Fire Protection Analysis

Cotchett Education Building

Building 002

Cal Poly

San Luis Obispo

William J. Beasland

Statement of Disclaimer

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Keywords

Cotchett Education Building
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Life Safety Code

Abstract

This report analyzes the **Cotchett Education Building** on the Cal Poly, San Luis Obispo College campus. Since this is an existing building, with various modifications made during the life of the building, it was analyzed as an existing building. *NFPA 101, Life Safety Code, 2012 edition* (LSC) contains requirements for existing buildings, and was the primary code used in this analysis. Other codes used in analysis were referenced in each section.

The **Cotchett Education Building** meets most requirements of *NFPA 101, Life Safety Code, 2012 edition***.** However, there are recommendations regarding exiting and the alarm system. See section 7 of this analysis for these recommendations.

Contents

Statement of Disclaimer 2
Keywords 2
Abstract 2
1 General 5
1.1 Introduction 5
1.2 Plans 5
1.3 Applicable Code 7
1.4 Assumptions 7
2 Structural Analysis 8
2.1 Occupancies 8
2.2 Height and Area 8
2.3 Actual Building Construction 11
2.4 Structural Conclusions 12
3 Exiting and Code Analysis 13
3.1 Applicable Code 13
3.2 Assumptions 13
3.3 Prescriptive Requirements 13
3.4 Evacuation Time Analysis 23
4 Fire Alarm System Analysis 27
4.1 Plans 27
4.2 Applicable Codes 28
4.3 Assumptions 28
4.4 System Type 29
4.5 Detection Devices 29
4.6 Alarm Notification Devices 33
4.7 Alarm, Supervisory and Trouble Signal Disposition 35
4.8 Mass Notification System 37
4.9 Power Requirements 38
4.10 Inspection, Testing and Maintenance 40
5 Proposed Fire Sprinkler System 41
5.1 Applicable Codes 41
5.2 Assumptions 41
5.3 System Type 41

5.4 Water Supply 41
5.5 Occupancy 42
5.6 Design Criteria 42
5.7 System Components 44
5.8 Hydraulic Calculations 45
5.9 Inspection, Testing and Maintenance 46
6 Performance Based Analysis 48
6.1 Performance Based Design 48
6.2 Design Fire Scenarios 49
7 Recommendations 65
7.1 Exiting 65
7.2 Alarm System 65
8 Special Thanks 66
9 Conclusions 67

Appendix 1: Building Code Information & Misc. Notes 68
Appendix 2: Selected Construction Plans 70
Appendix 3: Occupancies 83
Appendix 4: Occupant Loads 87
Appendix 5: Email from Rex Wolf 96
Appendix 6: Exit Locations 99
Appendix 7: Means of Egress Protection 103
Appendix 8: Exit Signs 107
Appendix 9: Fire Alarm Plans 111
Appendix 10: Business Building Fire Alarm Cover Sheet 115
Appendix 11: Fire Alarm Equipment 117
Appendix 12: Sprinkler Layout 209
Appendix 13: Fire Sprinkler Hydraulic Calculations 214
Appendix 14: Fire Modeling: Design Fire Scenario 1 222
Appendix 15: Fire Modeling: Design Fire Scenario 2 224

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1 General

1.1 Introduction

This report analyzes the **Cotchett Education Building** on the Cal Poly, San Luis Obispo College campus. Since this is an existing building, with various modifications made during the life of the building, it was analyzed as an existing building. *NFPA 101, Life Safety Code, 2012 edition* (LSC) contains requirements for existing buildings, and was the primary code used in this analysis. Other codes used in analysis were referenced in each section.

The **Cotchett Education Building** meets most requirements of *NFPA 101, Life Safety Code, 2012 edition***.** However, there are recommendations regarding exiting and the alarm system. See section 7 of this analysis for these recommendations.

The **Cotchett Education Building** is a three story (basement plus 2 stories) unsprinklered building on the Cal Poly, San Luis Obispo College campus. It is a college classroom building, with some offices and lecture halls. There are also some mechanical, electrical and storage rooms.

The **Cotchett Education Building** was built in the 1940s, and was extensively remodeled when the adjoining **Business Building** was built in approximately 1989. The central, open stairway was added at this time.

The Basement is primarily offices, maintenance facilities, storage, electrical rooms and mechanical rooms. It is roughly 16624 square feet in area.

The First Floor is primarily offices, classrooms, teaching labs and lecture rooms. It is roughly 15577 square feet in area.

The Second Floor is primarily classrooms, teaching labs and lecture rooms. It is roughly 11640 square feet in area.

The clock tower is not considered occupiable space.

1.2 Plans

Available plans were requested from the Facilities Department at California Polytechnic State University.

Almost no original plans for the **Cotchett Education Building** are available from the original, 1940s construction.

However, when the adjoining **Business Building** was built in approximately 1989 the code analysis was based on the combined buildings. This analysis will be based on the combined height, area and other features of both buildings, since they were analyzed as a single structure when the **Business Building** was built.

Selected plans from the 1989 addition and remodeling, focusing on the **Cotchett Education Building** are included in Appendix 3.

1.3 Applicable Code

Since this is an existing building, with various modifications made during the life of the building, it will be analyzed as an existing building. *NFPA 101, Life Safety Code, 2012 edition* (LSC) contains requirements for existing buildings, and will be the primary code used in this analysis. Other codes used in analysis will be referenced in each section.

1.4 Assumptions

This analysis is based in floor plans acquired from the Cal Poly, San Luis Obispo, Facility Services Department. Since this analysis is being performed based on plans only, without access to complete original plans and specifications, and access to the building for a physical survey is impractical, some assumptions are being made for the sake of the analysis. These assumptions are listed in the body of this analysis.

2 Structural Analysis

The Cotchett Education Building was built in the 1940s, and was extensively remodeled when the adjoining Business Building was built in approximately 1989. The central, open stairway was added at that time.

The building was added to, and remodeled to the *Uniform Building Code*, 1985 edition, and designed as Type II FR construction. This is the equivalent to IBC construction type IB.

This Structural Code Analysis is based on *The International Building Code*, 2009 edition (IBC) requirements for new construction. All table and section references in this chapter are to *International Building Code,* 2009 edition (IBC). Analyzing the building under this standard allows comparison to current expected levels of safety, even though it was designed to earlier standards.

2.1 Occupancies

The bulk of the building is Business Occupancy, per Section 304 of the IBC is defines as:

304.1 Business Group B. Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

Educational occupancies for students above the 12th grade.

There are also offices, also classified as **Business Occupancy**. (IBC, section 304.1)

Minor storage rooms, lecture rooms and electrical and mechanical rooms are considered as accessory to the predominate **Business Occupancy**. (IBC, section 508.3.1) No separations between occupancies are required per table 508.3.3.

2.2 Height and Area

Building Height of the combined building, as defined in Section 502.1 is 61.5 feet.

Overall building is 3 stories above grade.

Building Area

Cotchett Education Building	Basement	16624 sf
Cotchett Education Building	1st floor	18996 sf
Cotchett Education Building	2nd floor	15120 sf
Business Building	Ground	29308 sf
Business Building	1st floor	16730 sf
Business Building	2nd floor	22700 sf
Business Building	3rd floor	13000 sf
Total Building Area		**132478 sf**

Largest Story (Ground/Basement) **45932 sf**

2.2.1 Increase due to Open Frontage

Increase due to Open Frontage per Section 506.2

Area increase due to frontage = I_f = [F/P – 0.25] W / 30

From 1989 remodeling/addition plans, **Building Code Information & Misc. Notes** table on Sheet T-1, (Appendix 1) there is separation on 2 of the 4 sides giving a F/P of 0.5.

The following assumptions are made:

F/P = 0.5

W = Width of public way or open space = minimum of 30 ft.

I_f = [0.5 – 0.25] 30 / 30 = 0.25

2.2.2 Maximum Floor Area for Unsprinklered Building

From the *Building Code Information & Misc. Notes* (Appendix 1), the building is unsprinklered.

Maximum Floor Area for Unsprinklered Building per Section 506.1

Allowable building area per story = A_a = {A_t + [A_t x I_f] + [A_t x I_s]}

A_t = tabular building area per floor from table 503

I_f = Area increase due to frontage = 0.25

I_s = Area increase due to sprinklers = 0 if unsprinklered

A_a = {A_t + [A_t x 0.25] + [A_t x 0]} = 1.25 A_t

For each construction type, maximum allowable unsprinklered building area per story

= 1.25 x A_t (from table 503)

Additionally, Section 506.4.1 limits unsprinklered buildings of 3 stories or more to a total building floor area of 3 times A_a.

2.2.3 Maximum Building Height and Stories

Maximum building height and stories for unsprinklered buildings are shown in Table 503. This agrees with the *Building Code Information & Misc. Notes* from the original construction.

2.2.4 Allowable Height and Area Summary

Total Building Area	**132,478 sf**
Largest Story (Ground/Basement)	**45,932 sf**
Building Height	**61.5 feet.**
Overall building Stories	**3 stories above grade**

Unsprinklered Building

	Max. Height Above Grade	Maximum Stories Above Grade	Maximum Tabular Area (A_t)	Maximum Allowable Area per Floor (A_a)	Maximum Allowable Total Building Area
Source	From Table 503	From Table 503	From Table 503	A_t x 1.25 Per Section 506.1	A_a x 3 Per Section 506.4.1
Units	(ft)		(sf)	(sf)	(sf)
Minimum Required for This Building	61.5	3	N/A	45,932	132,478
Construction Type					
IA	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
IB	160	11	Unlimited	Unlimited	Unlimited
IIA	65	5	37,500	46,875	140,625
IIB	55	3	23,000	28,750	86,250
IIIA	65	5	28,500	35,625	106,875
IIIB	55	3	19,000	23,750	71,250
IV	65	5	36,000	45,000	113,500
VA	50	3	18,000	22,500	67,500
VB	40	2	9,000	11,250	33,750

Note: Table entries in red are insufficient and these construction types are not allowable for this building if unsprinklered.

Table entries in green are for actually used construction type IB

The primary restricting factors are individual floor area and overall building area.

These factors restrict unsprinklered construction types to IA, 1B and IIA for this building.

2.2.5 IBC Fire Resistance Requirements

The IBC would allow unsprinklered construction types IA, 1B and IIA for this building.

The building was actually constructed to the *Uniform Building Code, 1985 edition*, Type II FR construction. This has very similar fire resistance requirements to IBC Type IB. Because of this, this analysis will be based on IBC Type IB construction, which is acceptable for this building.

Building Element	Required by Table 601, IBC, 2009 Edition, Type IB	Required by Uniform Building Code, 1985 edition, Type II FR
Primary Structural Frame	2 hr	2 hr
Nonbearing Walls and Partitions	0 hr	0 hr
Floor Construction and Secondary Members	2 hr	2 hr
Roof Construction and Secondary Members	1 hr	1 hr

Per Table 602, and based on a minimum separation distance of 30 feet, no fire resistance rating is required for exterior walls. This agrees with the *Building Code Information & Misc. Notes* (Appendix 1) from the remodeling construction.

Per Section 708.4, shafts (including stairwells) shall have a minimum fire resistance rating of 1 hr if connecting less than four stories; however they shall have a minimum fire resistance rating of no less than the floor that they are separating, in this case 2 hours. This 2 hour shaft requirement agrees with the *Building Code Information & Misc. Notes* from the remodeling construction.

Per table 715.4, 1-1/2 hour door assemblies are required at the 2 hour rated stairwells.

2.3 Actual Building Construction

Since this analysis is being performed based on plans only, without access to complete original plans and specifications, and access to the building for a physical survey is impractical, assumptions are being made for the sake of the analysis.

The Cotchett Education Building was built in the 1940s, and was extensively remodeled when the adjoining **Business Building** was built in approximately 1989. The central, open stairway was added at that time.

The building was added to and remodeled to the *Uniform Building Code, 1985 edition*, designed to Type II FR construction.

As noted above in section 2.1.7, and as detailed in the *Building Code Information & Misc. Notes* (Appendix 1) from the addition and remodeling construction, the following criteria apply:

Applicable Code	*Uniform Building Code, 1985 edition*
Construction Type	II FR
Structural Frame	2 hr
Shaft Enclosures	2 hr
Floors	2 hr
Roof	1 hr
Interior Walls and Partitions	0 hr

No fire resistance rating is required for exterior walls.

Minimal information is available on the original 1940s construction, but based on the 1989 classification of *Uniform Building Code, 1985 edition*, Type II FR construction; it should at least meet these requirements.

The remodeling plans show the existing structure as steel frame with concrete roof and floor decks, new structural elements were to be sprayed with 2 hr fireproofing.

The existing walls are shown as lath and plaster, presumably on metal studs to meet non-combustible requirements. New GWB partitions are shown in the remodeled areas, unrated in most areas, 2 hour rated at the new stairwell. While the wall detail sheets were not included in the plans available, it is presumed that the remodeled walls were built with metal studs.

2.4 Structural Conclusions

Based on the available information, this building meets the structural fire protection requirements cited in The International Building Code, 2009 edition (IBC) requirements for new construction.

3 Exiting and Code Analysis

3.1 Applicable Code

This Exiting and Code Analysis is based on *NFPA 101, Life Safety Code, 2012 edition* (LSC) requirements for existing construction. All references in this section are to this code.

3.2 Assumptions

Horizontal exits to and from Business 03 are not considered in the base analysis. Exiting capacity from this building is more than sufficient without considering exiting to Business 03, and Business 03 has not been analyzed as to suitability for horizontal exiting.

3.3 Prescriptive Requirements

3.3.1 Occupancies

Occupancy classifications are defined in section 6.1 of the *Life Safety Code*.

The bulk of the building is Business Occupancy, which the *Life Safety Code* defines as:

Business Occupancy. An occupancy used for the transaction of business other than mercantile.

The building is primarily college classrooms. College and university instructional buildings, classrooms under 50 persons, and instructional laboratories are classified as Business Occupancy. (LSC, section A.6.1.11.1)

There are also offices, also classified as **Business Occupancy**. (LSC, section A.6.1.11.1)

Minor storage rooms and electrical and mechanical rooms are considered as incidental to the predominate **Business Occupancy**. (LSC, section 6.1.14.1.3)

College and university classrooms, 50 persons and over are classified as **Assembly Occupancy**. (LSC, section A.6.1.2.1)

The Business and Assembly occupancies will be treated as Mixed Occupancies, needing to meet the more restrictive of the two occupancies. (LSC, section 6.1.14.3)

Occupancies are shown in Appendix 2.

