

PROJECT SUBMITTAL GUIDELINE: FIRE ALARM AND DETECTION SYSTEMS

A DSA Project Submittal Guideline is a compilation of recommendations based on Code, referenced standards, DSA [USP](#) documents, and DSA practices. These guidelines are designed to give the design profession helpful information, and insight into the DSA project application, submittal and review processes. Guidelines are provided by DSA in support of the USP goals of giving stakeholders the information they need in order to be able to work smoothly with DSA, and to help standardized practices among the four DSA Regional Offices.

Compliance with a Guideline does not assure that a project is complete or that it adheres to the requirements of the California Building Standards Code (Title 24 of the California Code of Regulations) or all DSA requirements. Additional information may be required, depending on project complexity or site conditions. For complete submittal requirements see forms DSA-1 and DSA-3.

(Title 24 Part 2, Vol. 1, NFPA 13 and NFPA 72)

General: Plans must be clearly legible and where possible, drawn to 1'0" = 1/8" scale. Plans that are not legible may be rejected by the plan reviewer as unacceptable for plan review purposes. Only electrical equipment, devices, wiring, etc. related to the fire alarm system(s) should be shown on the plans. Ensure the background is coordinated with the Architectural Floor plans, and include rated wall and door locations, and uses of all areas or spaces.

Buildings that are not part of educational use shall meet the requirements for that individual occupancy group outside of the group "E" occupancy for fire alarm requirements.

Where the scope of the project is only the replacement of the fire alarm control unit, the State Fire Marshal's, "**Fire Alarm Control Unit Replacement in Existing Buildings**" shall be followed. See http://www.osfm.fire.ca.gov/informationbulletin/pdf/2008/IB_WUI-FAC_FINAL_20080910.pdf

For the purposes of this document, "state funded" projects are those for which an application has been or will be made to the Office of Public School Construction (OPSC) for funding under the provisions of the Leroy F. Greene School Facilities Act of 1998.

1. PROJECT INFORMATION: Provide the following information and notes on the plans:

- 1.1 Scope of work:** Brief project description as it pertains to your plan submittal. Include description of occupancy or use of structure(s). Note the names or designations of all buildings on site.
- 1.2 TYPE OF FIRE ALARM SYSTEM (MANUAL VS. AUTOMATIC):** Indicate which type the system is;
 - 1.2.1 MANUAL SYSTEM:** A manually operated device used to initiate a fire alarm signal.
 - 1.2.2 AUTOMATIC SYSTEM:** A fire alarm system which does not require manual operation.
 - 1.2.3 MANUAL SYSTEM WITH PARTIAL, SELECTIVE or SUPPLEMENTARY DETECTION:** (See NFPA 72 for minimum requirements)

Protective covers for manual fire alarms are allowed by DSA provided they are transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed. Each cover shall not exceed a combined projection over 4 inches from the surface of the wall into walks, halls, corridors, passageways or aisles.

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Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 pounds (22.2 N) of force.

1.2.5 TOTAL AUTOMATIC AND MANUAL SYSTEM: A manual and automatic fire alarm system is required in all new buildings (including portable permanent buildings) use for educational purposes with an occupant load of 50 or more or containing more than one classroom.

Existing campus projects that have state funding and an estimated valuation of \$200,000 or more are required to have automatic fire alarm system in area modernized.

1.2.6 MANUAL SYSTEM: A minimum of a manual system is required per Chapter 9 of the CBC for:

- a) Temporary (max. 3 year), educational building projects with state funding.
- b) Buildings that do not have an occupant load of at least 50, or more than one classroom.
- c) Construction project projected to be \$200,000 or less with state funding.

1.2.7 Voice Communication System with Secondary power Supply is required for Assemblies with 1000 or more occupants when used by the general public. These facilities are normally Auditoriums or Theatres where commercial performances are given, and where other types of uses, not associated with the school campus, are conducted. (Exterior Stadiums and Bleachers are not included)

1.2.8 Heat detectors may be omitted from non-combustible spaces and from concealed combustible spaces provided with an automatic fire sprinkler system provided a statement on the floor plans indicates each area where the substitution is being utilized.

Heat detectors may be used in lieu of smoke detectors in the following areas:

- a) Mechanical, Electrical and Storage rooms.
- b) Science Labs, Auto Shops, Welding/Metal and Woodworking Shops and other areas where experiments or other activity produce inordinate amounts of fumes or other **particulates that will initiate "nuisance" alarms.**
- c) Near Shower rooms or other areas that produce steam.
- d) Kitchens with smoke or steam producing equipment.
- e) Closets and small storage rooms (100 Square Feet in area or less), or other small unconditioned spaces.

