California schools from 1986-1993. The combined dollar losses fluctuate from year to year, falling between \$ three million and \$10 million. Despite the inconsistency with respect to property loss values, there is an obvious decrease in the

values associated with content loss. This is evident when comparing content losses prior to 1990 with those occurring after 1990.

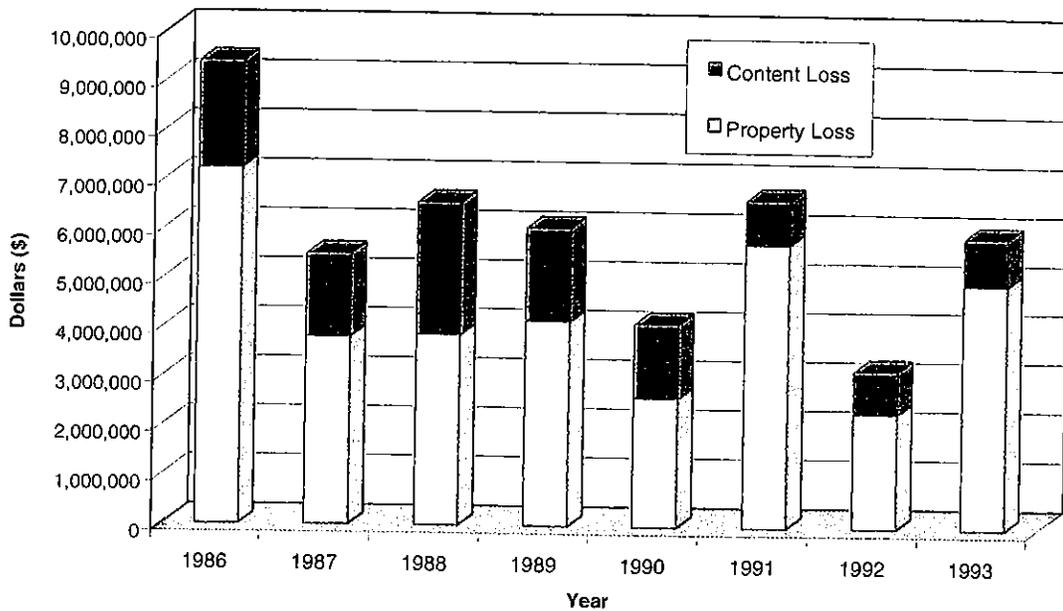


Figure 2.3.2.2(b) - Content and Property loss from Incendiary Non-Residential School Fires (1986-1993, California)

2.3.2.3 Arsonists

Figure 2.3.2.3(a) breaks down the distribution of arsonists by age groups. This data represents arson arrests in all occupancies. Juvenile arrests, including those persons 17 years and younger, account for approximately 48 percent of all persons arrested for arson. Children in the junior-high school age group, 12 to 14 years old, make up approximately half of all juvenile arrests.

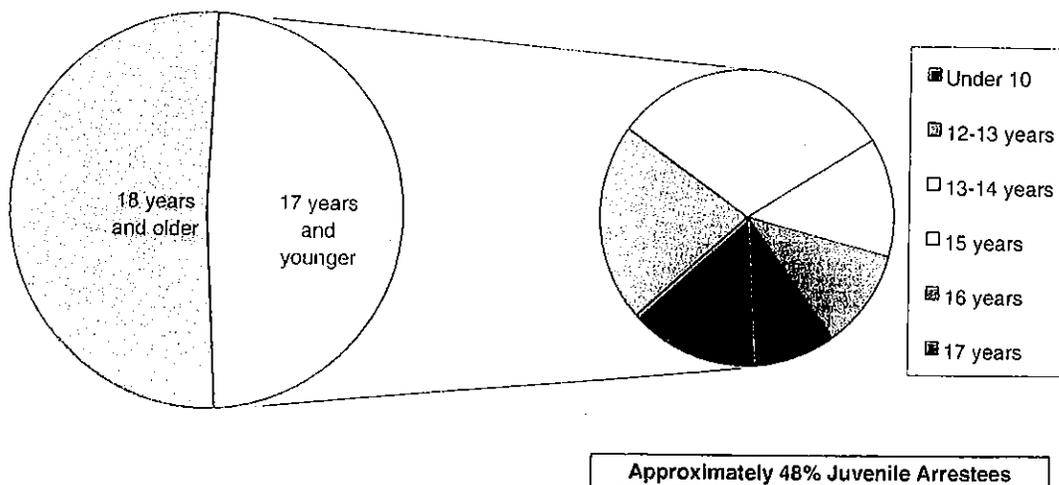


Figure 2.3.2.3(a) - Trends in Age Profiles of Persons Arrested for Arson (1988-1996, National)

The age distributions depicted above are for persons arrested for committing arson regardless of occupancy type, not specifically educational occupancies. The data show that the age profile of arsonists is related to the number of incendiary and suspicious fires in schools.

2.3.3 Time of Fire Ignition

The data provided in Figure 2.3.3(a) represents the time of fire ignition reported in California schools. The values are the average occurrence rate for 1990, 1991, and 1992. California statistics show that 70 percent of fires in educational occupancies occur between the hours of 8:00 A.M. to 8:00 P.M. Approximately one-half of all structural fire incidents occur after normal business hours, from 4:00 P.M. to 7:00 A.M. This translates to approximately 50 percent of all educational structure fires occurring during times when the building is not normally occupied.