General requirements for existing **Business Occupancy** are in LSC, Chapter 39.
General requirements for existing **Assembly Occupancy** are in LSC, Chapter 13.

3.3.2 Exiting Analysis

3.3.2.1 Occupant Loads

Occupant Load factors are obtained from LSC table 7.3.1.2.

Area	Occupancy	LSC section per LSC table 7.3.1.2	Occupant Load Factor
Classrooms 50 or over Occupants (Less concentrated use, without fixed seating)	Assembly	6.1.2.1	15 Net
Classrooms under 50 Occupants (Educational use, classrooms)	Business	6.1.11.1	20
Offices, other Business Uses	Business	6.1.11.1	100
Storage, other than storage and mercantile	Storage	6.1.13.1	500

Because the building is primarily **Business Occupancy**, and **Business Occupancy** is based on gross square footage, areas such as corridors and mechanical and electrical rooms will be analyzed at the Business Occupancy load of 100 ft^2 per person.

See Appendix 3 for occupant loads for each room and floor.

3.3.2.2 Individual Room Egress Capacity

Life Safety Code, section 7.2.1.2.3.2 requires: Door openings in means of egress shall be not less than 32 in. in clear width. All doors are at least 32 inch.

The *Life Safety Code*, Table 7.3.3.1, gives a capacity factor of 0.2 in/person for level components.

For 32 inch doors, this yields:

32 in / 0.2 in/person = 160 person door capacity

As shown in Appendix 3, no rooms in the building have an occupant load of over 100, so all individual room door capacities (32 inches or 160 persons) are sufficient.

3.3.2.3 Rooms Requiring More than One Exit

Rooms 126, 127 and 206 have occupant loads of over 50 and are classified as **Assembly Occupancy.** They are required to have two means of egress, and do. LSC, section 7.5.1.3.1 requires the two means of egress in each of these rooms to be remotely located from each other. They all comply with this requirement.

3.3.2.4 Stairways

There are four stairways in the building and they comply with several provisions of the code, as noted.

Stair locations are shown in Appendix 1.
Rated separations are shown in Appendix 4.

Capacity factors are from LSC Table 7.3.3.1

Door Capacity Factor	0.2	in. / person
Stair Capacity Factor	0.3	in. / person

Per LSC Section 7.3.3.2:
For stairways wider than 44 in. (1120 mm) and subject to the 0.3 in. width per person capacity factor, the capacity shall be permitted to be increased using the following equation:

$C = 146.7 + (Wn – 44)/0.218$

where:
C = capacity, in persons, rounded to the nearest integer
Wn = nominal width of the stair in inches

LSC Table 7.2.2.2.1.2 requires a minimum stair width of 44 inches for stairs with a cumulative occupant load of under 2000 persons. Total occupancy of the building is under 1000 and each stairway is 56 inches wide, so this requirement is easily met.

3.3.2.4.1 Stair 1

Serves Floors:	Basement and First
Provides Exiting for:	Basement, Not considered in egress analysis.
Discharges to:	First Floor (Corridor)
Rated Separation at:	Basement
Stair Width:	56”
Stair Capacity:	201 Not considered in egress analysis.
Door Width:	36”
Door Capacity:	180 Not considered in egress analysis.
Governing Capacity:	180 (door) Not considered in egress analysis.
LSC Code Section:	**8.6.9 Convenience Openings.**

This stairway is only separated from the first floor and cannot serve as a required means of egress.

This stairway complies with LSC, section **8.6.9 Convenience Openings, Which states:**

8.6.9.1 Where permitted by Chapters 11 through 43, unenclosed vertical openings not concealed within the building construction shall be permitted as follows:
(1) Such openings shall connect not more than two adjacent stories (one floor pierced only). *(Complies)*

(2) Such openings shall be separated from unprotected vertical openings serving other floors by a barrier complying with 8.6.5. *(Complies)*
(3) Such openings shall be separated from corridors. *(Complies)*
(4) In other than approved, existing convenience openings, such openings shall be separated from other fire or smoke compartments on the same floor. *(Complies)*
(5) In new construction, the convenience opening shall be separated from the corridor referenced in 8.6.9.1(3) by a smoke partition, unless Chapters 11 through 43 require the corridor to have a fire resistance rating. *(Complies)*
(6)* Such openings shall not serve as a required means of egress. *(Complies)*

3.3.2.4.2 Stair 2

Serves Floors:	Basement, First and Second
Provides Exiting for:	Basement, First and Second
Discharges to:	Outside (between the basement and first floor)
Rated Separation at:	Basement, First and Second
Stair Width:	56”
Stair Capacity:	201
Door Width:	42”
Door Capacity:	210
Governing Capacity:	201 (stair)
LSC Code Section:	**8.6.5 Required Fire Resistance Rating**

This is a conventional egress stairway, connecting all three floors and is required to have a 1- hour fire separation.

This stairway discharges outside at the intermediate landing between the basement and first floor, through a 42 inch door. The Basement door is also a 42 inch door. Both the First and Second Floors have 96 inch double doors feeding this stair.

This stairway complies with LSC, section **8.6.5 Required Fire Resistance Rating** which states:
The minimum fire resistance rating for the enclosure of floor openings shall be as follows (see 7.1.3.2.1 for enclosure of exits):
(1) Enclosures connecting four or more stories in new construction — 2-hour fire barriers
(2) Other enclosures in new construction — 1-hour fire barriers *(Complies)*

3.3.2.4.3 Stair 3

Serves Floors:	First and Second
Provides Exiting for:	Second
Discharges to:	First Floor (Corridor)
Rated Separation at:	None
Stair Width:	56”
Stair Capacity:	201
Door Width:	64”
Door Capacity:	320
Governing Capacity:	201 (stair)
LSC Code Section:	**8.6.6 Communicating Space.**

This is an open stairway that discharges at the first floor corridor C01. Rated separations enclose the combined first floor corridor C11, second floor corridor C21 (north end) and stair, creating a Communicating Space. The first floor corridor C11 discharges to outdoors.

This stairway would be classified by the LSC, section **8.6.6,** as **Communicating Space** which states:

Unless prohibited by Chapters 11 through 43, unenclosed floor openings forming a communicating space between floor levels shall be permitted, provided that the following conditions are met:
(1) The communicating space does not connect more than three contiguous stories. *(Complies, connects two stories)*
(2) The lowest or next-to-lowest story within the communicating space is a street floor. *(Lowest floor discharges at street level)*
(3) The entire floor area of the communicating space is open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard. *(Does not comply)*
(4) The communicating space is separated from the remainder of the building by fire barriers with not less than a 1-hour fire resistance rating, *(Complies)*
(5) The communicating space has ordinary hazard contents protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 *(No sprinkler system)*or has only low hazard contents *(Strict administrative controls would be required)*. (See 6.2.2.)
(6) Egress capacity is sufficient to allow all the occupants of all levels within the communicating space to simultaneously egress the communicating space by considering it as a single floor area in determining the required egress capacity. *(Complies, egress capacity of 320 is sufficient.)*
(7)* Each occupant within the communicating space has access to not less than one exit without having to traverse another story within the communicating space. *(Complies)*
(8) Each occupant not in the communicating space has access to not less than one exit without having to enter the communicating space. *(Does not comply)*

This stairway was part of the analysis and remodeling done in the late 1980s, and this arrangement was acceptable under the UBC of the time:

> Sec. 3309.(a) **General.** Interior stairways, ramps or escalators shall be enclosed as specified in this section.
> **EXCEPTIONS:** 1. In other than Groups H and I Occupancies, an enclosure need not be provided for a stairway, ramp or escalator serving only one adjacent floor and not connected with corridors or stairways serving other floors.

(See recommendations)

3.3.2.4.4 Stair 4

Serves Floors:	First and Second
Provides Exiting for:	Second
Discharges to:	First Floor (Lobby)
Rated Separation at:	First and Second
Stair Width:	56”
Stair Capacity:	201
Door Width:	(2) 96 inch doorways at Second Floor, (3) 72 inch doorways at First Floor Lobby
Door Capacity:	1080
Governing Capacity:	201 (stair)
LSC Code Section:	**8.6.6 Communicating Space.**

This is an open stairway that discharges at the first floor lobby. Rated separations enclose the combined first floor lobby, second floor lobby and stair, creating a Communicating Space. The lobby discharges to both outdoors and the Business 03 building. Horizontal exits to Business 03 are not considered in the base analysis, since exiting capacity from this building is more than sufficient without considering exiting to Business 03.

This stairway complies with LSC, section **8.6.6, Communicating Space** which states:

Unless prohibited by Chapters 11 through 43, unenclosed floor openings forming a communicating space between floor levels shall be permitted, provided that the following conditions are met:
(1) The communicating space does not connect more than three contiguous stories. *(Complies, connects two stories)*
(2) The lowest or next-to-lowest story within the communicating space is a street floor. *(Lowest floor discharges at street level)*
(3) The entire floor area of the communicating space is open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard. *(Complies)*
(4) The communicating space is separated from the remainder of the building by fire barriers with not less than a 1-hour fire resistance rating, *(Complies)*
(5) The communicating space has ordinary hazard contents protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 *(No sprinkler system)* or has only low hazard contents *(Strict administrative controls would be required).* (See 6.2.2.)
(6) Egress capacity is sufficient to allow all the occupants of all levels within the communicating space to simultaneously egress the communicating space by considering it as a single floor area in determining the required egress capacity. *(Complies, egress capacity of 1080 is sufficient for entire building.)*
(7)* Each occupant within the communicating space has access to not less than one exit without having to traverse another story within the communicating space. *(Complies)*
(8) Each occupant not in the communicating space has access to not less than one exit without having to enter the communicating space. *(Complies)*

This stairway was part of the analysis and remodeling done in the late 1980s, and this arrangement was acceptable under the UBC of the time:

> Sec. 3309.(a) **General.** Interior stairways, ramps or escalators shall be enclosed as specified in this section. **EXCEPTIONS:** 1. In other than Groups H and I Occupancies, an enclosure need not be provided for a stairway, ramp or escalator serving only one adjacent floor and not connected with corridors or stairways serving other floors.

(See recommendations)

3.3.2.5 Egress by Floor

3.3.2.5.1 Basement

The Basement is primarily offices, maintenance facilities, storage, electrical rooms and mechanical rooms. It is roughly 16624 square feet in area.

The Basement occupant load from Appendix 4 is 183 persons.

Basement exiting capacity:

Location	Door Width	Door Capacity	Stair Width	Stair Capacity	Governing Capacity
Corridor C05	36”	180	56” (exterior)	201	180
Corridor C01	64”	320	66” (exterior)	247	247
Corridor C02	64”	320	2@48” (exterior)	330	320
Stair 2	42”	210	56”	201	201
Room 10	36”	180	56” (exterior)	201	180
Total Basement Exit Capacity					**948**

Total available exiting capacity of 948 persons greatly exceeds occupant load of **183**.

Stair 1 also serves the basement, but since it is a Convenience Opening it is not considered in egress calculations.

3.3.2.5.2 First Floor

The First Floor is primarily offices, classrooms, teaching labs and lecture rooms. It is roughly 15577 square feet in area.

The First Floor occupant load from Appendix 4 is 405 persons.

First Floor exiting capacity:

Location	Door Width	Door Capacity	Stair Width	Stair Capacity	Governing Capacity
Corridor C15	64”	320	N/A	N/A	320
Corridor C11	64”	320	84” (interior)	330	320
Corridor C12	3@ 72”	1080	N/A	N/A	1080
Stair 2	42” (see Stairs)	210	56”	201	201
Total First Floor Exit Capacity					**1921**

Total available exiting capacity of 1921 persons greatly exceeds occupant load of **405**.

3.3.2.5.3 Second Floor

The Second Floor is primarily classrooms, teaching labs and lecture rooms. It is roughly 11640 square feet in area.

The Second Floor occupant load from Appendix 4 is 405 persons.

Second Floor exiting capacity:

Location	Door Width	Door Capacity	Stair Width	Stair Capacity	Governing Capacity
Stair 2	42” (see Stairs)	210	56”	201	201
Stair 3	N/A	N/A	56”	201	201
Stair 4	N/A	N/A	56”	201	201

Total Second Floor Exit Capacity **603**

Total available exiting capacity of 603 persons exceeds occupant load of **405**.

3.3.2.6 Egress Arrangement

Exits are shown in Appendix 6

3.3.2.6.1 Main Entrance/Exit

At least one stair (stair 4) from floor 2 to 1 must be capable of exiting at least 203 persons. This stair, with a capacity of 201 persons is marginal for this requirement, being 2 persons overloaded. This could potentially be explained away with slightly less conservative assumptions regarding occupant load of the second floor.

LSC section 7.3.1.1.2 requires that the loss of any one means of egress must leave at least 50 percent of the required capacity available. Each of the three stairs serving the second floor is rated with a capacity of 201 persons. The two other stairs from floor 2 to 1 must be capable of exiting at least 302 persons combined. Any two of the three stairs would be capable of exiting 402 people and would meet this requirement. The first floor and basement, with their greatly excessive egress capacity will easily meet this requirement.

LSC section 7.7.2 states: Not more than 50 percent of the required number of exits, and not more than 50 percent of the required egress capacity, shall discharge through areas on any level of discharge. One of the three means of egress (two are required) from the second floor discharges through the first floor. The second floor, with an occupant load of 405, has one stairway with a capacity of 201 discharging through the first floor. This is an acceptable arrangement.

3.3.2.6.2 Required Number of Means of Egress

LSC section 7.4-1.1 requires at least two means of egress from any space, unless permitted elsewhere in the code. All three floors exceed this requirement.

Per LSC, section 7.4.1.2, occupant loads in excess of 500 require at least 3 means of egress. All floors have occupant loads under 500, and have at least three means of egress, exceeding this requirement. The overall building has a total occupant load of 993 persons which requires at least 3 means of egress. Eight are provided.

3.3.2.6.3 Egress Separation

Per LSC section 7.5.1.3.5, an existing building is exempt from minimum diagonal separation distance requirements, as long as the egresses are remotely located. Thus, all three floors meet this requirement.

3.3.2.6.4 Maximum Travel Distance

Per LSC, section 13.2.6.2, maximum travel distance to an exit for unsprinklered assembly occupancies is 200'.
Per LSC, section 39.2.6.2, maximum travel distance for unsprinklered business occupancies is 200'.
All points of the building comply with this requirement.