In all cases the DSA Plan Reviewer will determine the applicability of this type of system.

1.2.9 Fire Alarm Supervision is required for all fire alarm and fire sprinkler flow alarms and tamper switches per NFPA 72 by an approved supervising station in accordance with CBC Chapter 9.

1.3 DSA project number and School District file number.

1.3.1 School name and address.

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- 1.3.2 Plans shall be stamped** by the licensed Electrical Engineer and/or licensed Architect of Record, whoever is responsible for the design, with current renewal dates and signatures. (See [IR A-21: Design, Installation and Maintenance of Fire Alarm Systems](#).)
- 1.3.3 Symbol Legend** for fire alarm system. Symbols shown on the Symbol Legend must match those in Architectural, General Electrical, and Floor plans for the Fire Alarm System. **NOTE:** To expedite plan review, exclude symbols for components that are not part of the project.
- 1.3.4 Equipment List:** (May be combined with the symbol legend when identified as such)
- 1.3.5** Indicate the make and model of each fire alarm component.
- 1.3.6** Indicated the current CSFM listing number for each component.
- 1.4 Sequence of Operations:** Written sequence of operations or a Matrix of operations indicating what occurs when the system is activated in "alarm," "trouble" and "supervisory" conditions.
- 1.5** Please review the following 25 items and apply as appropriate to your project notes and/or specifications.
- 1) APPLICABLE STANDARD 2010 NFPA 72
 - 2) INSTALLATION OF THE SYSTEMS SHALL NOT BE STARTED UNTIL DETAILED DESIGN DOCUMENTS AND SPECIFICATION, INCLUDING STATE FIRE MARSHAL LISTING NUMBERS FOR EACH COMPONENT OF THE SYSTEM HAS BEEN APPROVED BY DSA.
 - 3) UPON COMPLETION OF THE INSTALLATION OF THE SYSTEMS, A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF A DSA PROJECT INSPECTOR.
 - 4) A STAMPED SET OF APPROVED FIRE ALARM DESIGN DOCUMENTS SHALL BE ON THE JOB SITE AND USED FOR INSTALLATION.
 - 5) ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE CODE OR RECOGNIZED STANDARDS SHALL BE BROUGHT TO THE ATTENTION OF DSA AND THE ARCHITECT/ENGINEER OF THE PROJECT.
 - 6) DSA, ARCHITECT/ENGINEER AND OWNER SHALL BE NOTIFIED A MINIMUM OF 48 HOURS PRIOR TO THE FINAL INSPECTION AND /OR TESTING.
 - 7) ALL PENETRATIONS THROUGH RATED ASSEMBLIES, REQUIRING OPENING PROTECTION SHALL BE PROVIDED WITH A PENETRATION FIRE STOP SYSTEM AS IDENTIFIED IN CBC CHAPTER 7, UL OR OTHER LAB TESTING CRITERIA. APPROVED TYPE OF MATERIALS SHALL BE IDENTIFIED WITHIN THE SPECIFICATION WITHIN THE FIRE ALARM SECTION.
 - 8) WALL MOUNTED VISUAL NOTIFICATION DEVICES SHALL HAVE THEIR BOTTOMS MOUNTED AT 80" MINIMUM AND 96" MAXIMUM FROM FINISHED FLOOR.
 - 9) WALL MOUNTED AUDIBLE NOTIFICATION DEVICES SHALL HAVE THEIR TOPS MOUNTED AT 90" MINIMUM AND 100" MAXIMUM FROM FINISHED FLOOR AND NO CLOSER THEN 6" TO A HORIZONTAL STRUCTURE.
 - 10) AUDIBLE DEVICES SHALL PROVIDE A SOUND PRESSURE LEVEL OF 15 DECIBELS (Dba) ABOVE THE AVERAGE AMBIENT SOUND LEVEL OR 5 Dba ABOVE THE MAXIMUM SOUND LEVEL HAVING A DURATION OF AT LEASE 60 SECONDS, WHICHEVER IS GREATER, IN EVERY OCCUPIABLE SPACE WITHIN THE BUILDING.
 - 11) AUDIBLE DEVICES SHALL BE SYNCHRONIZED TEMPORAL CODE 3 PATTERN.
 - 12) THE CONTRACTOR SHALL ADJUST/INSTALL ALL DEVICES TO MAXIMIZE PERFORMANCE AND TO MINIMIZE FALSE ALARMS.
 - 13) VISUAL DEVICES SHOULD NOT EXCEED 2 FLASHES PER SECOND AND SHOULD NOT BE SLOWER THAN 1 FLASH EVERY SECOND. THE DEVICE SHALL HAVE A PULSING LIGHT SOURCE NOT LESS THAN 15 CANDELLA. VISUAL DEVICES WITHIN 55' FROM EACH OTHER SHALL BE SYNCHRONIZED.
 - 14) UNDERGROUND AND EXTERIOR CONDUITS TO HAVE WATERTIGHT FITTINGS AND WIRE TO BE APPROVAL FOR WET LOCATIONS.
 - 15) ALL FIRE ALARM WIRING SHALL BE FLP OR FPLP (FIRE POWER LIMITED OR FIRE POWER LIMITED PLENUM) AS REQUIRED FOR APPLICATION. WIRING IN CONDUIT ABOVE GROUND MAY BE THHN OR THWN.