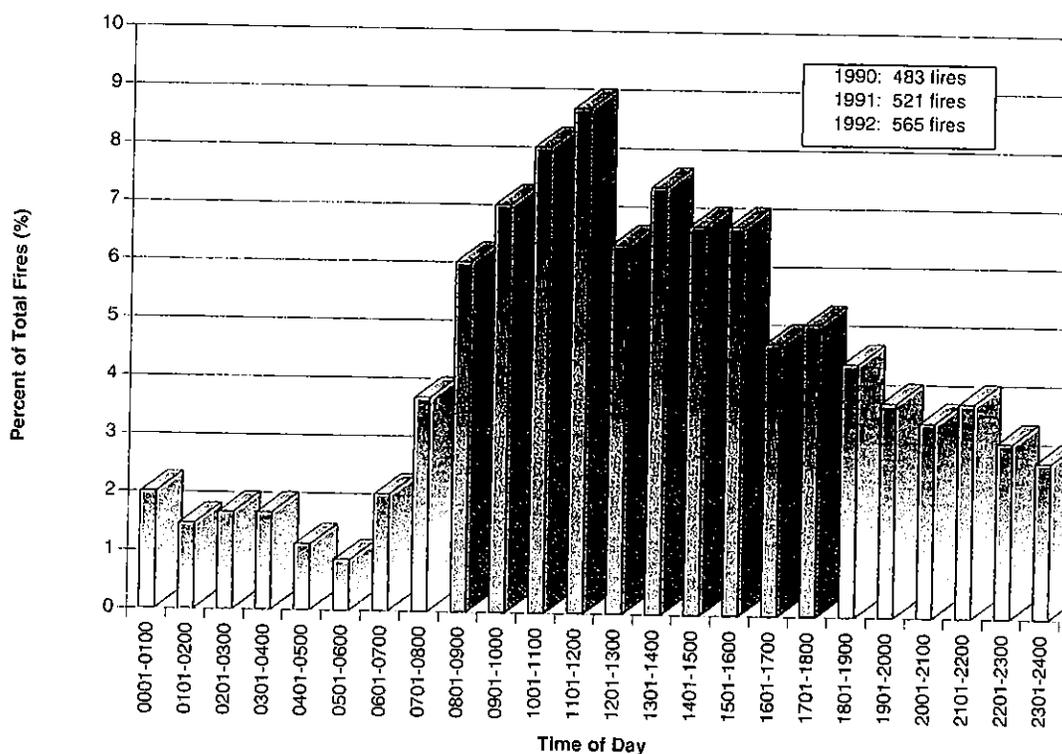


Figure 2.3.3(a) - Structural Fires in Educational Properties, by Time of Day (1990-1992, California)

2.4 Fire Protection Systems

Model code currently requires the installation of an approved fire alarm system in educational facilities. The purpose of these requirements is to provide a minimum level of

life safety. This section investigates the performance of fire protection and life safety systems.

Fire protection systems can be defined as:

Manual Fire Alarm System: A system or portion of a combination system that consists of manually activated devices designed to alert occupants of a fire incident. Most manual fire alarm systems are not designed to automatically alert the fire department or central station.

Automatic Fire Alarm and Detection System: A system or portion of a combination system that consists of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to those signals.

Automatic Fire Sprinkler System: An integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The installation includes one or more automatic water supplies. The portion of the sprinkler system above ground is a network of specially sized or hydraulically designed piping installed in a building, structure, or area, generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser or its supply piping is typically equipped with a tamper switch that indicates the status of the valve (open or closed) at the fire alarm control panel. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.

During a fire event, automatic fire sprinklers are activated on an individual basis, dependent on the temperature rise at the location of the fire. Sprinkler discharge is achieved when the temperature reaches a level to cause melting of a fusible element or shattering of a glass bulb. Only the sprinkler heads that are heated to the specified activation temperature will open and release water.

Table 2.4 provides an overview of the use and effectiveness of fire protection features in educational occupancies specifically related to structure fires. The data is a five-year national average incorporating statistics reported from 1993 to 1997. The figures show that, nationally, approximately 65.5 percent of all educational occupancies were equipped with a smoke detection or other fire alarm system. Of these systems, 78.3 percent were operational. The statistics reveal that approximately half of all educational facilities were equipped with a working smoke detection or fire alarm system. Automatic fire sprinkler systems were provided in 23.2 percent of the schools.

The fire deaths in educational facilities during the years reported in Table 2.4 are few. The data show a 100 percent reduction in the number of deaths per 1,000 fires when automatic fire sprinkler systems were present. This data must be interpreted carefully, as the associated data is limited.

The benefits of providing an automatic fire sprinkler system are apparent when referencing property loss values. Those schools protected with automatic fire sprinkler systems experienced 74.7 percent less dollar loss than those without such systems. On average, schools fully protected by automatic fire sprinkler systems saw losses of \$3,553 per fire. This is in comparison to the \$14,017 loss per fire incident in schools which did not have fire sprinkler protection.

Losses associated with sprinkler-protected versus non-sprinkler-protected buildings must be interpreted carefully. This is because the larger, more valuable properties are more often provided with automatic fire sprinkler systems while smaller, less valuable properties are not.

Table 2.4 - Fire Protection Features in Educational Property Structure Fires Reported to Public Fire Departments, 1993-1997 Annual Averages (National)

| <i>Feature</i> | <i>Value</i> |
|--|--------------|
| Percent of Fires in Buildings with: | |
| Smoke or other fire alarms present | 65.5% |
| Smoke or fire alarms in which devices were operational | 78.3% |
| Operational smoke or fire alarms (product of first two statistics) | 51.2% |
| Automatic suppression system | 23.2% |
| Deaths per 1000 fires with: | |
| Automatic suppression system present | 0.0 |
| No automatic suppression system present | 0.3 |
| Reduction in deaths per 1,000 fires with automatic suppression systems | 100.0% |
| Average loss per fire with: | |
| Automatic suppression system present | \$3,553 |
| No automatic suppression system present | \$14,017 |
| Reduction in loss per fire with automatic suppression systems | 74.7% |

NFPA - US Fire Problem Overview

2.4.1 Detection

Table 2.4.1 displays the performance of automatic fire alarm and detection systems in educational property structure fires. The data is divided into high school, junior high school, and elementary school statistics. The statistics show that approximately 50 percent fewer fires are reported in educational properties with automatic detection present than without. The classification of "detectors present" implies smoke or heat detectors. Thus, fire loss data for schools having only a manual fire alarm system appear in Table 2.4.1 as educational properties with no detection present. Additionally, about one-third of the fire incidents reported in these facilities are recorded as unclassified or unknown with respect to the fire alarm system.