3.3.2.6.5 Maximum Dead End Travel Distance

Per LSC, section 13.2.5.1.3, maximum dead end travel distance for unsprinklered assembly occupancies is 20'.
Per LSC, section 39.2.5.2, maximum dead end travel distance for unsprinklered business occupancies is 50'.
This building has exits at the ends of most corridors, so dead ends are minimized. Maximum dead end travel distance is approximately 15', at the basement corridors serving room 24. Thus, all three floors meet this requirement.

3.3.2.6.6 Maximum Common Path Distance

Per LSC, section 13.2.5.1.2, maximum common path of travel distance for unsprinklered assembly occupancies with an occupant load of over 50 is 20'.
Per LSC, section 39.2.5.3.1, maximum common path of travel distance for unsprinklered business occupancies is 75'.
Maximum common path of travel distance is approximately 15', at the basement corridors serving room 24. Thus, all three floors meet this requirement.

3.3.2.6.7 Connections to Business 03 Building

There are two first floor and two second floor connections to building **Business 03.** Horizontal exits to and from Business 03 are not considered in the base analysis. Exiting capacity from this building is more than sufficient without considering exiting to Business 03, and Business 03 has not been analyzed as to suitability for horizontal exiting. These connections were, however, taken into account when analyzing for dead end and common path travel distances, since they would allow alternate means of egress.

3.3.3 Finish Requirements

3.3.3.1 Interior Finish Requirements

LSC, Section 13.3.3 for Assembly Occupancy and Section 39.3.3 for Business Occupancies contain requirements for Interior and floor finishes.

Assembly Occupancy

Area	**Finish Class**
Corridors and Lobbies	Class A or Class B
Enclosed Stairways	Class A
Assembly areas with occupant loads up to 300	Class A, Class B, or Class C

Business Occupancy

Area	Finish Class
Exits and in exit access corridors	Class A or Class B
Other Business Areas	Class A, Class B, or Class C

Interior finishes must be tested in accordance with the test criteria specified in LSC, table A.10.2.

3.3.3.2 Floor Finish Requirements

No requirements for existing buildings per LSC sections 13.3.3.5 (for assembly occupancies) and 39.3.3.3 (for business occupancies).

3.3.4 Separation Requirements

Rated separations are shown in Appendix 4.

LSC Table 6.1.14.4.1 requires a 1 hour separation between assembly and business occupancies. This cannot be further reduced. Thus a 1 hour separation is required, unless it is treated as Mixed Occupancies, needing to meet the more restrictive of the two occupancies. (LSC, section 6.1.14.3) This will eliminate the need for rated separations between the larger lecture halls (assembly occupancy) and the remainder of the building (business occupancy).

See the Stairs section of this report for stairway separation requirements.

LSC, Section 13.3.6 (for assembly occupancies) and section 39.3.6 (for business occupancies) state that there are no additional requirements for corridor protection in existing buildings.

3.3.5 Construction Requirements

LSC table 13.1.6 requires construction type I(442), I(332), II(222), II(111), III(211), or IV(2HH) for the assembly floors and below for an unsprinklered building. Since the assembly occupancy is on the first and second floors, all floors must be one of these construction types.

The building was actually constructed to the *Uniform Building Code, 1985 edition*, Type II FR construction. This has very similar fire resistance requirements to NFPA Type II(222), and is acceptable.)

3.3.6 Exit Signs

LSC, Section 12.2.10 (for assembly occupancy) and LSC, Section 38.2.10 (for business occupancy) require that means of egress shall be provided with signs in accordance with Section 7.10.

Exit signs will be installed per LSC section 7.10.

Exit sign locations are shown in Appendix 8.

3.3.7 Fire Sprinkler System

This is an unsprinklered building. A conceptual design for a proposed sprinkler system is presented in section 5 of this analysis.

3.3.8 Fire Alarm System

A fire alarm system is required by section 39.3.4.1.

It must be installed in conformance with section 9.6 and NFPA 72®*, National Fire Alarm and Signaling Code,* 2010 edition.

It is analyzed in section 4 of this analysis.

3.4 Evacuation Time Analysis

3.4.1 Occupant Characteristics

Occupants are expected to be primarily students, with some professors and other college staff. The students will generally be young, in decent to good physical condition, and (reasonably) alert and awake. The professors and staff will tend to be older than the students, but in generally good enough condition to evacuate reasonably quickly.

The *British Standard Institute publication, PD-7974-6:2004* is referenced in *the SFPE Handbook of Fire Protection Engineering, fourth edition*, section 3-12. It states that: "when groups of building occupants are considered, a range of common situations and developing scenarios can be identified."

These are summarized in the following table:

Category	**Occupant Alertness**	**Occupant Familiarity**	**Occupant Density**	**Enclosure/ Complexity**	**Example of Occupancy Type**
A	Awake	Familiar	Low	One or many	Office or industrial
B1	Awake	Unfamiliar	High	One or few	Shop, restaurant, Circulation space
B2	Awake	Unfamiliar	High	One with Focal point	Cinema, theater
Ci, Cii	Asleep	Familiar	Low	Few	Dwelling
Ciii	Asleep	Unfamiliar	Low	Many	Hotel, hostel
D	Medical care	Unfamiliar	Low	Many	Residential (institutional)
E	Transportation	Unfamiliar	High	Many	Railway station/ Airport

Of these categories, this building best fits Category A. The occupants are awake and familiar with the building. Overall population density is relatively low and there are many enclosures. Offices are explicitly in this category and college classrooms would also fit into this category.

3.4.2 Building Evacuation Time

3.4.2.1 Pre-Movement Time

As discussed under **Occupant Characteristics,** this building best fits Category A, which includes offices. *SFPE Handbook of Fire Protection Engineering*, fourth edition, contains Table 3-12.2, *Delay Times Derived from Actual Fires and Evacuation Exercises Reported in the Referenced Literature.*
This table includes the following data. Delay times are in minutes:

Event Description	Median Delay Time	Mean Delay Time	Factors
High-rise Office Building	1.0	N/A	Fire incident, no alarms, data from Interviews with occupants of four floors Of building (11 interviewees were trapped)
High-rise Office Building	1.0	1.2	Unannounced drill on 3 floors, data for First person to reach each of 4 stairwell Doors to wait for voice instruction; Trained staff; data from video Recordings
Mid-rise Office Building	0.6	0.6	Unannounced drill; good alarm Performance; fire wardens; warm day
Mid-rise Office Building	0.9	1.1	Unannounced drill; good alarm Performance; fire wardens; cool day

Based on the above data, the fact that an alarm system will be provided, and that faculty will perform a roll similar to floor wardens, a pre-movement time (T_p) of 1 minute was selected. This assumes occupant reaction will be close to ideal and given the lack of real-world data, is very uncertain. However, it will be applied to exit time calculations, which will be used to calculate a best case evacuation time, so would be appropriate.

3.4.2.2 Hand Calculation

The hydraulic flow model was used to estimate evacuation time from the Cotchett Education Building. The following factors are summed to give a minimum estimated egress time:

Pre-movement time (T_p)
Time to pass through exit (T_e)
Travel time on stairs (T_t)

The following assumptions were made:

All persons will start to evacuate at the same instant.
Occupant flow will not involve any interruptions caused by decisions of the individuals involved.
All or most of the persons involved are free of disabilities that would significantly impede their ability to keep up with the movement of a group.
Flow through doorways and stairways is at optimal rate.

On each floor, the occupant load is distributed evenly between exit stairways and doorways.
Travel time to exits is not considered.
Calculated path of egress is along centerline of path.
Occupants were considered exited once they left the exit stairway or doorway to the exterior of the building
Pre-movement time is 1 minute as discussed above.

Constants from *SFPE Handbook of Fire Protection Engineering*, third edition, section three, chapter 14, *Emergency Movement*:

Constant	**Unit**	**Doorway**	**Stair, 7" rise, 11" tread**
K	ft/min	275	212
a	ft^2/p	2.86	2.86
$F_{s,max}$	p/min/ft	24	18.5
D_{max}	p/ft^2	0.175	0.175
Total Boundary Layer	ft	1.0 (12 in)	1.0 (12 in)
Stairway conversion Factor	N/A	N/A	1.85

3.4.2.2.1 Time to pass through exit (Te)

Calculated flow rate, F_c for doorways and stairways is determined using the equation:

$$F_c = F_s W_e$$

Where
F_c = Calculated flow (p/min)
F_s = specific flow (p/min/ft)
W_e = effective width (ft) = width of stair – 1.0 ft

Using this formula, the Calculated flow rate, F_c for various doorways and stairways was calculated.

Width	Door/Stair	W_e	F_s	F_c
42"	Door	30"	24	60 p/min
64"	Door	52"	24	104 p/min
72"	Door	60"	24	120 p/min
96"	Door	84"	24	168 p/min
56"	Stair	44"	18.5	67 p/min
84"	Stair	72"	18.5	111 p/min

It is assumed that exiting from each floor will be split evenly between the egress stairways and doorways on each floor.

Floor	**Occupant Load**	**Number of Egresses**	**Occupants per Egress (Persons per LSC)**	**Total Egress Capacity**
Basement	183	5	37	948
First	405	4	102	1921
Second	405	3	135	603

The Basement has a low occupant load and high egress capacity. The First Floor has a similar occupant load to the Second Floor and much greater egress capacity, so only the Second Floor will be considered.

The Second Floor is served by three 56" stairways.

Stairway 2 has a 96" double door at the second floor, a 56" stair and a 42" egress door at the landing between the basement and first floor, which is the most restricting component. All three floors exit through this door.

Stairway 3 has no door at the second floor, a 56" stair and joins at the first floor to discharge through a 64" doorway.

Stairway 4 has two 96" double doors at the second floor, a 56" stair and joins at the first floor to discharge through three 72" doorways.

By far stairway 2 has the highest assumed egress load, with people egressing from all three floors. Additionally, it has the greatest restriction, with the 42" egress door. This is the most demanding egress path and will be examined.

Occupants Using Stair 2

Floor	**Occupant Load**	**Number of Egresses**	**Occupants per Egress**
Basement	183	5	37
First	405	4	102
Second	405	3	135
Total at Stair 2			**274**

Persons / F_c for 42" door = T_e = Time to pass through exit
T_e = 274 persons / 60p/min = 4.5 min

3.4.2.2.2 Travel time on stairs (Tt)

Travel Speed = S = k(1-aD) = 212(1-2.86 x 0.175) = 106 ft/min

Travel distance:

Second floor to first floor stair	12' (height)	x 1.85 (stair factor)	= 22.2'
Three landings	9.33' (travel on landing	x 3 (landings)	= 28.0'
First floor to landing	6' (height)	x 1.85 (stair factor)	= 11.1'
Total travel distance			= 61.3'

Travel time on stairs (T_t) = 61.3 ft / 106 ft/min = 0.6 min

3.4.2.2.3 Total Travel Time (T)

$T = T_p + T_e + T_t$ = 1.0 min + 4.5 min + 0.6 min = 6.1 min or 366 seconds

3.4.2.3 Pathfinder Calculation

A Pathfinder computer exiting analysis was performed on the **Cotchett Education Building**. The entire structure was modeled to scale. It was populated by room using the population load calculated in Appendix 3 and used in the Hand Calculations above.

An evacuation simulation was run. Screenshots were taken every 30 seconds of all three floors and are included Appendix 6. The Pre-Movement time will be added to the computer calculated egress time of 160 seconds to calculate Total Travel Time.

Pre-Movement time (T_p)	60 seconds
Computer Calculated Egress Time ($T_e + T_t$)	160 seconds
Total Travel Time (T)	220 seconds

As shown in Appendix 6, the last area to be evacuated is the center of the second floor. A large mass of people backs up at the center stair (stair 4) before eventually evacuating, with the rest of the building clearing out considerably sooner.

This can explain the difference between the hand and computer calculations. The hand calculations were based on the assumption that stair 2, at the south of the building would be the last to empty, with a hand calculated evacuation time of 366 seconds. In the computer model, the occupants evacuated more efficiently, with more using stair 4, and a total evacuation time of 220 seconds.

4 Fire Alarm System Analysis

4.1 Plans

Available plans were requested from the Facilities Department at California Polytechnic State University.

Plans, dated 4/10/2008 depicting the current fire alarm system component locations in the **Cotchett Education Building** are included in Appendix 9. No installation or wiring plans or component detail are available.

Since the current fire alarm system was modified over the years without much documentation, and remote location prohibits physical survey, much of this analysis will be based on what the minimum requirements are, as opposed to evaluating the installed equipment.

Fire alarm plans for the adjoining **Business Building**, dated 7/24/1991 are available and the Fire Alarm System cover sheet is included in Appendix 10. The buildings are connected to each other, as depicted in the plans. Given that alarm systems normally contain equipment from a single supplier, where necessary, for the sake of this analysis, it will be assumed that similar components and features are used in in the **Cotchett Education Building.**

4.2 Applicable Codes

As noted in the *National Fire Alarm and Signaling Code Handbook*, while NFPA 72®*, National Fire Alarm and Signaling Code* describes the details of how a fire alarm system must be installed, the requirement to have a fire alarm system is contained in another enacted code.

Since this is an existing building, with the alarm system installed during the life of the building, it will be analyzed as an existing building. *NFPA 101, Life Safety Code, 2012 edition* (LSC) contains requirements for existing buildings, including fire alarm system requirements.

Occupancy classifications are defined in section 6.1 of the *Life Safety Code*.

The bulk of the building is Business Occupancy, which the *Life Safety Code* defines as:

Business Occupancy. An occupancy used for the transaction of business other than mercantile.

Further discussion of the occupancy classification of the building occupancies can be found in the *Exiting Analysis* of this building performed in section 3 of this analysis.

A fire alarm system is required by section 39.3.4.1 of the LSC which states:

39.3.4.1 General. A fire alarm system in accordance with Section 9.6 shall be provided in all business occupancies where any one of the following conditions exists:
(1) The building is three or more stories in height.
(2) The occupancy is subject to 100 or more occupants above or below the level of exit discharge.
(3) The occupancy is subject to 1000 or more total occupants

Both conditions (1) and (2) apply. The building is three stories high. The *Exiting Analysis* determined the occupant load of each of the floors to be in excess of 100 occupants as shown in Appendix 4.

The fire alarm system must be installed in conformance with section 9.6 of the LSC and NFPA 72®*, National Fire Alarm and Signaling Code,* 2010 edition.

Inspection, testing and maintenance requirements are based on chapter 14 of NFPA 72®*, National Fire Alarm and Signaling Code,* 2010 edition.