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- 16) PER CEC STANDARDS, ALL WIRING IS TO BE PULLED THROUGH EACH JUNCTION BOX AND CONNECTED DIRECTLY TO EACH FIRE DEVICE. DO NOT SPLICE THE WIRE. ALL BOXES TO BE SIZED PER CEC.
- 17) SMOKE DETECTORS SHALL NOT BE ANY CLOSER THAN 1' FROM FIRE SPRINKLERS OR 3' FROM ANY SUPPLY DIFFUSER. IN AREA OF CONSTRUCTION OR POSSIBLE DAMAGE/CONTAMINATION ON NEWLY INSTALLED FIRE ALARM DEVICES SHALL BE COVERED UNTIL THAT AREA IS READY TO BE TURNED OVER TO THE OWNER.
- 18) ALL FIRE ALARM CIRCUITS SHALL BE IN CONDUIT, SURFACE RACEWAY OR OPEN RUN ABOVE CEILINGS, UNDER FLOORS AND IN WALLS IN A NEAT AND PROTECTED MANNER AS INDICATED ON DESIGN DOCUMENTS. EXPOSED CIRCUITS ARE ONLY PERMITTED WHEN NOTED AS EXPOSED ON DESIGN DOCUMENTS.
- 19) FIRE ALARM PANEL, REMOTES, AND COMPONENTS SHALL BE SECURED TO MOUNTING SURFACES PER MANUFACTURERS SPECIFICATIONS. NO SINGLE DEVICE SHALL EXCEED THE WEIGHT OF 20 LBS. WITHOUT SPECIAL MOUNTING DETAILS.
- 20) A DEDICATED BRANCH CIRCUIT SHALL BE PROVIDED FOR FIRE ALARM EQUIPMENT. THIS CIRCUIT SHALL BE ENERGIZED FROM THE COMMON USE AREA PANEL AND SHALL HAVE NO OTHER OUTLETS. THE BREAKER SHALL HAVE A RED LOCKING DEVICE TO BLOCK THE HANDLE IN THE "ON" POSITION. THE CIRCUIT BREAKER SHALL BE LABELED "FIRE ALARM CIRCUIT CONTROL". CIRCUIT ID TO BE LABELED AT FIRE PANEL/EXTENDERS.
- 21) THE INSTALLING CONTRACTOR SHALL PROVIDE A RECORD OF COMPLETION PER NFPA 72, FIGURE 10.18.2.1.1.
- 22) CONTROL PANELS, REMOTE ANNUNCIATORS SHALL BE INSTALLED WITH THEIR BOTTOMS MOUNTED AT 48"
- 23) THE INSTALLING CONTRACTOR SHALL PROVIDE SYSTEM PROGRAMMING FOR SUPERVISORY MONITORING PER CBC SECTION 901.6.2.
- 24) SUPERVISORY MONITORING SHALL BE TESTED AND VERIFIED AS SENDING CORRECT SIGNALS IN CONJUNCTION WITH FINAL ACCEPTANCE TEST.
- 25) OWNER SHALL BE RESPONSIBLE FOR ESTABLISHING A FIRE SYSTEM MONITORING CONTRACT OR PROVISIONS.

2. PLAN SUBMITTAL: Plan submittal shall be in accordance with item 1.0 and the following: Include information and details indicated below as applicable to the project. All plans must be clear and legible, with clearly defined walls (rated and non-rated), reflected ceiling details, platforms, etc.