Table 2.4.1 - Performance of Automatic Fire Alarm Detection Systems in Educational Property Structure Fires 1982-1986 Annual Averages (Nationwide)

| <i>System Performance</i> | <i>Fires</i> | <i>Civilian Injuries</i> | <i>Civilian Deaths</i> | <i>Property Damage (\$M)</i> |
|----------------------------|--------------|--------------------------|------------------------|------------------------------|
| All Educational Properties | 11,100 | 236 | 3 | 95.7 |
| Detectors Present | 2,990 | 92 | 1 | 12.4 |
| No Detectors Present | 4,230 | 93 | 2 | 43 |
| Unclassified | 210 | 7 | 0 | 0.7 |
| Unknown | 3,650 | 48 | 0 | 39.6 |
| High School | 3,130 | 79 | 0 | 33 |
| Detectors Present | 770 | 15 | 0 | 4.6 |
| No Detectors Present | 1,230 | 50 | 0 | 17 |
| Unclassified | 20 | 1 | 0 | 0 |
| Unknown | 1,120 | 13 | 0 | 11.4 |
| Junior High School | 1,570 | 187 | 1 | 11 |
| Detectors Present | 360 | 6 | 0 | 0.8 |
| No Detectors Present | 630 | 5 | 1 | 3.8 |
| Unclassified | 10 | 4 | 0 | 0.2 |
| Unknown | 570 | 3 | 0 | 6 |
| Elementary School | 2,470 | 556 | 2 | 21.3 |
| Detectors Present | 520 | 38 | 1 | 2.3 |
| No Detectors Present | 1,000 | 10 | 1 | 9.8 |
| Unclassified | 20 | 0 | 0 | 0 |
| Unknown | 940 | 7 | 0 | 9.2 |

NFPA - US Fire Problem Overview

Figure 2.4.1(a) shows the performance of automatic fire alarm detection systems in educational structure fires by the number of injuries per 100 fires and the average direct dollar loss.

The number of civilian injuries in schools with automatic fire alarm and detection systems is slightly ~~higher~~ lower than in schools without detection. This variance is on the order of one percent or one additional injury per every 100 fires. Again, fires with unclassified/ unknown fire protection systems make up approximately one third of the incidents in this category. Additionally, detector activation rates must be considered, as shown in Figure 2.4.1(b).

The same caution must be made when analyzing the data presented in Figure 2.4.1(a) regarding direct dollar losses. The numbers seem to depict a clear relationship between detection and reduced property losses, as well as the unknown/unclassified data. Although this data must be viewed cautiously we assume that the property losses associated with fires in structures equipped with automatic fire alarm and detection, are less than the losses experienced in buildings without detection. This is based on the significant variation in dollar loss rates associated with each circumstance.

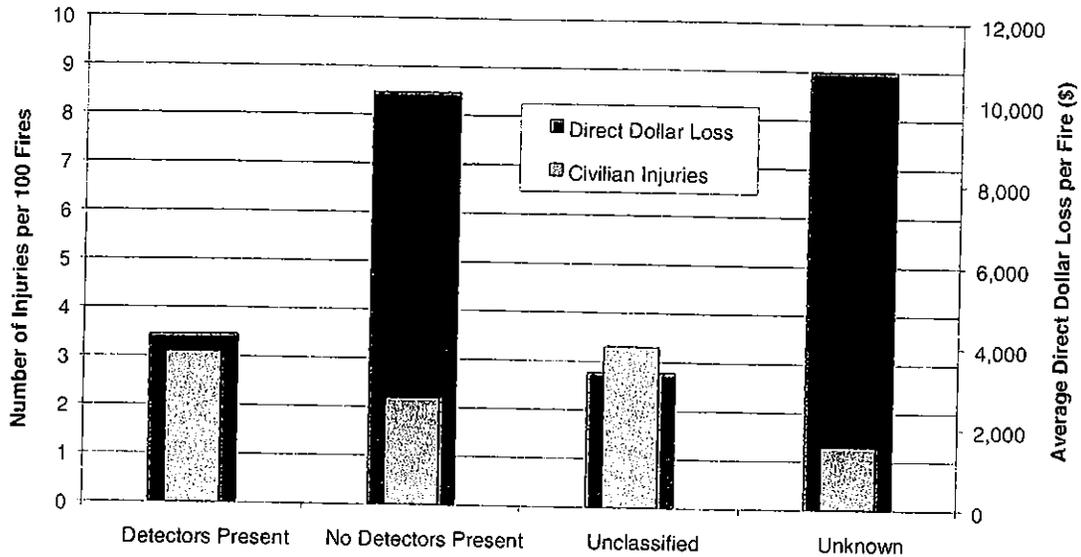


Figure 2.4.1(a) - Performance of Automatic Detection Systems in Educational Structure Fires (1982-1986, Nationwide)

Figure 2.4.1(b) identifies the operational rate for automatic fire alarm and detection systems in educational facilities. The data presented below represents statistics compiled between 1982 and 1986 for functioning systems in areas of such facilities. Of those areas with detection, approximately 50 percent of all fires activated the automatic detection system. For the remaining detector equipped area, slightly less than half (45 percent) the fires were too small to activate -a detector, while just over half of the fires (55 percent) went undetected due to failed detector operation.

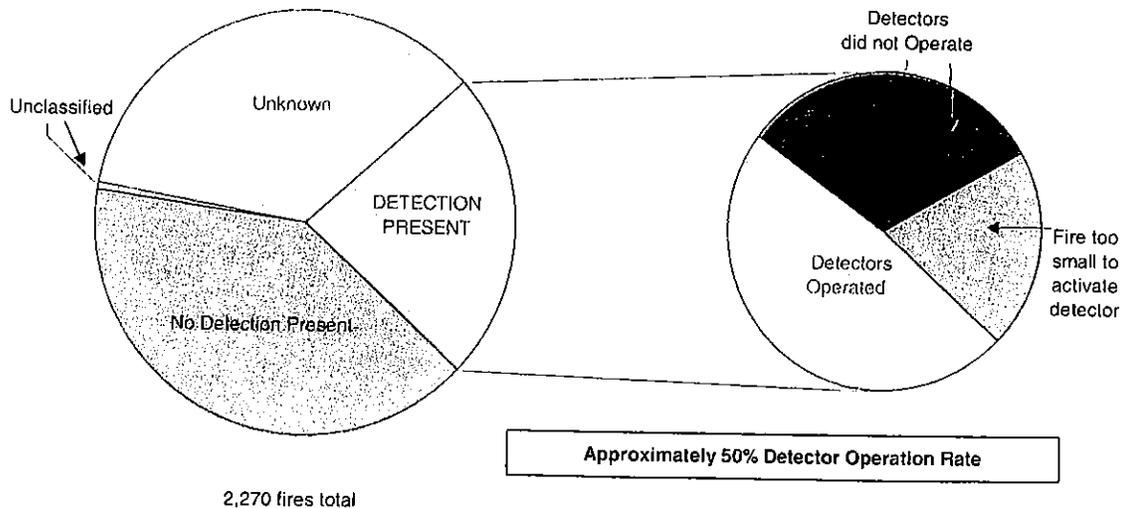


Figure 2.4.1 (bc) - Performance of Automatic Detection Systems in Function Areas of Educational Property Structure Fires (1982-1986, National)

Figure 2.4.1 (c) provides a comparison of the performance of automatic fire alarm and detection systems for various property types. The relationship between automatic detection systems and life safety is not directly apparent. The data clearly show greater percentage of injuries associated with structural fires in elementary schools that are equipped with automatic fire alarm and detection systems. However, the same data show a significant decrease in injury rates associated with structural fires in high schools having such systems.