4.3 Assumptions

This analysis is based in alarm and floor plans acquired from the Cal Poly, San Luis Obispo, Facility Services Department. Since this analysis is being performed based on floor plans only, without access to complete plans and specifications, and access to the building for a physical survey is impractical, assumptions are being made for the sake of the analysis.

Since information on existing equipment is not available, where necessary, for the sake of this analysis, it will be assumed that similar components and features to those listed in the fire alarm plans for the adjoining **Business Building** are used in in the **Cotchett Education Building.**

4.4 System Type

The **Cotchett Education Building** contains a protected premises fire alarm system that is connected with the Proprietary supervising station fire alarm system in the campus police station.

The fire alarm control panel is located in the basement level corridor, as shown in Appendix 9.

All components are to be listed, per NFPA 72, section 10.3.1.

4.5 Detection Devices

Section 39.3.4.2 of the *Life Safety Code* has the following requirement for alarm system initiation in a Business occupancy:

39.3.4.2 Initiation. Initiation of the required fire alarm system shall be by one of the following means:
(1) Manual means in accordance with 9.6.2.1(1)
(2) Means of an approved automatic fire detection system that complies with 9.6.2.1(2) and provides protection throughout the building
(3) Means of an approved automatic sprinkler system that complies with 9.6.2.1(3) and provides protection throughout the building

Detection means (1), manual means (manual pull stations) was provided. In a college classroom (Business Occupancy) environment, occupants are expected to be primarily students, with some professors and other college staff. The students will generally be young, in decent to good physical condition, and (reasonably) alert and awake. The occupants are expected to be able to detect a fire and activate the pull station alarm while evacuating.

Additionally, although not required by the LSC, duct smoke detectors were provided. Additionally, ceiling mounted spot type smoke detectors in selected rooms were provided.

4.5.1 Detection Components

The locations and type of detection components are listed in Appendix 9.

The only LSC required detection components are manual fire alarm boxes. It states:

9.6.2.3 A manual fire alarm box shall be provided as follows, unless modified by another section of this *Code*:

(1) For new alarm system installations, the manual fire alarm box shall be located within 60 in. (1525 mm) of exit doorways.

(2) For existing alarm system installations, the manual fire alarm box either shall be provided in the natural exit access path near each required exit or within 60 in. (1525 mm) of exit doorways.

9.6.2.5* Additional manual fire alarm boxes shall be located

so that, on any given floor in any part of the building,
no horizontal distance on that floor exceeding 200 ft (61 m)
shall need to be traversed to reach a manual fire alarm box.

Similarly, NFPA 72 requires:

17.14.8* Additional manual fire alarm boxes shall be provided so that the travel distance to the nearest fire alarm box will not be in excess of 200 ft (61.0 m), measured horizontally on the same floor.

Thus, manual fire alarm boxes in this existing building must be provided both in the natural exit access path near each required exit and within 200 ft. horizontal travel distance from all parts on the same floor. All three floors of the **Cotchett Education Building** comply with both of these requirements.

Additionally, automatic detection devices, not required by the LSC, are provided in the following rooms:

Pull station at stair discharge

Room	Room Title	Area	NFPA 101	NFPA 72
		SF	Occupancy	Detection
0003-00	Mech Room	547	Business	Duct Detector
0009-00	Support Office	676	Business	Spot Smoke Detector
0009-A0	Support Office	635	Business	Spot Smoke Detector
0015-00	Staff Office	149	Business	Spot Smoke Detector
0015-A0	Admin Office	219	Business	Spot Smoke Detector
0016-A0	Support Office	155	Business	Spot Smoke Detector
0016-B0	Staff Office	139	Business	Spot Smoke Detector
0016-C0	Staff Office	203	Business	Spot Smoke Detector
0017-00	Maint Rpr Sp	370	Business	Spot Smoke Detector
0019-00	Maint Rpr Sp	642	Business	Spot Smoke Detector
0021-A0	Gen Storage	307	Storage	Spot Smoke Detector
0024-00	Conf Room	708	Business	Spot Smoke Detector
0025-00	Spec Inst Sup	420	Business	Heat Detector
0025-A0	Spec Inst Sup	115	Business	Spot Smoke Detector
0026-00	Admin Use	208	Business	Spot Smoke Detector
0027-00	Mech Room	361	Business	Duct Detector
0028-00	Maint Rpr Sp	153	Business	Spot Smoke Detector

Spot type smoke detectors are provided as shown in the above listed rooms. It is assumed that all ceiling heights are at 10 feet. The smoke detectors in the rooms listed above have the proper number of detectors provided in each of the listed rooms in order to provide detection with 30 ft x 30 ft nominal smoke detector spacing, per NFPA 72, section 17.7.3.2.3.1.

It appears that by scale in some of the rooms the smoke detectors are over spaced, but given the small scale and apparent offsetting of detectors to avoid room numbers, it is assumed for the purpose of this report that actual installation meets NFPA 72 spacing requirements.

A heat detector is provided in Room 25, which measures approximately 38’ x 24’. Assuming detector location near the center of the room, a heat detector listed spacing of at least 40 feet will be required.

Smoke and heat detectors are provided at the elevator lobbies, presumably for elevator recall use.

4.5.2 Detection Scenario

In this building, the primary means of fire detection is manual fire alarm boxes, with spot type automatic smoke detectors only provided in basement office and support rooms. Given this, a computer monitor fire in an office or support rooms is a likely scenario for analyzing spot type automatic smoke detector activation.

Assume a Simplex Model 2098-9201 photoelectric smoke detector, as used in the **Business Building**. (See Appendix 5 for smoke detector cuts.)

Use Detact XLS To estimate response time for ceiling mounted detector, with the following parameters to simulate a computer monitor fire in room 17, Maintenance Repair Space:

Nominal 30 ft x 30 ft smoke detector spacing
Ceiling height = 10 ft
Fire height at the top of table = 2.5 ft
Medium t-squared fire
Fire growth coefficient = 0.012 kW/s^2
Use RTI = 2 to simulate smoke detector.
Use "PVC" material, Scattering Type detector (photoelectric) from NFPA 72, Table B.4.7.5.3. for Temperature rise of 7.2 C

Detact XLS Input
(H) Fire to ceiling = 10 ft (ceiling) – 2.5 ft (fire) = 7.5' = 2.3 m
(W) Room width = 25 ft = 7.6 m
(R) Radial Distance = 30' x 0.7 = 21' (max distance to a detector) = 6.4 m
(TO) Ambient temperature = assume 20 C
(Ta) Activation Temperature = 20 C (ambient) + 7.2 C (Temp. rise) = 27.2 C
(RTI) 2 to simulate smoke detector.

DETACT.XLS: Estimate of the response time of ceiling mounted fire detectors

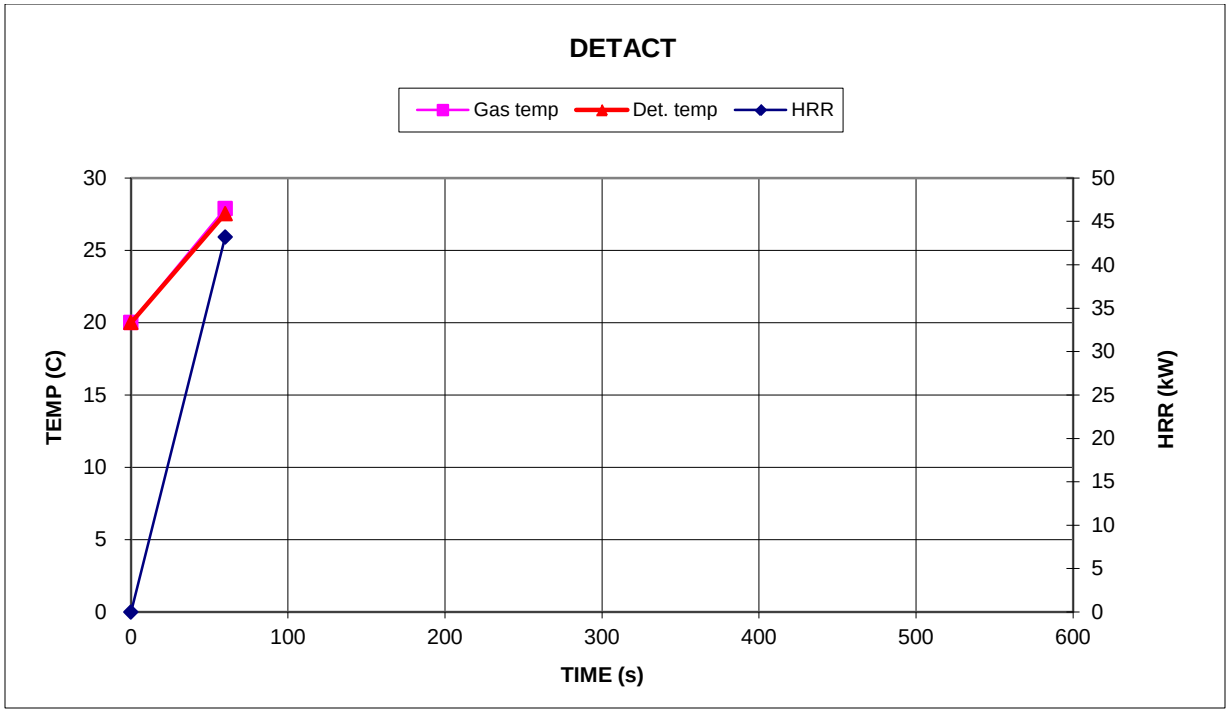
INPUT PARAMETERS			CALCULATED PARAMETERS		
Calculation reset	1	0 or 1	R/H	2.7826	-
Ceiling height (H)	2.3	m	W/H	3.3043	-
Room width (W)	7.6	m	Temperature factor	0.1516	-
Radial distance (R)	6.4	m	Velocity factor	0.1746	-
Ambient temperature (To)	20	C	Calculation time (t)	101	s
Actuation temperature (Ta)	27.2	C	Fire HRR (Q)	122.41	kW
Rate of rise rating (ROR)	8.3	C/min	Gas temperature (Tg)	35.766	C
Response time index (RTI)	2	(m-s)1/2	Gas velocity (Ug)	0.6566	m/s
Fire growth power (n)	2	-	ROR at detector	12.509	C/min
Fire growth coefficient (k)	0.012	kW/s^n	Detector temp (Td)	35.459	C
Fire location factor (kLF)	1	-	Detection trigger	43	72

Representative t2 coeff.	k
Slow	0.003
Medium	0.012
Fast	0.047
Ultrafast	0.400

CALCULATION RESULTS	FT	ROR	
Transport lag time (tl)	39	39	s
Detection time (td)	59	30	s
HRR at detection (Qd)	42	11	kW
HRR w/transport lag (Ql+d)	116	58	kW

< Press PgDn key for additional results >

Calculation time (s)	HRR	Gas temp	Det. temp
0	0	20	20
60	43	28	28
120	#N/A	#N/A	#N/A
180	#N/A	#N/A	#N/A
240	#N/A	#N/A	#N/A
300	#N/A	#N/A	#N/A
360	#N/A	#N/A	#N/A
420	#N/A	#N/A	#N/A
480	#N/A	#N/A	#N/A



Per the attached Detact XLS spreadsheet, detection time is 59 seconds.

From the Detact XLS spreadsheet, at the detector activation time of 59 seconds, the heat release rate is 42 kW.

4.6 Alarm Notification Devices

Section 39.3.4.3 of the *Life Safety Code* has the following requirement for occupant notification in a Business occupancy:

39.3.4.3 Occupant Notification. During all times that the building is occupied *(see 7.2.1.1.3)*, the required fire alarm system, once initiated, shall perform one of the following functions:
(1) It shall activate a general alarm in accordance with 9.6.3 throughout the building, and both of the following also shall apply:
(a) Positive alarm sequence in accordance with 9.6.3.4 shall be permitted.
(b) A presignal system in accordance with 9.6.3.3 shall be permitted.
(2) Occupant notification shall be permitted to be made via a voice communication or public address system in accordance with 9.6.3.9.2.

4.6.1 Alarm Notification Components

All general alarm notification components, provided in building corridors and two of the larger rooms, are combined

audible/visual units. Since exact information on the existing units is not available, capabilities required to meet NFPA 72 requirements will be determined.

A voice communication or public address system is required to notify other areas, primarily classrooms, offices and support rooms. Since information on the existing system is not available, capabilities required to meet LSC requirements will be determined.

Areas without general alarm notification components need to be notified by a voice communication or public address system. The LSC states:

9.6.3.9.2* Where permitted by Chapters 11 through 43, automatically transmitted or live voice announcements shall be permitted to be made via a voice communication or public address system that complies with the following:
(1) Occupant notification, either live or recorded, shall be initiated at a constantly attended receiving station by personnel trained to respond to an emergency.
(2) An approved secondary power supply shall be provided for other than existing, previously approved systems.
(3) The system shall be audible above the expected ambient noise level.
(4) Emergency announcements shall take precedence over any other use.

Thus, the **Cotchett Education Building's** voice communication or public address system can be used in place of a NFPA 72 complying notification system if the above conditions are complied with.

4.6.2 Alarm Notification Spacing

4.6.2.1 Audible Signaling

NFPA 72, Table A.18.4.3 gives the average ambient sound level for an Educational Occupancy as 45 dBA. NFPA 72, Section 18.4.3 requires that audible signal level be at least 15 dBA greater than the average ambient sound level, in this case:

45 dBA (ambient) + 15 dBA = 60 dBA minimum audible signal sound level

The maximum distance in the corridors to an audible signaling device is 80 feet as shown in Appendix 2.

Assuming an audible signaling device rated for 80 dBA at 10 ft, and using the 6 dBA rule of thumb method:

Distance (ft)	dBA
10	80
20	74
40	68
80	62

Thus, for a minimum required audible signal sound level of 60 dBA and a maximum distance to the device of 80 feet,

audible signaling devices rated for at least 80 dBA at 10 ft are required. The devices used in this analysis are 86 dBA and meet this requirement.

4.6.2.2 Visual Signaling

NFPA 72, section 18.5.4.4 contains requirements for visual signaling devices in corridors no more than 20 feet wide. Directly visible lower intensity signaling devices (15 cd minimum) are allowed because the occupants are alert and moving and their vision is focused by the narrowness of the space. These devices must be no more than 15 feet from the end of the corridor and no more than 100 ft between devices.