2.1 Site Plan showing:

- 1 All structures on the site.
- 2 **Each system's connection(s) and show** the interconnection(s) of structures on the site (clearly labeled).
- 3 Locations of FACP and all Sub-panels or Power Boosters, and Annunciator Panels. Existing FACP that are being used for an addition require the previously approved DSA Application Number.
- 4 Distances of all conduit runs from FACP and Sub-panels to buildings or devices. **Locations of all "Exterior Audible" appliances include Fire Sprinkler Bells or Horns as applicable.**

2.2 Building floor plan(s) at 1/8" = 1'0" scale

Identify and indicate the height of all walls that are NOT full height. Walls not indicated with specific heights will be considered to be full height and require fire alarm appliances accordingly.

- 1 Identify all elevation changes.
- 2 Identify the use of all areas. The uses must correspond with the Architectural Floor Plans.
- 3 Identify Fire-rated corridor(s), walls for occupancy and area separation(s), and other rated walls to determine requirements for penetration protection.
- 4 **Provide "Cross-section" detail(s) indicating the ceiling and/or roof construction for determining smoke and heat detector spacing, including ceiling pocket depths, as applicable.**
- 5 Show Type and location of fire alarm panels, detectors, manual pull stations, audible

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alarm appliances, visible notification appliances, supervisory signal components, EOL'S, equipment and devices, all identified by symbols matching the symbol legend.

- 6 Show all wiring, indicating number, type and size of wires for each circuit.
- 7 Sequentially number each circuit and component. The labels must correspond with the Riser Wiring Diagram.
- 8 If utilizing ceiling mounted visible notification appliances indicate the height of the applicable ceilings.
- 9 Indicate height of library stacks or storage walls (those not indicated will be presumed to be full height).
- 10 Show all doors and door swings, Floor to ceiling windows, skylights (for ceiling mounted appliances) and other openings, projections, elevation changes, etc. that would affect the placement of alarm appliances.

2.3 Mixing of Appliances:

- 1 All new systems or system upgrades shall produce the California Temporal Pattern.
- 2 Existing systems being repaired may maintain the existing sounding pattern.
- 3 Combined burglar and fire alarm systems shall be designed and installed by C-10 Contractor. (See DSA IR A-21)

2.4 Audible notification appliances:

- 1 Normal occupied classroom ambient sound levels are estimated at an average of 45dBA, with shops, band rooms, etc. much higher.
- 2 Provide additional Audible Notification Appliances as necessary to attain 15dBA above ambient. All areas shall be tested using a sound level meter, and witnessed by the Project Inspector.

2.5 Visible Notification Appliances are required in all areas noted in CFC Section 6.2.3.1, and shall include:

- 1 Nurse's Offices and Cot Rooms (ensure curtains do not obstruct the visible notification appliances).
- 2 Sanitary facilities including restrooms, bathrooms and shower rooms.
- 3 Corridors
- 4 Music, Choir and all associated Practice Rooms (note offices in these areas may also require visible notification appliances due to the residual noise of the Band or Choir rooms).
- 5 Multipurpose rooms
- 6 Vocational Classroom areas may require additional appliances due to the excessive noise levels (Auto, Wood, Metal, & Photo shops, etc.)
- 7 Occupied rooms where ambient noise impairs hearing of the fire alarm.
- 8 Lobbies
- 9 Meeting Rooms
- 10 Classrooms

2.6 Sequentially number each circuit and component.

- 1 Identify each appliance for both initiating devices and notification appliances.

For example: (sequentially number each circuit and component)

A1-1 = Audible circuit #1, device #1 P3-4 = Initiation circuit #3, device #4, etc.
Identify devices in the sequence intended to be wired per the riser diagram.

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- 2 Show the candela rating of each visible notification appliance adjacent to the device on the floor plans.
- 3 Provide mounting details of all components as applicable (i.e.: manual boxes, audible, visible and combination visible/audible notification appliances, etc.). Show mounting heights and "Beam Detector" installation directives (i.e.: maximum height above finished floor, horizontal spacing, etc.).

2.7 Wiring Riser Diagram and additional information as necessary to show the following:

- 1 Show all devices, appliances, components and equipment by symbols matching the symbol legend for each pathway.
- 2 Wire type, gauge, length and number of conductors in each circuit, or cable. Spare conductors shall be identified.
- 3 Clearly indicate on the plans where specialty wiring is installed that act as heat detection and attachments.