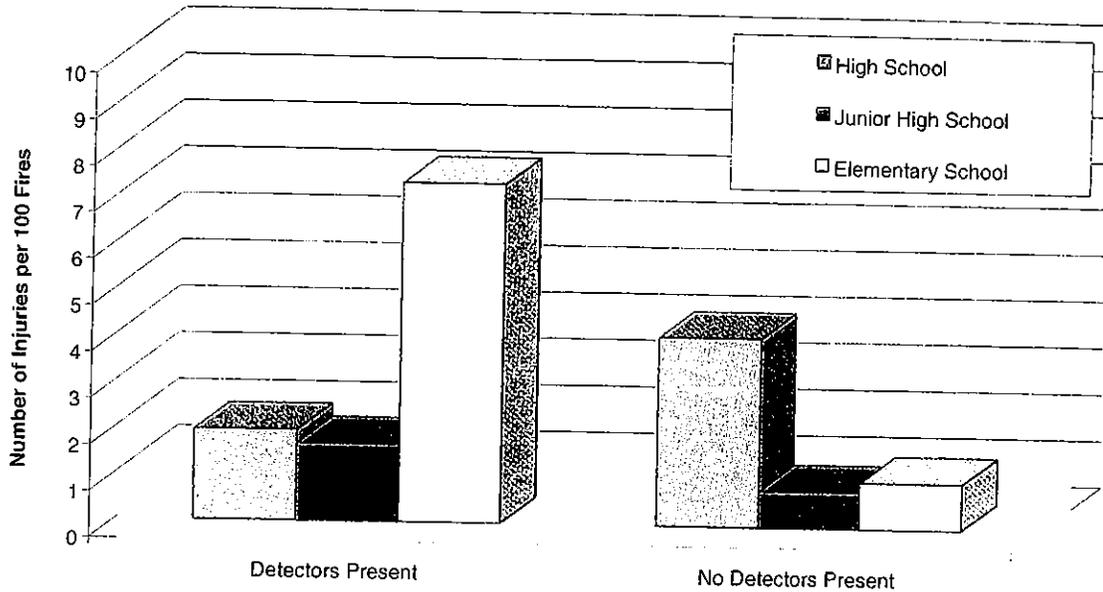


Figure 2.4.1(c) - Number of Injuries per 100 fires: Detection (1982-1986, National)

Figure 2.4.1(d). shows that there is a lower average dollar loss per fire in buildings with detectors compared to those without such systems.

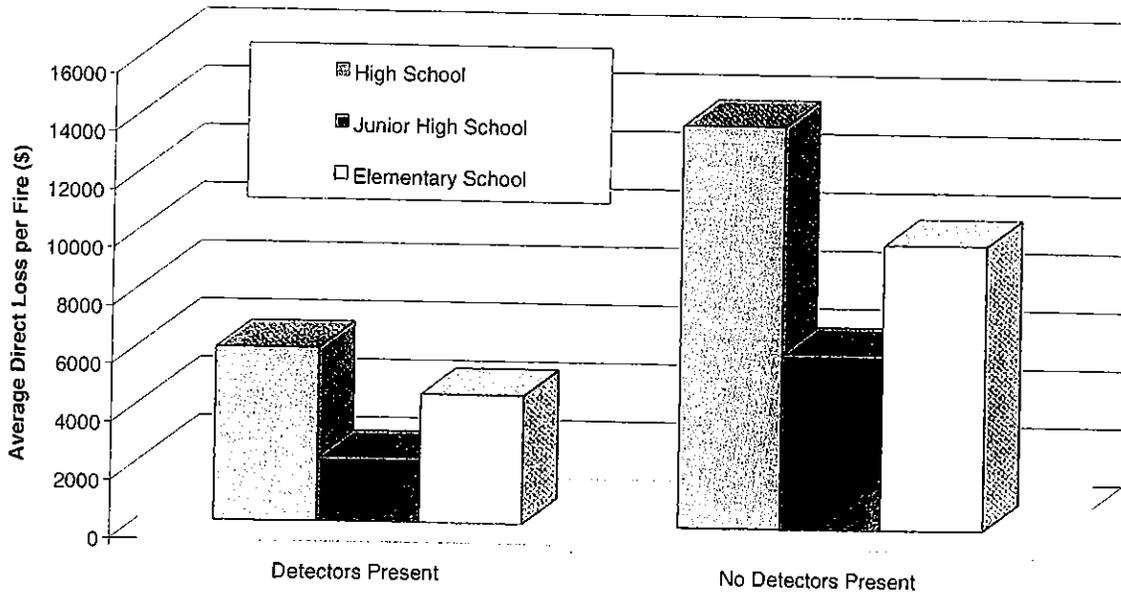


Figure 2.4.1 (d) – Average Direct Dollar Loss per fire: Detection (1982-1986, National)
 More specifically, -elementary, junior high, and high schools experience approximately

60 percent less average dollar loss per fire for buildings equipped with automatic fire alarm and detection systems than for buildings without such protection.

2.4.2 Suppression

Table 2.4.2 displays the performance of automatic fire sprinkler systems in educational property structure fires. The data is divided into high school, junior high school, and elementary school statistics.