Several areas of the corridors do not meet these criteria:

Basement
Corridor west of room 25A (no visible device)

First Floor
North corridor, west of room 118, visual device is over 15 feet from end of corridor.
South end of south corridor, south of rooms 129 and 130 (no visible device)

Second Floor
North corridor, west of room 201, visual device is over 15 feet from end of corridor.
Corridor south of room 214 (no visible device)

Additionally there are visual devices in the following non-corridor rooms, located asymmetrically in the rooms. Required candelas are from NFPA 72, Table 18.5.4.3.1(a)

Room Number	Distance to Far Wall	2 X Distance to Far Wall	Effective Room Size	Required (cd)
17	20 ft	40 ft	40 ft x 40 ft	60
8	30 ft	60 ft	60 ft x 60 ft	135
1st Floor Entry Vest	45 ft	90 ft	90 ft x 90 ft	304*

*No 300+ cd No visual devices were located. The 1st Floor Entry Vestibule appears to not comply with visual spacing requirement.

4.7 Alarm, Supervisory and Trouble Signal Disposition

The **Cotchett Education Building** contains a protected premises fire alarm system that is connected with a **Proprietary Supervising Station** fire alarm system in the campus police station.

NFPA 72, Section 3.3.267.2 defines a **Proprietary Supervising Station** fire alarm system as:

An installation of an alarm system that serves contiguous and noncontiguous properties, under one ownership, from a Proprietary Supervising Station located at the protected property, or at one of multiple non-contiguous protected properties, at which trained, competent

personnel are in constant attendance.

Since the installation at the campus police station is both continually manned by trained, competent personnel and under the same ownership as the **Cotchett Education Building**, it qualifies as a **Proprietary Supervising Station** fire alarm system. The requirements for a Proprietary Supervising Station fire alarm system are detailed in NFPA 72, section 26.4.

The **Proprietary Supervising Station** can receive three different types of signals from the **Cotchett Education Building:**

Alarm
Supervisory
Trouble

Alarm signals are warnings of fire danger that require immediate action and shall be treated as fire alarms. They are initiated by:

manual fire alarm boxes
automatic fire detectors
waterflow from the automatic sprinkler system, or
actuation of other fire suppression systems or equipment

NFPA 72, section 26.4.5.6.1 requires that Alarm signals be disposed of as follows:

26.4.5.6.1 Alarms. Upon receipt of an alarm signal, the proprietary supervising station operator shall initiate action to perform the following:
(1) Immediately notify the fire department, the emergency response team, and such other parties as the authority having jurisdiction requires
(2) Dispatch a runner or technician to the alarm location to arrive within 2 hours after receipt of a signal
(3) Restore the system as soon as possible after disposition of the cause of the alarm signal

Supervisory signals are indication that action is needed in connection with the operation of other fire protection systems that are being monitored by the fire alarm system, such as a fire sprinkler system tamper switch.

NFPA 72, section 26.4.5.6.3 requires that Supervisory signals be disposed of as follows:

26.4.5.6.3 Supervisory Signals. Upon receipt of sprinkler system and other supervisory signals, the proprietary supervising station operator shall initiate action to perform the following, if required:
(1) Communicate immediately with the designated person(s) to ascertain the reason for the signal
(2) Dispatch personnel to arrive within 2 hours to investigate, unless supervisory conditions are promptly restored
(3) Notify the fire department if required by the authority having jurisdiction
(4) Notify the authority having jurisdiction when sprinkler systems are wholly or partially out of service for 8 hours or more
(5) Provide written notice to the authority having jurisdiction as to the nature of the signal, time of occurrence, and restoration of service when equipment has been out of service for 8 hours or more

Trouble signals indicate a fault in a monitored circuit or component of the fire alarm system or primary or secondary power supply.

NFPA 72, section 26.4.5.6.4 requires that Trouble signals be disposed of as follows:

26.4.5.6.4 Trouble Signals. Upon receipt of trouble signals or other signals pertaining solely to matters of equipment maintenance of the alarm system, the proprietary supervising station operator shall initiate action to perform the following, if required:
(1) Communicate immediately with the designated person(s) to ascertain reason for the signal
(2) Dispatch personnel to arrive within 4 hours to initiate maintenance, if necessary
(3) Notify the fire department if required by the authority having jurisdiction
(4) Notify the authority having jurisdiction when interruption of service exists for 4 hours or more
(5) When equipment has been out of service for 8 hours or more, provide written notice to the authority having jurisdiction as to the nature of the signal, time of occurrence, and restoration of service

4.8 Mass Notification System

As of this writing, information on a mass notification system at the Cotchett Education Building is unavailable. However, as noted above, areas without general alarm notification components need to be notified by a voice communication or public address system complying with LSC requirements.

The LSC allows a voice communication or public address system to be used for occupant notification because routine operation demands highly reliant, acoustically capable, and sufficiently audible public address systems. As the LSC, appendix section A.9.6.3.9.2 states, in part:

As 9.6.3.9.2 specifically permits an alternative means of notification to that prescribed by *NFPA 72*, it does not mandate that the secondary power supply and the intelligibility and audibility facets of the public address system comply with *NFPA 72* or suggest that equivalency with the related provisions of *NFPA 72* is required. However, it is anticipated that, when approving the secondary power and audibility capabilities of public address systems, authorities having jurisdiction will ensure that these systems are conceptually comparable to the emergency voice alarm and communications system provisions of *NFPA 72*, such that a reliable and effective occupant notification system is provided.

Thus an existing approved a voice communication or public address system need not comply with NFPA 72 requirements for a mass notification system.

4.9 Power Requirements

Since information on existing equipment is not available, for the sake of this analysis, it will be assumed that similar components and features to those listed in the fire alarm plans for the adjoining **Business Building** are used in in the **Cotchett Education Building.** The components in the power calculations are from the adjoining **Business Building,** based on the assumption that the components would be of similar vintage.

Battery Calculation					
Simplex	**Description**	**Quantity**	**Standby Current**	**Standby Current**	
Number			**Per Unit (Amps)**	**Total (Amps)**	
4002	**FACU**	1	0.320000	0.320000	
2099-9201	**Pull Station**	10	0.000300	0.003000	
	Heat Detector	2	0.000040	0.000080	
2098-9201	**Smoke Detector**	20	0.000040	0.000800	
2098-9649	**Duct Detector**	2	0.001000	0.002000	
4906-9127	**Horn/Strobe 15 cd**	13	0.000000	0.000000	
4906-9127	**Horn/Strobe 75 cd**	1	0.000000	0.000000	
4906-9139	**Horn/Strobe 135 cd**	1	0.000000	0.000000	
4906-9139	**Horn/Strobe 185 cd**	1	0.000000	0.000000	
			Total Standby Amps	**0.325880**	
Simplex	**Description**	**Quantity**	**Alarm Current**	**Alarm Current**	
Number			**Per Unit (Amps)**	**Total (Amps)**	
4002	**FACU**	1	0.557000	0.557000	
2099-9201	**Pull Station**	10	0.000300	0.003000	
	Heat Detector	2	0.000086	0.000172	
2098-9201	**Smoke Detector**	20	0.000086	0.001720	
2098-9649	**Duct Detector**	2	0.001000	0.002000	
4906-9127	**Horn/Strobe 15 cd**	13	0.075000	0.975000	
4906-9127	**Horn/Strobe 75 cd**	1	0.196000	0.196000	
4906-9139	**Horn/Strobe 135 cd**	1	0.333000	0.333000	
4906-9139	**Horn/Strobe 185 cd**	1	0.433000	0.433000	
			Total Alarm Amps	**2.500892**	

Required Standby Time (hours)		24	Required Alarm Time (hours)		0.0833
Total Standby Current (amps)		0.325880	Total Alarm Current (amps)		2.500892
Required Standby Capacity (amp-hours)		**7.82112**	**Required Alarm Capacity (amp-hours)**		**0.208324**
Required Standby Capacity (amp-hours)		7.82112			
Required Alarm Capacity (amp-hours)		0.208324			
Total Required Capacity (amp-hours)		**8.029444**			
20% Safety Factor		1.605889			
Total Reqd Battery Capacity (amp-hours)		**9.635333**			

Based on the above Battery Calculations, based on a 24 hour required standby capacity and a 5 minute alarm capacity and including a 20% safety factor, a minimum battery capacity of 9.64 amp-hours (nominally 10 amp-hours) is required.

4.10 Inspection, Testing and Maintenance

4.10.1 Acceptance Testing

Current system acceptance testing criteria is detailed in NFPA 72®, *National Fire Alarm and Signaling Code,* 2010 edition, section 14.4.1.1. Since this system has little documentation on file, most of the records required by NFPA 72, section 14.6, is not available. This includes As-built drawings, operating and maintenance manuals and sequence of operation, as well as testing and maintenance records.

4.10.2 Periodic Inspection, Testing and Maintenance

In accordance with NFPA 72, section 14.2.2, it is the it is the building owner's responsibility to have the fire alarm system inspected, tested and maintained.

Inspection frequency requirements are summarized in NFPA 72, table 14.3.1. The frequency and NFPA 72 section detailing requirements are included in the table.

Inspection Frequency Requirement Summary for Cotchett Education Building

Semiannually

Inspect Batteries
Inspect Transient Suppressors
Inspect FACU Trouble signals
Inspect Voice Communication Equipment
Inspect Duct Detectors
Inspect Manual Fire Alarm Boxes
Inspect Heat Detectors
Inspect Interface Equipment
Inspect Alarm Notification Appliances
Inspect Supervising Alarm System Transmitter

Annually

Inspect Control Equipment: Fuses
Inspect Control Equipment: Interfaced Equipment
Inspect Control Equipment: Lamps and LEDs
Inspect Control Equipment: Primary Power Supply

Inspection and testing requirements are detailed in NFPA 72, section 14.4.2.2.

5 **Proposed** Fire Sprinkler System

Since the building is unsprinklered, a conceptual design for a fire sprinkler system has been developed as part of this project to provide protection in accordance with *NFPA 13, Installation of Fire Sprinkler Systems, 2013 edition*. Sprinkler layouts are included in **Appendix 12.** Higher resolution PDF files of 24 inch by 36 inch sprinkler plans are included in Attachment A.

5.1 Applicable Codes

This Fire Sprinkler System Analysis is based on *NFPA 13, Installation of Fire Sprinkler Systems, 2013 edition*. All installation references are to this code. Inspection, testing and maintenance requirements are based on *NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2011 Edition.*

5.2 Assumptions

This analysis is based in floor plans acquired from the Cal Poly, San Luis Obispo, Facility Services Department. Since this analysis is being performed based on floor plans only, without access to complete plans and specifications, and access to the building for a physical survey is impractical, assumptions are being made for the sake of the analysis.

They include:

Floors are 12'-0" floor to floor.
Ceilings in rooms with ceilings are flat and at 10'-0" above the floor.
There are no ceilings in mechanical and electrical rooms and in accessible pipe chases.
There are no obstructions to sprinkler placement or coverage.

5.3 System Type

A wet pipe sprinkler system was chosen as the most appropriate for a heated building containing classrooms, offices and related uses.

5.4 Water Supply

A reliable municipal water supply, well gridded, with an essentially unlimited water supply is assumed. A 6" cement lined class 52 underground feed line from the municipal supply to the building, 100 feet long, with one elbow, one tee and one gate valve in the line is allowed for hydraulic calculations.

A water supply was assumed for initial calculations and appears on hydraulic graphs. Subsequently, actual flow test results were obtained. They are superior, so calculations and graphs were not revised.

	Assumed	Actual
Location	N/A	N. Poly View Drive
Date	N/A	8/19/2011
Static Pressure	50 psi	60 psi
Residual Pressure	40 psi	55 psi

Flow	1000 gpm	914 gpm

5.5 Occupancy

The **Cotchett Education Building** is a college classroom building, with some offices and lecture halls. There are also some mechanical, electrical and storage rooms.

NFPA 13 defines Light Hazard Occupancies in section 5.2: *Light Hazard Occupancies .Light hazard occupancies shall be defined as occupancies or portions of other occupancies where the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected.*

NFPA 13, section A.5.2 classifies Educational, Office and Auditorium occupancies as **Light Hazard Occupancy**. Restrooms and corridors are also considered as Light Hazard.

NFPA 13 defines Ordinary Hazard (Group 1) Occupancies in section 5.3.1.1: *Ordinary hazard (Group 1) occupancies shall be defined as occupancies or portions of other occupancies where combustibility is low, quantity of combustibles is moderate, stockpiles of combustibles do not exceed 8 ft (2.4 m), and fires with moderate rates of heat release are expected.*

Mechanical Rooms, Electrical Rooms and Storage Rooms are considered as Ordinary Hazard (Group 1). It is assumed that storage rooms will have no storage over 8 feet high.

The Basement is primarily Light Hazard per NFPA 13 (offices and support facilities) with some Ordinary Hazard (Group 1) (storage, electrical rooms and mechanical rooms). It is roughly 16624 square feet in area.

The First Floor is primarily Light Hazard (offices, classrooms, teaching labs and lecture rooms). It is roughly 15577 square feet in area, with some Ordinary Hazard (Group 1) (storage).

The Second Floor is primarily Light Hazard (classrooms, teaching labs and lecture rooms), with some Ordinary Hazard (Group 1) (mechanical room). It is roughly 11640 square feet in area.

Occupancies are shown in plans in **Appendix 3**.

Room occupancies are listed in **Appendix 4.**

5.6 Design Criteria

5.6.1 Spacing

Spacing requirements are per NFPA 13, section 8.6 and are for standard pendent and upright spray sprinklers.

	Light Hazard	**Ordinary Hazard (Group 1)**
Maximum Sprinkler Spacing (between sprinklers)	15’	15’

Maximum Sprinkler Spacing (to wall)	7.5'*	7.5'
Minimum Sprinkler Spacing (between sprinklers)	6'	6'
Minimum Sprinkler Spacing (to wall)	4"	4"
Maximum Sprinkler Coverage Area	225 ft^2	130 ft^2

* Light hazard sprinklers in a small room (up to 800 ft^2) can be up to 9 feet from one wall of the room, per NFPA 13, section 8.6.3.2.4.

5.6.2 Maximum System Area

Maximum system area for light and ordinary hazard systems is 52,000 ft^2 per floor, per NFPA 13, section 8.2.1. Actual largest floor area is roughly 16624 square feet in area. One system is sufficient for all three floors.

5.6.3 Hydraulic Design Criteria

Base hydraulic design criteria is defined in NFPA 13, Figure 11.2.3.1.1.