NOTE: Wiring must be listed for use as required by Title 24 Part 3 (CEC) Article 760

- 3 Zone identification when (or where) applicable. 2010 NFPA 72, Section 3.3.300
- 4 Circuit/pathway class designation for both initiating device and notification appliance circuits. NFPA 72, Chapter 12
- 5 Candela rating of each Visible Notification Appliance per UL Standard 1971 and NFPA 72, Chapter 18.
- 6 Electrical panel and circuit breaker supplying main power to FACP and sub-panels as applicable.
- 7 For additions to existing systems show new and existing circuits and components for all buildings in "Scope of Work". Provide copies of fire alarm plans previously approved by DSA "For Reference Only" to verify types, locations, and number of components on a given circuit.

2.8 "Point-to-Point" wiring detail for each type of device or appliance being installed.

2.9 Battery type(s), amp hours and load calculations separately for the FACP and each sub-panel with a battery standby.

2.10 Operation Matrix with the following identified:

- 1 **Standby Operation** (100% of applicable components for 24 hours).
- 2 **Alarm Operation** (100% of applicable components for 5 minutes) after 24 hours of Standby Operation).
- 3 Control Panel or Sub-panel amperage draw.
- 4 List of components by model, which draw power from the panel. Amperage draw for each component.
- 5 Quantities of each component.
- 6 Total current draw for all components type/model.
- 7 Total current draw of each subtotal.
- 8 Calculate required battery Amp Hours (Standby + Alarm Operation requirements).
- 9 Indicate Amp Hours of Batteries you intent to provide – less the required capacity and list the spare Amp Hours available. (Battery calculations shall include a 20 percent safety margin to the calculated amp-hour rating.)
- 10 Indicate the installation date (if applicable) for standby lead acid batteries per NFPA 72.

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2.11 Voltage Drop Calculations for all notification circuits in the FACP and for each sub-panel with a battery backup. Account for each notification appliance's voltage draw, and provide total draw and drop for each circuit. Indicate notification appliance model and voltage drop corresponding with those listed in the applicable manufacturer's product data sheet (Cut Sheets).

2.12 Point-to-Point or Ohms Law calculations.

2.13 Zone or Circuit used in calculations.

2.14 Voltage Drop, percent not to exceed listed manufacturer's operating range.

NOTE: Voltage Drop listed manufacturer's operating range: Providing a 10% safety factor will allow the expansion of the circuit/addition of appliances in the future.

- 1 **"Visible" Appliances" (Strobes)**, calculate the voltage drop using the candela draw for each device shown on the floor plans. Use the listed drop shown in the manufacturer's data specifications (Cut Sheets).
- 2 **"Audible Appliances" (Horns or Bells)**, calculate the voltage drop using the listed drop shown in the manufacturer's data specifications (cut sheets).

2.15 Provide formula used for calculations.

NOTE: Actual voltage drops shall be witnessed and recorded by the Project Inspector during the testing of the circuit under full load.

2.16 Applicable codes: Ensure the current codes are listed on the plans.

3. PRODUCT DATA (CUT) SHEET SUBMITTAL: Include the following information and details as applicable to the project:

3.1 Current and legible copies of manufacturer's product data specification sheets (Cut Sheets) for all equipment used.

- 1 Include **all pages** of the product data sheets.
- 2 Product data sheets must include the current draw of the components.
- 3 Include cut sheets and CSFM Listing for existing Fire Alarm Control Panels and Extender Panels for compatibility confirmation.

3.2 CSFM Listings: Legible copies of current applicable California State Fire Marshal (CSFM) Listings for each component and control unit used. New panels must be listed, and have a copy of the current CSFM Listings. Listings must match those on the plans.

3.3 Audible Devices are listed to produce the California Temporal Pattern either via the Main Fire Alarm Control Panel, or by self-generation.

3.4 ORDER OF SUBMISSION:

3.4.1 Submit Manufacturer's Product Data Sheets (Cut Sheets) followed immediately by

3.4.2 A complete (all pages) copy of the applicable CSFM Listing, then

3.4.3 The next Cut Sheet(s) with applicable CSFM Listing

NOTE:

The above items constitute a check list for minimum submittal requirements. Additional information may be required depending on the project's complexity and site conditions.

Upon completion and acceptance of the project, a reproducible "as built" set of drawings of the entire fire alarm system or the areas worked upon, shall be provided to the owner or the owner's representative.