Table 2.4.2 - Performance of Automatic Fire Sprinkler Systems in Educational Property Structure Fires 1982-1986 Annual Averages (Nationwide)

| <i>System Performance</i> | <i>Fires</i> | <i>Civilian Injuries</i> | <i>Civilian Deaths</i> | <i>Property Damage (\$M)</i> |
|----------------------------|--------------|--------------------------|------------------------|------------------------------|
| All Educational Properties | 11,08100 | 236 | 3 | 95.7 |
| System Present | 1,010 | 49 | 1 | 1.9 |
| No System Present | 6,130 | 137 | 2 | 59.0 |
| Unclassified | 240 | 4 | 0 | 1.5 |
| Unknown | 3,700 | 46 | 0 | 33.3 |
| High School | 3,1430 | 789 | 0 | 33.6 |
| System Present | 330 | 3 | 0 | 0.4 |
| No System Present | 1,660 | 60 | 0 | 22.1 |
| Unclassified | 20 | 0 | 0 | 0 |
| Unknown | 1,130 | 15 | 0 | 10.6 |
| Junior High School | 1,570 | 17 | 1 | 11 |
| System Present | 120 | 1 | 0 | 0 |
| No System Present | 870 | 13 | 1 | 5.6 |
| Unclassified | 10 | 0 | 0 | 0.3 |
| Unknown | 570 | 3 | 0 | 5.1 |
| Elementary School | 2,470 | 556 | 2 | 21.23 |
| System Present | 130 | 34 | 1 | 0.6 |
| No System Present | 1,380 | 14 | 1 | 11.1 |
| Unclassified | 10 | 0 | 0 | 0.1 |
| Unknown | 950 | 7 | 0 | 9.4 |

NFPA - US Fire Problem Overview

Figure 2.4.2(a) shows the number of injuries per 100 fires and corresponding average direct dollar loss in educational structures equipped with automatic fire sprinkler systems.

The number of civilian injuries in schools with automatic fire sprinkler systems is significantly higher than in schools without such systems. This variance is on the order of 3-three percent or 3 additional injuries per every 100 fires. Again, fires with unclassified or unknown fire protection systems make up approximately one-third of the incidents in this category.

Although the numbers depict a clear relation between automatic fire sprinkler systems and reduced property losses, we cannot know the exact relationship without better information about the unknown/unclassified data, and the fire sprinkler activation rates. However, we believe it is safe to assume that property losses associated with fires in structures protected by an automatic fire sprinkler system are less than the losses for buildings without automatic fire sprinkler systems. We base this conclusion on the apparent significant variation in dollar loss rates associated with each circumstance.

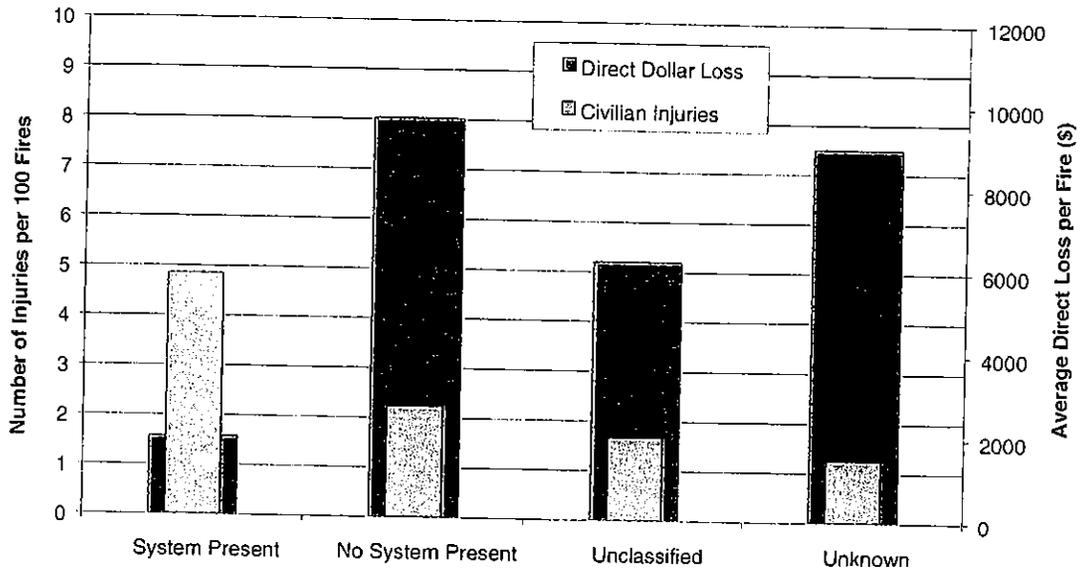


Figure 2.4.2 (a) - Performance of Automatic Fire Sprinkler Systems in Educational Property Structure Fires: Injuries and Property Damage (1982-1986, National)

Figure 2.4.2(b) identifies the operational rate for automatic fire sprinkler systems in educational facilities. The data presented below represents statistics compiled between 1982 and 1986 for properly operating systems. Of those areas with automatic fire sprinkler protection, approximately 16 percent of all fires activated the system while the remaining 84 percent of fires were too small to activate the fire sprinkler system

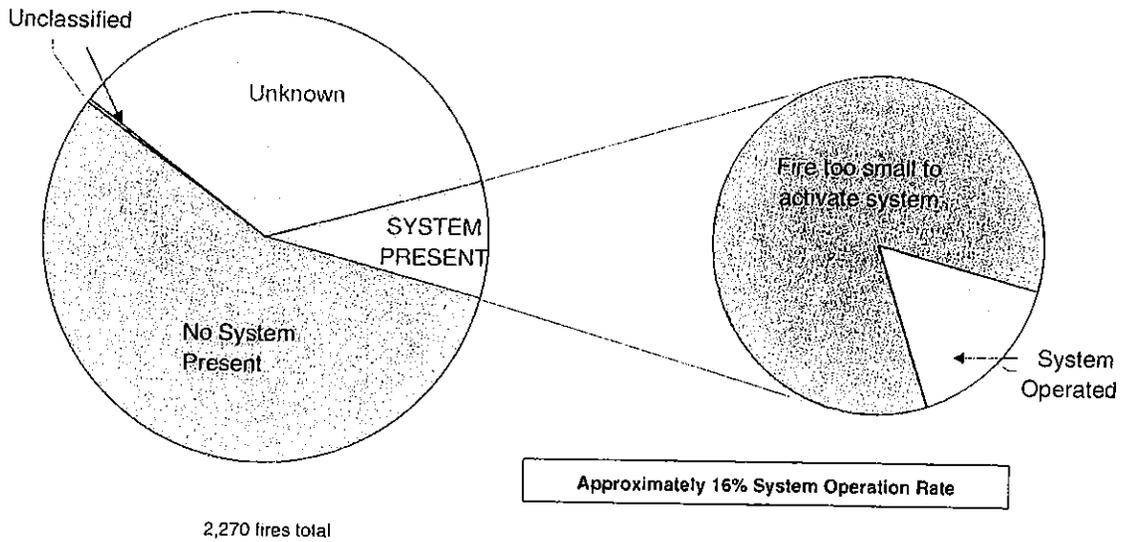


Figure 2.4.2 (b) - Performance of Automatic Fire Sprinkler Systems in Educational Facilities (1982-1986, National)

Figure 2.4.2 (c) provides a comparison of the performance of automatic fire sprinkler systems for various property types. The data clearly show a greater percentage of injuries per structural fire in elementary schools that are equipped with automatic fire sprinkler systems than those that are not equipped with such systems.