	Light Hazard	**Ordinary Hazard (Group 1)**
Design Density	0.10 gpm/ft^2	0.15 gpm/ft^2
Base Design Area	1500 ft^2	1500 ft^2
Design Area w/ Quick Response	900 ft^2	900 ft^2

NFPA 13, section 11.2.3.1.3 allows remote area size reduction for light or ordinary hazard with quick response sprinklers, using the formula:

y (area % reduction) = -3x / 2 + 55 where x is ceiling height in feet

for x = 10 ft

-3(10) / 2 + 55 = 40% area reduction for 10 ft ceiling height.

1500 ft^2 - 40% = 900 ft^2 allowable remote area for 10 ft ceiling height

5.6.4 Hose Stream Allowance

Hose stream allowance is defined in NFPA 13, table 11.2.3.1.2.

	Light Hazard	**Ordinary Hazard (Group 1)**
Hose Stream Allowance	100 gpm	250 gpm

Since there are no interior hose valves, no inside hose allowance is allowed.

5.6.5 Water Supply Duration

Water supply duration is defined in NFPA 13, table 11.2.3.1.2.

	Light Hazard	Ordinary Hazard (Group 1)
Duration	30 min	60 – 90 min

Per NFPA 13, section 11.2.3.1.3, the lesser, 60 minute time duration can be used if waterflow and supervisory devices are electronically supervised at a continually monitored location. Since such supervision is required for this system by NFPA 101, the 60 minute duration can be used.

The city water supply can normally be presumed to provide the required flow for the 60 minute duration.

5.7 System Components

All components are to be listed, per NFPA 13, section 6.1.1 except as listed in tables 6.3.1.1 and 6.4.1.

All components are to be are to be rated to at least 175 psi, per NFPA 13, section6.1.3.

5.7.1 Sprinklers

For areas with ceilings: Standard spray sprinklers, quick response, chrome pendent, 155 degree F, ½" orifice, K = 5.6.

For areas without ceilings: Standard spray sprinklers, quick response, brass upright, 155 degree F, ½" orifice, K = 5.6.

5.7.2 Piping

Mains (3" and 4") are to be black, schedule 10 grooved piping with grooved fittings.

Branch Lines (1" through 2") are to be black, schedule 40 threaded piping with cast iron threaded fittings.

All interior piping is c 120.

5.7.3 Riser

A single system riser serves all three floors.

A 4" reduced pressure backflow preventer, with two control valves with tamper switches provides backflow prevention, as well as serving as system control valve and incoming check valve.

A paddle type flow switch, connected to inside alarm bell, outside alarm bell and continually manned monitoring station, provides water flow alarm.

A 4"x 2-1/2 x 2-1/2" fire department connection with NST threads (or as required by the local jurisdiction) feeds through a 4" check valve to the riser. A ball drip valve is provided at the fire department connection.

A system pressure gauge is provided at the riser.

A 2” test and drain valve is provided at the riser, serving as both main drain and inspector’s test valve.

5.7.4 Hangers and Restraint

Hangers and restraints will be in accordance with NFPA 13, Chapter 9.

5.8 Hydraulic Calculations

While the building is primarily Light Hazard occupancies, there are several relatively small areas of Ordinary Hazard (Group 1) in the building. Since the top (second) floor is the most hydraulically demanding area, a Light Hazard remote area and an Ordinary Hazard (Group 1) remote area will each be chosen on the second floor.

5.8.1 Light Hazard Calculations (Remote Area 1)

A design criteria of 0.10 gpm/ft^2 over a design area of 900 ft^2 was determined for Light Hazard occupancies in Section 5.6.3, **Hydraulic Design Criteria**, above.

In accordance with NFPA 13, section 23.4.4.1.1.1 the dimension of the remote area parallel to the branch lines must be at least 1.2 x the square root of the remote area. For a 900 ft^2 remote area:

1.2 x (900 ft^2) = 36 ft

A 100 gpm hose allowance was determined for Light Hazard occupancies in **Section 5.6.4, Hose Stream Allowance**, above.

Hydraulic calculations are shown in plans in **Appendix 13**.

Remote area 1 requires:

138.2 gpm @ 42.8 psi sprinkler demand

100 gpm hose demand

238.2 gpm @ 42.8 psi sprinkler and hose demand required from city water supply.

238.2 gpm demand x 30 minutes = 7146 total gallons capacity required from city water supply.

5.8.2 Ordinary Hazard (Group 1) Calculations (Remote Area 2)

A design criteria of 0.15 gpm/ft^2 over a design area of 900 ft^2 was determined for Ordinary Hazard (Group 1) occupancies **in Section** 5.6.3**, Hydraulic Design Criteria**, above.

Since the entire for Ordinary Hazard (Group 1) occupancy area is under 900 ft^2, the entire area will be calculated.

A 250 gpm hose allowance was determined for Ordinary Hazard occupancies in **Section 5.6.4, Hose Stream Allowance**, above.

Hydraulic calculations are shown in plans in **Appendix 13**.

Remote area 2 requires:

138.8 gpm @ 37.7 psi sprinkler demand

250 gpm hose demand

388.8 gpm @ 37.7 psi sprinkler and hose demand required from city water supply.

388.8 gpm demand x 60 minutes = 23328 total gallons capacity required from city water supply.

5.9 Inspection, Testing and Maintenance

5.9.1 Acceptance Testing

System acceptance testing criteria is based on *NFPA 13, Installation of Fire Sprinkler Systems, 2013 edition, Chapter 25, Systems Acceptance*.

The tests must be recorded on the *Contractor's Material and Test Certificate for Aboveground Piping* (NFPA 13, figure 25.1). The tests include:

Hydrostatic test system at 200 psi for 2 hours per NFPA 13, section 25.2.1.

Waterflow detection device test must activate audible alarm within 5 minutes of waterflow per NFPA 13, section 25.2.3.1.

Record static and residual pressures from main drain test per NFPA 13, section 25.2.3.4.

Open and close all control valves under pressure per NFPA 13, section 25.2.3.4.

Flow test backflow prevention assembly per NFPA 13, section 25.2.5

5.9.2 Periodic Inspection, Testing and Maintenance

Inspection, testing and maintenance requirements are based on *NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2011 Edition.*

Inspection, testing and maintenance requirements are summarized in NFPA 25, table 5.1.1.2, which is included in Appendix 14. The frequency and NFPA 25 section detailing requirements are included in the table.

Requirement Summary for **Cotchett Education Building**

Monthly

Inspect Gauges

Inspect Valves

Quarterly

Inspect waterflow alarm devices
Inspect valve supervisory alarm devices
Inspect hydraulic nameplate

Semiannually

Test vane type flow switch
Test valve supervisory alarm devices
Test main drain

Annually

Inspect building
Inspect hanger/seismic bracing
Inspect pipe and fittings
Inspect sprinklers
Inspect spare sprinklers
Inspect fire department connections
Inspect all valves

Every 5 Years

Inspect interior of piping
Test gauges

At 20 Years and Every 10 Years Thereafter

Test representative sampling of quick response sprinklers

Inspection and testing details are in NFPA 25, in locations listed in table 5.1.1.2.

6 Performance Based Analysis

Sections 3.3.2.4.3 and 3.3.2.4.4 of this report analyze stairs 3 and 4, respectively. They are both classified under communicating spaces by the *Life Safety Code*.

The *Life Safety Code* requires that the communicating space has ordinary hazard contents protected throughout by an approved automatic sprinkler system or has only low hazard contents.

Since there is no sprinkler system, only low hazard contents would be acceptable in the communicating spaces, including the entry lobby, stairs and many of the main corridors. The *Life Safety Code* defines low hazard contents as those of such low combustibility that no self-propagating fire therein can occur.

As the *Life Safety Code Handbook* states: "Very few occupancies qualify as having low hazard contents." Most combustibles would have to be prohibited from these areas in order to comply with the prescriptive requirements of the *Life Safety Code*.

Since complying with the *Life Safety Code* would entail either installing a fire sprinkler system or extreme administrative control of combustibles, fires in the areas of stairs 3 and 4 are chosen for the Design Fire Scenarios.

6.1 Performance Based Design

The *Life Safety Code*, Chapter 5 sets forth criteria for performance based design:

5.2.1 General.
A design shall meet the objectives specified in Section 4.2 if, for each design fire scenario, assumption, and design specification, the performance criterion in 5.2.2 is met.
5.2.2* Performance Criterion.
Any occupant who is not intimate with ignition shall not be exposed to instantaneous or cumulative untenable conditions.
A.5.2.2 One of the methods that follows can be used to avoid exposing occupants to untenable conditions…

Of the five options presented methods 2 was chosen as the most appropriate for this building.

Method 2. For each design fire scenario and the design specifications, conditions, and assumptions, the design team can demonstrate that each room or area will be fully evacuated before the smoke and toxic gas layer in that room descends to a level lower than 6 ft (1830 mm) above the floor.

This method assumes that evacuation will not be impeded if evacuation can be accomplished before the smoke layer reaches the head height of the occupants. This is the more conservative approach of the two, since it is based on the occupants not being exposed to smoke.

All of the options are based on the relationship that **Available Safe Egress Time (ASET)** must be greater than Required **Safe Egress Time (RSET).** In other words, the occupants need to be able to evacuate before conditions become untenable.

This method requires fire/smoke modeling to be performed, choosing appropriate fuel loads, fire scenario and other factors. The FDS fire modeling program, was used.

For this method, evacuation times, with an appropriate safety factor, would be compared to the time it would take for the smoke layer to descend to a height of six feet above the floor. If evacuation, with an appropriate safety factor, is accomplished in time, than this method would be used to show that the performance criterion in 5.2.2 is met.

6.2 Design Fire Scenarios

Section 5.5.3 of the Life *Safety Code* describes several possible Design Fire Scenarios. Of these, two were chosen.

6.2.1 Design Fire Scenario 1

Design Fire 1 is modeled near stair 3, in the north end of the building. It is representative of Design Fire Scenario 1 as described in Section 5.5.3.1 of the Life Safety Code. It is a trash can fire, possibly in a janitor's cart, designed to be a typical fire expected in this occupancy and location.

Evacuation times are hand calculated, with stair 3 presumed to be unusable due to the fire.

The FDS fire modeling program was used to model the fire. The time for the smoke layer to reach 6 feet (1.83m) above floor was measured in several locations.

LSC Design Fire Scenario: 1, Represents a typical fire expected in this occupancy and location.
Location: Near Stair 3, at first floor, north end of the building
Fuel: Trash Bag
Max Heat Release Rate: 350 kW.
Source: SFPE Handbook, Figure 3-1
Evacuation Time Calculation

See section 3.4.2.2 for basis and further details regarding evacuation time calculations.

It is assumed that exiting from each floor will be split evenly between the egress stairways and doorways on each floor.

Stair 3 is presumed to be unusable due to the fire.

Floor	Occupant Load	Number of Egresses	Occupants per Egress
Basement	183	5	37
First	405	3	135
Second	405	2	203

The Basement has a low occupant load and high egress capacity. The First Floor has a similar occupant load to the Second Floor and much greater egress capacity, so only the Second Floor will be considered.

By far, stairway 2 has the highest assumed egress load, with people egressing from all three floors. Additionally, it has the greatest restriction, with the 42" egress door. This is the most demanding egress path and will be examined.

Occupants Using Stair 2

Floor	Occupant Load	Number of Egresses Available	Occupants per Egress
Basement	183	5	37
First	405	3	135
Second	405	2	203
Total at Stair 2			375

Persons / F_c for 42" door = T_e = Time to pass through exit

T_e = 357 persons / 60p/min = 6.25 min

Travel time on stairs (Tt)

Travel Speed = S = k(1-aD) = 212(1-2.86 x 0.175) = 106 ft/min

Travel distance:

Second floor to first floor stair	12' (height)	x 1.85 (stair factor)	= 22.2'
Three landings	9.33' (travel on landing	x 3 (landings)	= 28.0'
First floor to landing	6' (height)	x 1.85 (stair factor)	= 11.1'
Total travel distance			= 61.3'

Travel time on stairs (T_t) = 61.3 ft / 106 ft/min = 0.6 min

Design Fire Scenario 1 Summary

Smoke detector activation time:	0.66 minute (40 seconds)	(from FDS, see appendix 14)
Pre-movement time:	1.00 minute	
Time to pass through exit:	6.25 minute	
Stair movement time:	0.60 minute	
Reqd Safe Egress Time (RSET):	8.51 minutes	

Avail Safe Egress Time (ASET): 1.0 to 6.8 minutes (from FDS, see appendix 14)

RSET is greater than ASET, so life safety criteria fail.

Design Fire Scenario 1 First Floor

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www.facilities.calpoly.edu

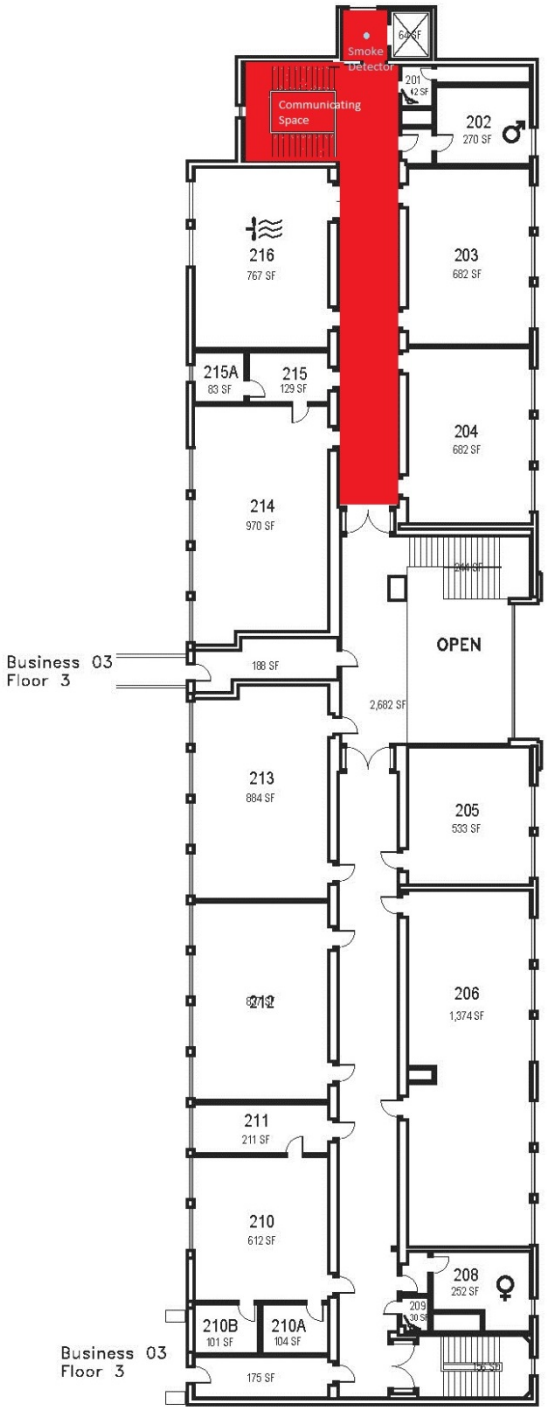
Cotchett Education Building

Ground Floor

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'



Design Fire Scenario 1 Second Floor

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CAL POLY
SAN LUIS OBISPO
Facility Services Facilities Planning and Capital Projects

Cotchett Education Building

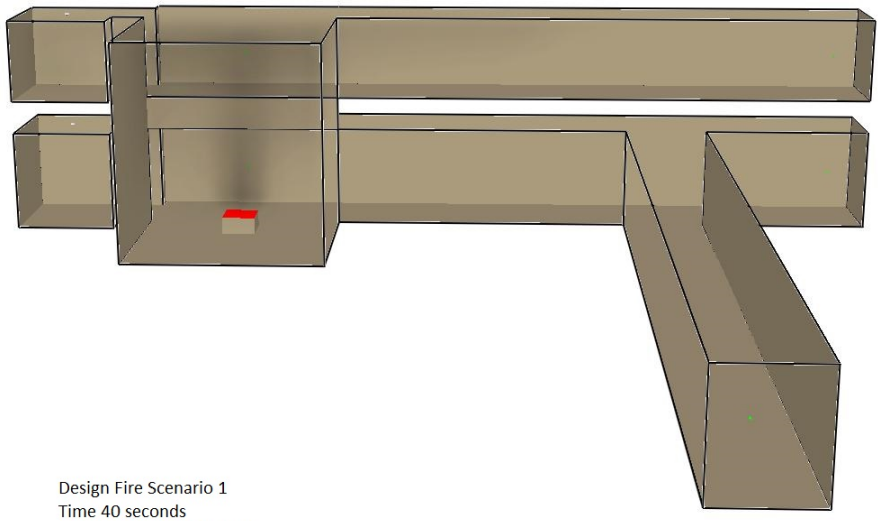
www.facilities.calpoly.edu

Second Floor

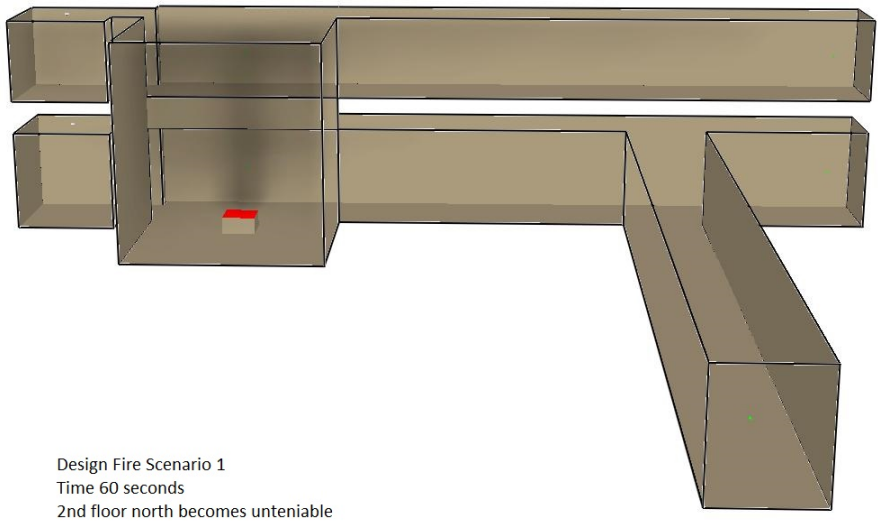
CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'



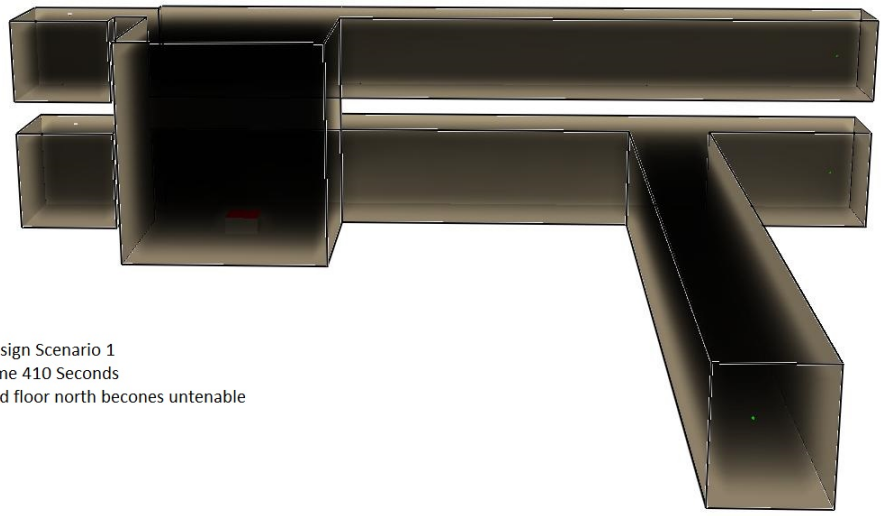
Blue recycling bin and gray bin near modeled fire location



Design Fire Scenario 1
Time 60 seconds
2nd floor north becomes unteniable

Frame: 100
Time: 60.0

mesh: 1



Design Scenario 1
Time 410 Seconds
2nd floor north becones untenable

Frame: 680
Time: 408.1

mesh: 1

6.2.2 Design Fire Scenario 2

Design Fire 2 is modeled near stair 4, in the center of the building. It is representative of Design Fire Scenario 8 as described in Section 5.5.3.8 of the Life *Safety Code.* It is modeled as a sofa fire in the center lobby. It is in accordance with scenario 8 criteria that require fire protection measures to be assumed to be ineffective. In this case, it is assumed that self-closing doors at the second floor do not close. Evacuation times are hand calculated, with stair 4 presumed to be unusable due to the fire. This splits the building into two separate sections, and the egress time for each is calculated separately.

Evacuation times are hand calculated, with stair 4 presumed to be unusable due to the fire.

The FDS fire modeling program was used to model the fire. The time for the smoke layer to reach 6 feet (1.83m) above floor was measured in several locations.

The fuel chosen for this model was intended to represent any of the more demanding, possibly transient fuel sources that could occur in this location at one time or another.

Fuel	**Max Heat Release Rate**	**Source: SFPE Handbook**
CEA Standard Commodity: Pallet load of cardboard boxes Containing polystyrene chips	3300 kW	Figure 3-1.42
Kiosk	2000 kW	Figure 3-1.54
Christmas tree (20% moisture content)	3000 kW	Figure 3-1.68
Sofa	3000 kW	Figure 3-1.102
Representative HRR	**3000 kW**	

LSC Design Fire Scenario: 8, Assumes that self-closing doors at the second floor do not close.
Location: Near Stair 4, at first floor lobby at center of the building
Fuel: See above
Max Heat Release Rate: 3000 kW

Evacuation Time Calculation

See section 3.4.2.2 for basis and further details regarding evacuation time calculations.

It is assumed that exiting from each floor will be split evenly between the egress stairways and doorways on each floor.

Stair 4 is presumed to be unusable due to the fire. This divides the building at the center. The egress time for the north and south sections will be individually calculated.

North

Floor	Occupant Load	Number of Egresses Available	Occupants per Egress
Basement	183	5	37
First (North of Stair/Lobby)	405	2	73
Second	405	1	144

The Basement has a low occupant load and high egress capacity. The First Floor has a similar occupant load to the Second Floor and much greater egress capacity, so only the Second Floor will be considered.

Stairway 3 would be the only usable stair for the north part of the second floor in this scenario. It has no door at the second floor, a 56" stair and joins at the first floor to discharge through a 64" doorway.

Occupants Using Stair 3

Floor	Occupant Load	Number of Egresses	Occupants per Egress
Basement	No access to stair 3		
First	146	2	73
Second	144	1	144
Total at Stair 3			**217**

Persons / F_c for 56" stair = T_e = Time to pass through exit

T_e = 217 persons / 67p/min = 3.20 min

Travel time on stairs (Tt)

Travel Speed = S = k(1-aD) = 212(1-2.86 x 0.175) = 106 ft/min

Travel distance:

Second floor to first floor stair	12' (height)	x 1.85 (stair factor)	= 22.2'
Three landings	9.33' (travel on landing	x 3 (landings)	= 28.0'
First floor to landing	6' (height)	x 1.85 (stair factor)	= 11.1'
Total travel distance			= 61.3'

Travel time on stairs (T_t) = 61.3 ft / 106 ft/min = 0.6 min

South

Floor	Occupant Load	Number of Egresses Available	Occupants per Egress
Basement	183	5	37
First (South of Stair/Lobby)	242	1	242
Second	261	1	261

The Basement has a low occupant load and high egress capacity. The First Floor has a similar occupant load to the Second Floor and much greater egress capacity, so only the Second Floor will be considered.

Stairway 2 would be the only usable stair for the south part of the second floor in this scenario.

Occupants Using Stair 2

Floor	Occupant Load	Number of Egresses	Occupants per Egress
Basement	183	5	37
First	242	1	242
Second	261	1	261
Total at Stair 2			540

Persons / F_c for 42" door = T_e = Time to pass through exit

T_e = 540 persons / 60p/min = 9.00 min

Travel time on stairs (Tt)

Travel Speed = S = k(1-aD) = 212(1-2.86 x 0.175) = 106 ft/min

Travel distance:

Second floor to first floor stair	12' (height)	x 1.85 (stair factor)	= 22.2'
Three landings	9.33' (travel on landing	x 3 (landings)	= 28.0'
First floor to landing	6' (height)	x 1.85 (stair factor)	= 11.1'
Total travel distance			= 61.3'

Travel time on stairs (T_t) = 61.3 ft / 106 ft/min = 0.6 min

Design Fire Scenario 2 Summary

	North	South
Smoke detector activation time	2.33 minutes	2.33 minutes (from FDS, see appendix 15)
Pre-movement time:	1.00 minute	1.00 minute
Time to pass through exit:	3.20 minutes	9.00 minutes
Stair movement time:	0.60 minute	0.60 minute
Reqd Safe Egress Time (RSET):	7.13 minutes	12.93 minutes
Avail Safe Egress Time (ASET):	2.0 to 3.0 minutes	2.0 to 3.0 minutes (from FDS, see appendix 15)

RSET is greater than ASET, so life safety criteria fail.

Wooden furniture near modeled fire location

Design Fire Scenario 2
First Floor

O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg

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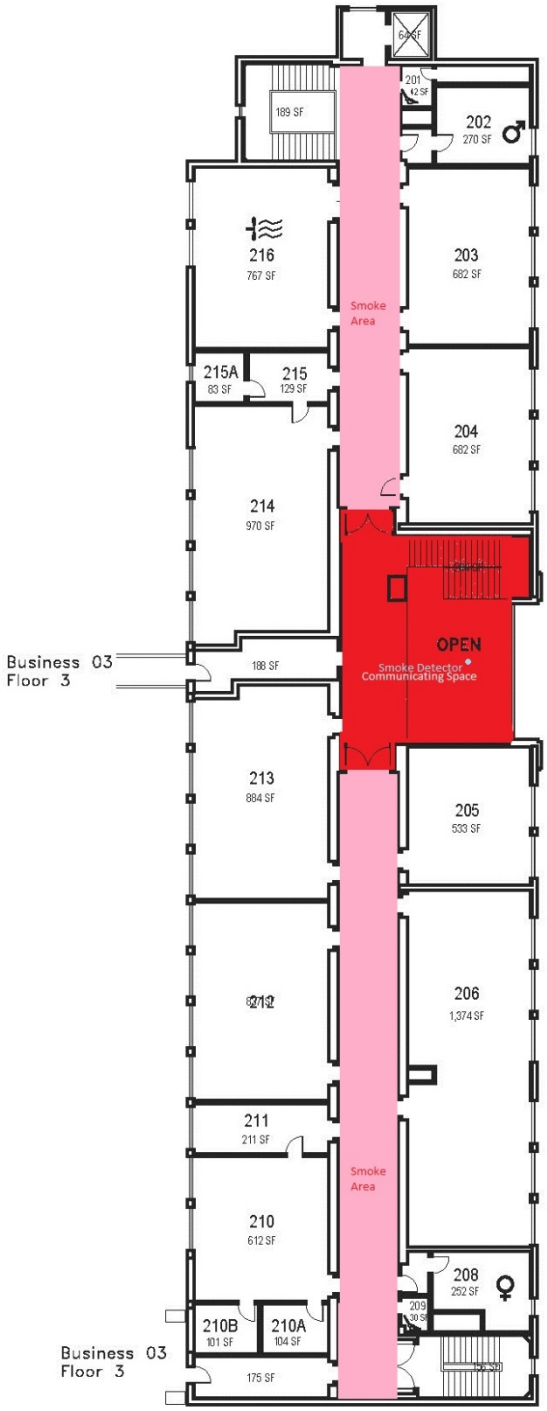
Ground Floor

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'



O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg

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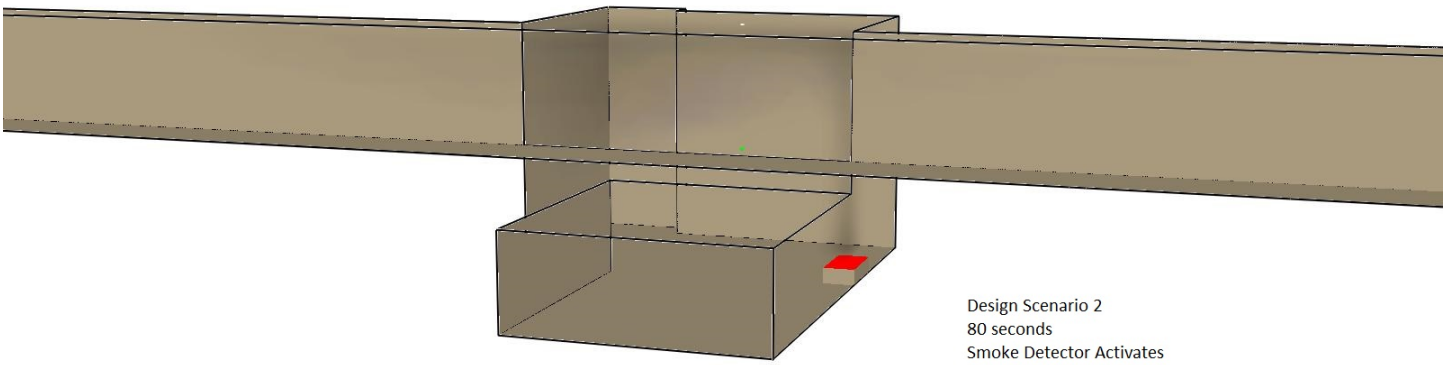
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