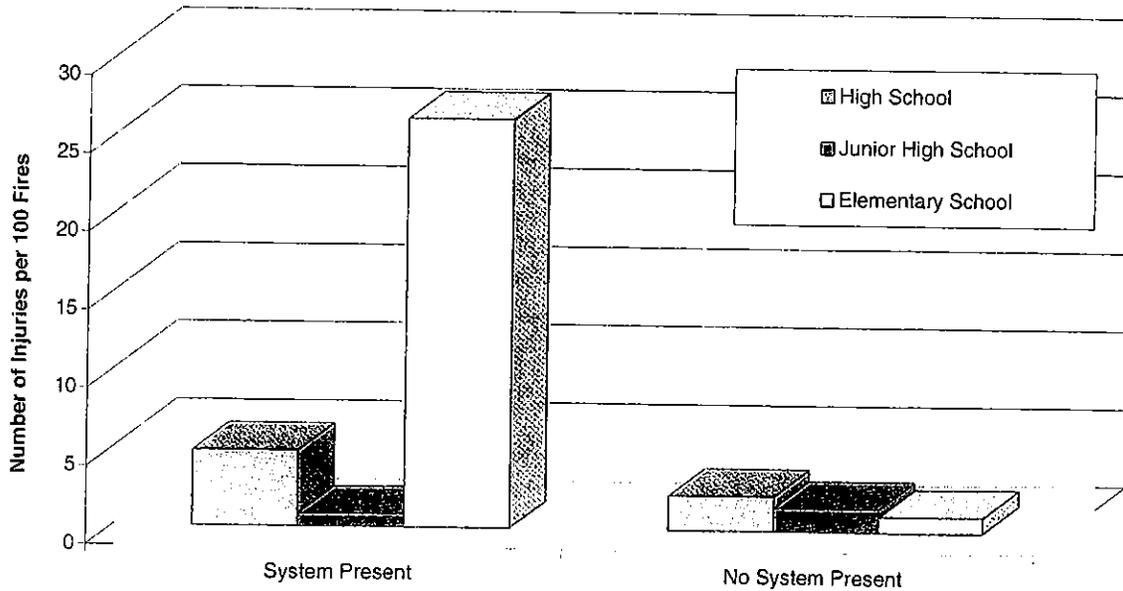


Figure 2.4.2 (c) - Number of Injuries per 100 Fires: Automatic Fire Sprinkler Systems (1982-1986, National)

Figure 2.4.2(d) shows the average dollar loss per fire. As is the case with automatic detection systems, there are lower direct losses per fire in buildings with automatic fire sprinkler systems compared to those buildings without fire sprinklers.

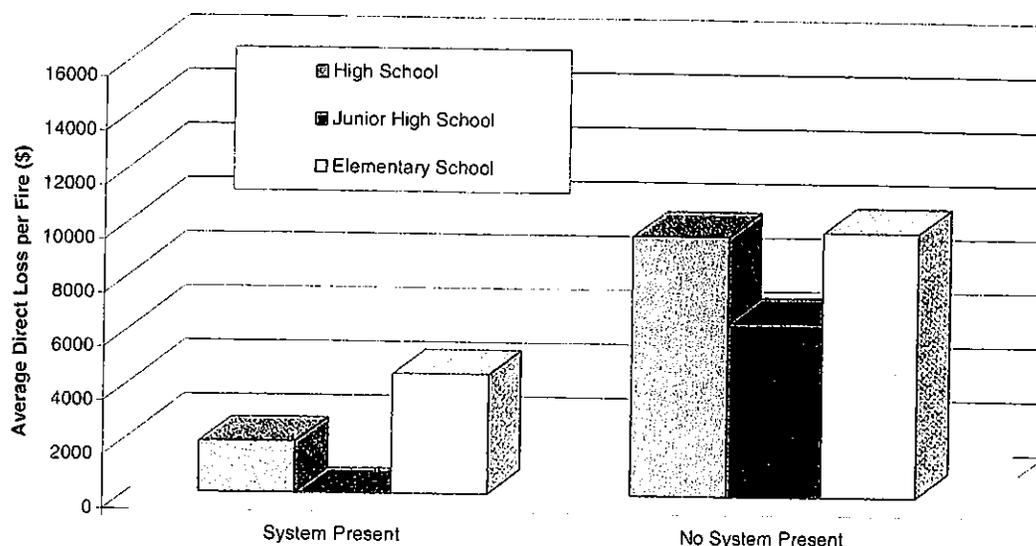


Figure 2.4.2 (d) – Average Direct Dollar Loss per fire: Automatic Fire Sprinkler Systems (1982-1986, National)

Elementary schools, junior high schools, and high schools experience approximately 80 percent less average dollar loss per fire in buildings equipped with automatic fire sprinkler systems compared to buildings without such protection.

2.5 Fire Department Involvement

Fire injuries are not limited to the occupants of the buildings. Figure 2.5 (a) identifies the firefighter injury rate by various property types. These values are associated with fires in non-residential structures and represent annual averages for 1995 and 1996.

The statistics report that structural fires in non-residential educational occupancies resulted in approximately 15 firefighter injuries per every 1,000 fires. This translates to an injury rate of approximately 1.5 percent. In comparison, the firefighter injury rate associated with structural fires in non-residential buildings is lower for educational occupancies than for all other properties, except institutional occupancies.

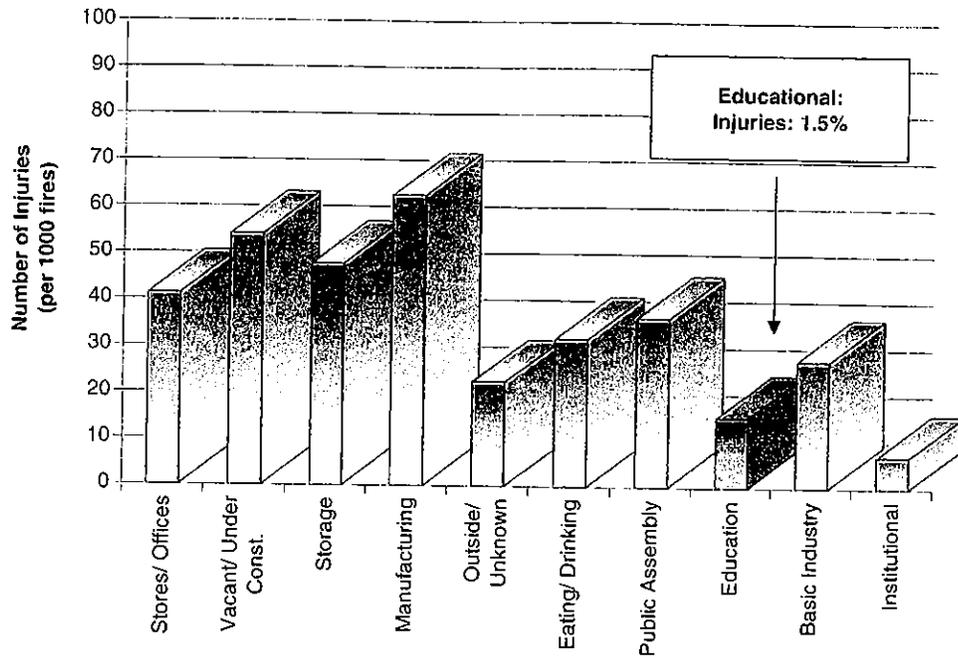


Figure 2.5 (a) – Firefighter Injuries per 1,000 fires: Property Type (1995-1996, National)

Figure 2.5 (b) represents the trend in firefighter injuries for non-residential school fires in California. The data includes firefighter injuries reported between 1977 and 1994. The number of injuries have declined steadily over the interval, from approximately 60 injuries in 1977 to only 10 in 1994.

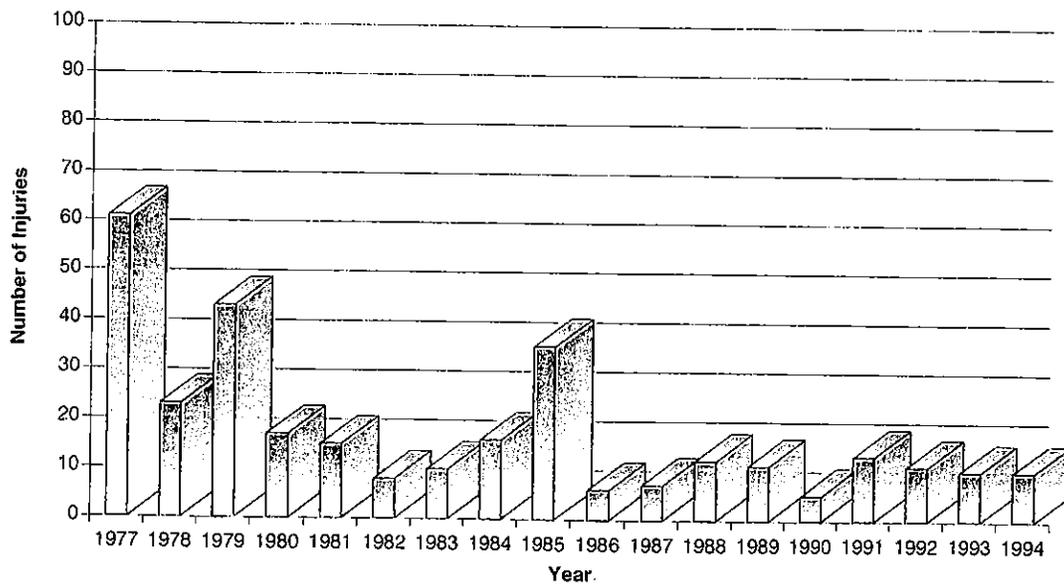


Figure 2.5 (b) – Firefighter Injuries, Non-residential Structure Fires (1977-1994, California)

In addition to injury rates, a second common concern with respect to firefighter operations is the number of fire department responses. Automatic fire alarm and detection systems are

often associated with an increase in false alarms and, therefore, a corresponding increase in the number of fire department responses.

The data provided in Figure 2.5 (c) represent the national statistics for 1987-1996. The data show false alarms accounted for approximately 10 percent of all fire department responses. System malfunctions were responsible for approximately 45 percent of all false alarms. Therefore, system malfunctions, causing false alarms, resulted in approximately 4.5 percent of all fire department responses nationwide in 1987-1996.

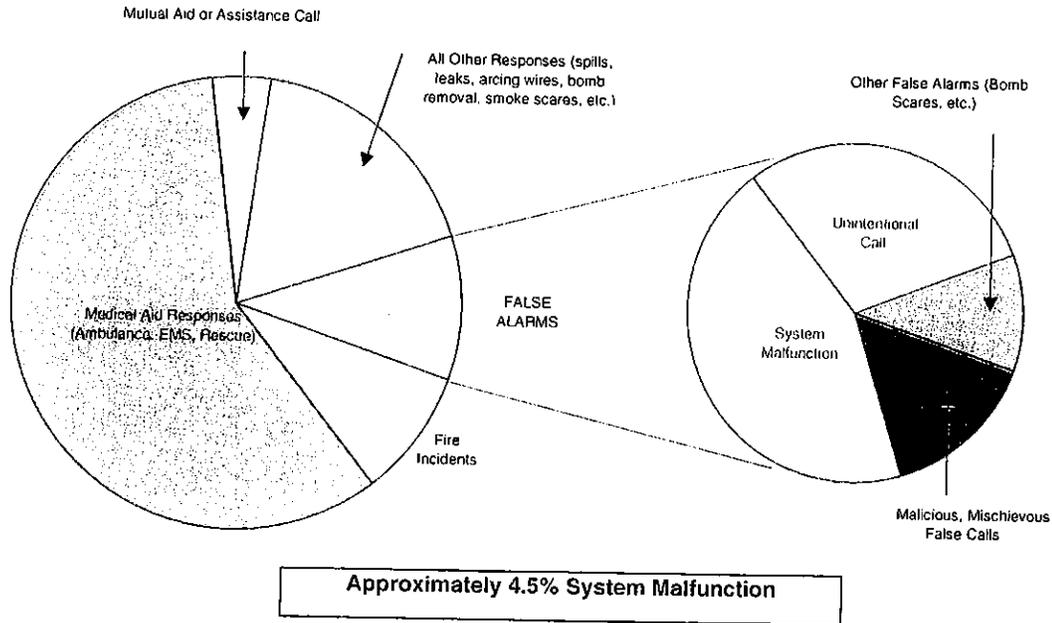


Figure 2.5 (c) – Firefighter Injuries, Non-residential Structure Fires (1987-1996, National)

2.6 Summary of Statistics

Fire loss statistics reveal that fire occurrences in educational facilities in California have decreased significantly over the past 20 years. It is not known if the accuracy of CFIRS data has changed over that period. During the 10-year period from 1980 through 1990, the national and California fire occurrence statistics depict a similar trend, each resulting in an overall decrease of approximately 50 percent. The number of school fires has remained relatively steady since the early 1990's. Approximately 500-600 fires are reported annually in educational structures in California. Related injuries have experienced a similar, yet less distinct, downward trend.

The primary areas of fire origin in schools include normally unoccupied areas, such as the lavatories, locker rooms, and cloak-rooms. The highest injury rates per fire incident are associated with fires originating in the laboratories, while the highest property loss rates result from fires started in large assembly areas.

The primary cause of fires in educational facilities is incendiary and suspicious activity, accounting for over 50 percent of all school fires. Such fires are associated with approximately 60 percent of the property loss. Nearly one half of all persons arrested for arson are under the age of 18. The highest injury rates per fire incident are associated with appliance fire, while the highest property loss rates result from fires started by natural causes. Approximately one-half of all structural fire incidents in schools occur after normal business hours, when the buildings are likely to be unoccupied.

Statistics show that death or injury as a result of fires in schools is infrequent. However, property loss is appreciable. The national data demonstrate the effectiveness of automatic fire alarm and detection and automatic fire sprinkler systems, when they operate, in reducing the property loss associated with such incidents.* Schools protected with an automatic fire alarm and detection system experienced approximately 60 percent less property damage than those without such systems. Similarly, schools protected with an automatic fire sprinkler system experienced approximately 80 percent less dollar loss. Activation rates of such systems are an important variable in assessing the data.

* See Section 2.4 for performance of automatic detection and suppression systems.

APPENDIX I
FIRE SCENE PHOTOGRAPHS



Portable Classroom Entrance.



Interior Damage to Portable Classroom.



Fire Damaged Ceiling Structure.



Fire Damaged Ceiling Structure.



Location of Ignition Source.



Ventilation Louvers in Rear Wall.



Windows at Front of Classroom.



Rear Wall of Classroom.



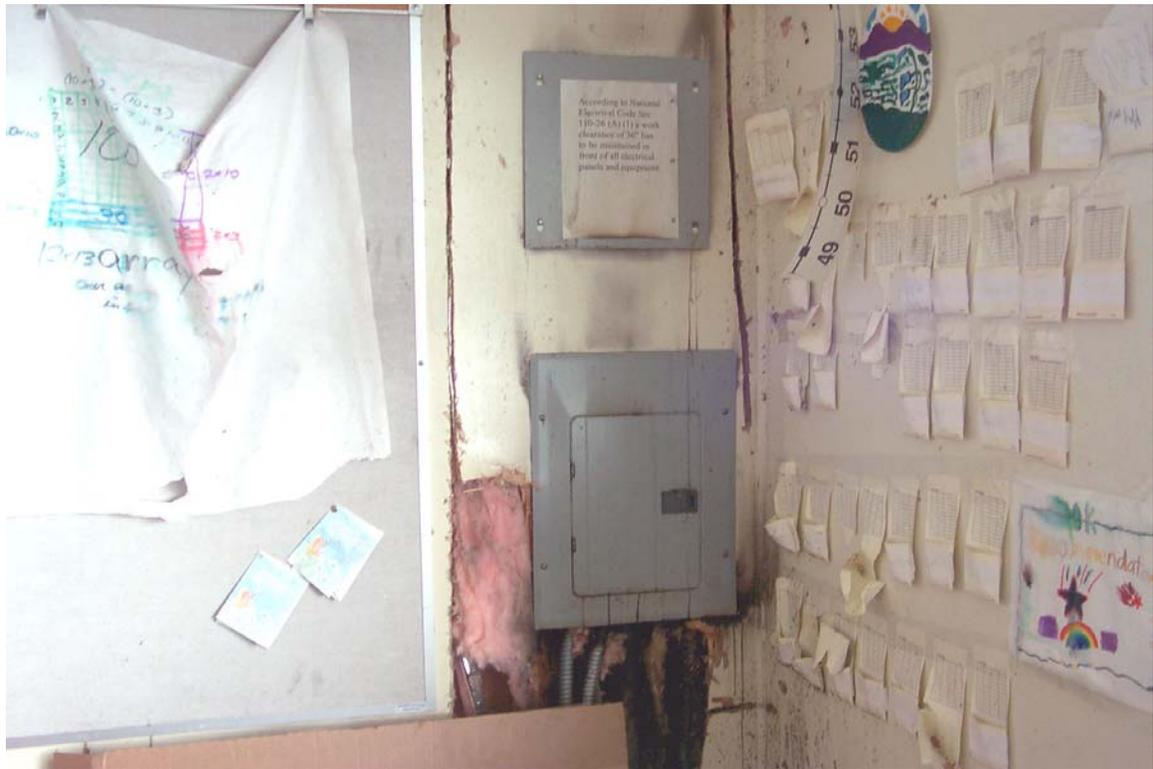
Wood Foundation System.



Wood Foundation System.



Entrance to Portable Classroom



Electrical Panel in Adjacent Classroom



Portable Classroom Involved and Adjacent Exposed Classroom



Portable Classroom Entrance



Interior Damage to Portable Classroom



Interior Damage to Portable Classroom



Floor in Front of Exit Door



Interior Damage to Portable Classroom



Front of Portable Classroom Involved



Rear Wall of Portable Classroom

APPENDIX J
REFERENCES

REFERENCES

1. Fact Book 2003, Handbook of Education Information by California Department of Education
2. Portable School Buildings: Scourge, Saving Grace, or Just Part of the Solution? April 1998, Ed Source
3. Custer, Richard L.P. and Brian J. Meacham, Introduction to Performance-Based Fire Safety, Society of Fire Protection Engineers and National Fire Protection Association, June 1997.
4. Proulx, Guylene, "Misconceptions about Human Behaviors in Fire", Canadian Consulting Engineer, pp. 36-38, March 1997.
5. Fire Protection Handbook, 19th Edition, NFPA
6. SFPE Handbook of Fire Protection Engineering, 2nd Edition, SFPE