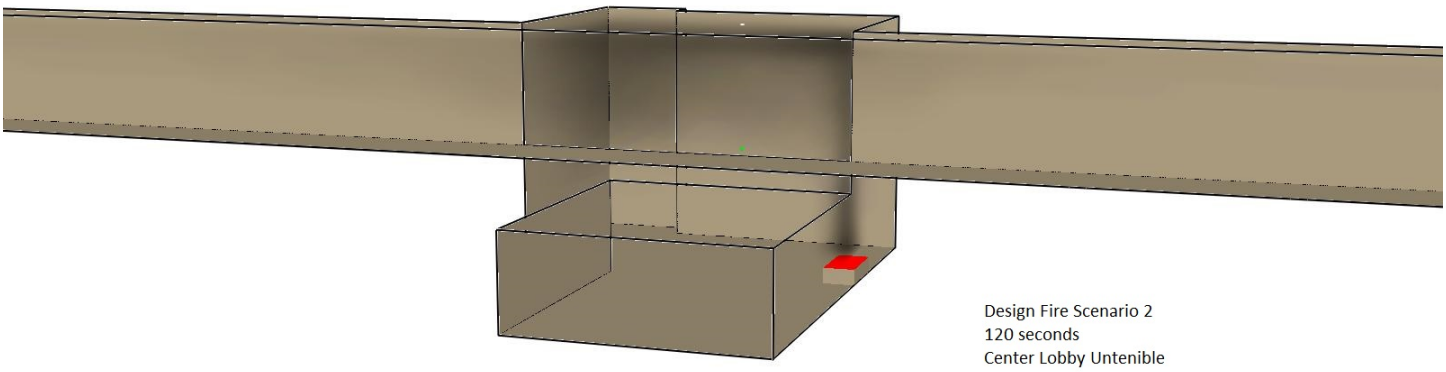
September 2011

1"=30'



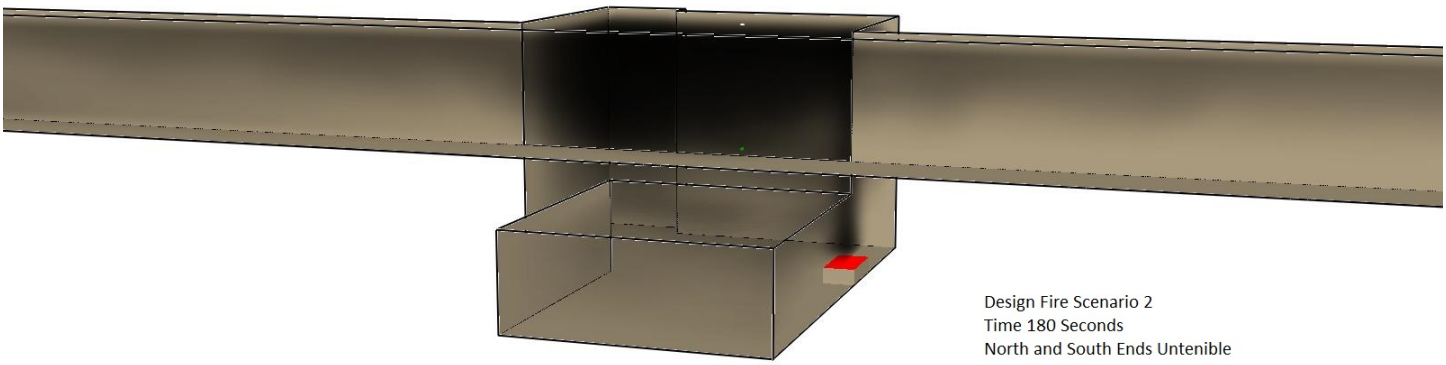
Frame: 140
Time: 84.0

mesh: 1



Frame: 200
Time: 120.0

mesh: 1



Design Fire Scenario 2
Time 180 Seconds
North and South Ends Untenible

Frame: 300
Time: 180.0

mesh: 1

7 Recommendations

7.1 Exiting

While stairs 3 and 4 have problems complying with requirements for communicating spaces per the *Life Safety Code,* it is not the legally adopted code. The building was last remodeled under the 1985 Uniform Building Code, and the current building code is the *California Building Code*, based on the *International Building Code*. The existing arrangement with two floors open to each other is acceptable to both the old UBC and the new IBC, contrary to the LSC. Thus, this arrangement is not a past or current code violation.

However, the *Life Safety Code* is commonly accepted as an accepted minimum level of safety for existing buildings, the following applies if LSC compliance is desired.

Both stairs 3 and 4 are classified under communicating spaces per the *Life Safety Code*, which applies to both new and existing buildings. The *Life Safety Code* requires that the communicating space has ordinary hazard contents protected throughout by an approved automatic sprinkler system or has only low hazard contents.

Since there is no sprinkler system, only low hazard contents would be acceptable in the communicating spaces, including the entry lobby, stairs and many of the main corridors. The *Life Safety Code* defines low hazard contents as those of such low combustibility that no self-propagating fire therein can occur.

As the *Life Safety Code Handbook* states: "Very few occupancies qualify as having low hazard contents." It goes on to offer the cautious example of: "pig iron ingots stored underwater." While this may be an extreme example of low hazard contents, most combustibles would have to be prohibited from these areas in order to comply with the prescriptive requirements of the *Life Safety Code*.

Since complying with the prescriptive requirements of the *Life Safety Code* would entail either installing a fire sprinkler system or extreme administrative control of combustibles, fires in the areas of stairs 3 and 4 were chosen for performance based analysis. Unfortunately, neither simulation produced passing results.

This leaves the two prescriptive options to comply with the *Life Safety Code*:

Institute stringent administrative controls, allowing only low hazard contents that are of such low combustibility that no self-propagating fire therein can occur. This would entail extreme control on the placement, use, storage and staging of combustibles in the main lobby, stairways 3 and 4, and the main first and second floor corridors. Such controls may be difficult to impossible to practically implement.

Alternatively, install an approved automatic sprinkler system in accordance with Section 9.7 of the *Life Safety Code*.

A conceptual design for a fire sprinkler system has been presented in section 5 of this analysis as part of this project to provide protection in accordance with *NFPA 13, Installation of Fire Sprinkler Systems, 2013 edition*. Sprinkler layouts are included in **Appendix 12.**

7.2 Alarm System

See section 4.6.2 of this analysis for alarm annunciation deficiencies to be verified and corrected.

8 Special Thanks

Special thanks to Aric Carracino for all the great photographs!

9 Conclusions

This report analyzes the **Cotchett Education Building** on the Cal Poly, San Luis Obispo College campus. Since this is an existing building, with various modifications made during the life of the building, it was analyzed as an existing building. *NFPA 101, Life Safety Code, 2012 edition* (LSC) contains requirements for existing buildings, and was the primary code used in this analysis. Other codes used in analysis were referenced in each section.

The **Cotchett Education Building** meets most requirements of *NFPA 101, Life Safety Code, 2012 edition***.** However, there are recommendations regarding exiting and the alarm system. See section 7 of this analysis for these recommendations.

Fire Protection Analysis

Cotchett Education Building

Appendix 1

Building Code Information & Misc. Notes
From the 1989 remodeling construction

BUILDING CODE INFORMATION & MISC. NOTES

1. APPLICABLE CODES

1985 UBC, CAL TITLE 24,
REFERENCE: U.L. FIRE RESISTANCE DIRECTORY, 1988
GYPSUM ASSOC. DESIGN MANUAL, ELEVENTH EDITION, 1984

2. OCCUPANCY TYPES

A. LECTURE HALL: A-3
B. MAIN ADDITION: B-2 WITH SOME MINOR A-3
C. EXISTING BUILDING: B-2 WITH SOME MINOR A-3

3. CONSTRUCTION TYPE: TYPE II FR

STRUCTURAL FRAME: 2 HR.
SHAFT ENCLOSURES: 2 HR.
FLOORS: 2 HR.
ROOF: 1 HR.
EXTERIOR NON-BEARING WALLS: MAIN COURTYARD WITH ASSUMED PROPERTY LINES AND INCLUSION OF SMALL COURTS WITHIN ALLOWABLE AREAS PERMIT USE OF NON-COMBUSTIBLE EXTERIOR WALLS AND NON-RATED OPENING PROTECTION. FOR EXCEPTION(S) SEE SITE PLAN.

4A ALL BUILDINGS TO BE UNSPRINKLERED

4B. BUILDING AREAS

ALLOWABLE BUILDING AREA: = 39,900 SF X 2 (MULTI-STORY) x 1.5 (SEPARATION ON TWO SIDES)
= 119,700 GSF

	MAIN ADDITON & LECTURE HALL	EXISTING BLDG.	TOTAL
A. GROUND FLOOR (INCL. SMALL COURTS, BUT NOT MAIN COURT)	29,308*	**	29,308
B. FIRST FLOOR	16,730*	18,996	35,726
C. SECOND FLOOR	22,700*	15,120	37,820
D. THIRD FLOOR	13,000		13,000
			115,854 GSF

NOTES: * INCLUDES COVERED WALKWAYS
** GROUND FLOOR OF EXISTING BUILDING QUALIFIES AS A BASEMENT AND IS NOT INCLUDED IN ALLOWABLE AREA TABULATION

5. EXITING TABULATIONS

BUILDING	O.L.	TOTAL O.L.	NO. EXITS	MIN. REQ'D EXIT WIDTH
LECTURE HALL	229(a)	229	2	6.0'
MAIN ADDITION				
GROUND FLR	(b)	(b)	(b)	(b)
FIRST FLR	333(a)	537	3	10.74'
SECOND FLR	329(a)	407	2	8.14'
THIRD FLR	155	155	2	6.0'
EXISTING BUILDING				
GROUND FLR	159	159	2	6.0'
FIRST FLR	339	623	3	12.46'(c)
SECOND FLR	441	567(d)	3	11.34'

EXITING NOTES:

a. OCCUPANT LOADS FOR LECTURE HALL AND MAIN ADDITION ROOMS 031, 032, 033, 034, 106, 107, 110, 111, 112, 203, 207, 208, 212, 213, 214 DETERMINED BY FIXED NUMBER OF SEATS OR WORKSTATIONS.
b. OCCUPIED AREAS AT GROUND FLOOR HAVE DIRECT EXITS TO OUTSIDE.
c. NEW DOORS FROM EXISTING BUILDING NEW LOBBY INTO COURTYARD ARE NOT A REQUIRED EXIT. NEW DOORS AT EXISTING BUILDING EAST ENTRY ARE CONSIDERED TO PROVIDE LESS THAN 88" OF TOTAL REQUIRED EXIT WIDTH DUE TO OTHER EXITS FROM SAME LEVEL.
d. BASE O.L. OF 441 + 126 TRIBUTARY LOAD FROM STAIR #3 AT MAIN ADDITION.

GENERAL NOTES

1. THESE DRAWINGS SHOWING EXISTING CONDITIONS HAVE BEEN COMPILED FROM EXISTNG DATA SUPPLIED BY THE OWNER TO THE ARCHITECT. THE ARCHITECT HAS CONDUCTED AN ON-SITE REVIEW TO VERIFY OBSERVABLE FINISHED CONDITIONS ONLY. THESE DRAWINGS HAVE BEEN PREPARED IN ACCORDANCE WITH GENERALLY ACCEPTED PROFESSIONAL PRACTICE FOR THEIR USE IN SHOWING EXISTING CONDITIONS, BUT THE ARCHITECT MAKES NO WARRANTY EITHER EXPRESS OR IMPLIED FOR THE ACCURACY OR COMPLETENESS OF THE EXISTING INFORMATION RECORDED.

2. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ON THE JOB.

3. WHERE NEW WORK IS REQUIRED, REMOVE PORTIONS OF WALLS, CEILINGS, FLOORING OR MATERIALS REQUIRED TO ACCOMMODATE NEW WORK. PATCH, REPAIR AND REFINISH OR PAINT WORK REMOVED OR DAMAGED AS A RESULT OF NEW CONSTRUCTION.

4. SEAL ALL PENETRATIONS CAUSED BY REMOVAL OF SERVICES TO MATCH PENETRATED FINISHES.

5. RE-ESTABLISH COMPLETE SERVICE TO ALL EXISTING FACILITIES WHERE DISRUPTED BY THIS CONSTRUCTION.

6. RE-ROUTE ALL SERVICES OR PORTIONS OF SERVICES IN THE PATH OF THE NEW WORK, AND PROVDE AS REQUIRED FOR COMPATIBILITY WITH NEW WORK.

7. SEE SPECIFICATION SECTION 01010 AND 02080, AND DRAWINGS AB1, ~~AB2~~ AB3 FOR DEMOLITION TO BE DONE BY HAZARDOUS MATERIALS ABATEMENT CONTRACTOR.

8. SEE PLUMBING DRAWINGS FOR ALL PLUMBING AND FIRE CONNECTIONS AT EXTERIOR WALLS.

Fire Protection Analysis

Cotchett Education Building

Appendix 2

Selected Construction Plans

UNIVERSITY'S CONSULTANT FOR HAZARDOUS MATERIALS
DYNAMAC CORPORATION
5701 Lindero Canyon Road, Suite I-201
Westlake Village, CA 91362 818/597-1061
818/597-1228 FAX

ARCHITECT
KAPLAN McLAUGHLIN DIAZ
222 Vallejo
San Francisco, CA 94111 415/398-5191
415/394-7158 FAX

STRUCTURAL ENGINEER
BUEHLER & BUEHLER ASSOCIATES
7300 Folsom Blvd., Suite 203
Sacramento, CA 95826 916/381-8181
916/381-8673 FAX

MECHANICAL ENGINEER
CAPITAL ENGINEERING
7300 Folsom Blvd.
Sacramento, CA 95826 916/386-8888
916/386-2610 FAX

ELECTRICAL ENGINEER
SILVERMAN & LIGHT
1201 Park Ave., Suite 100
Emeryville, CA 94608 415/655-1200
415/655-1344 FAX

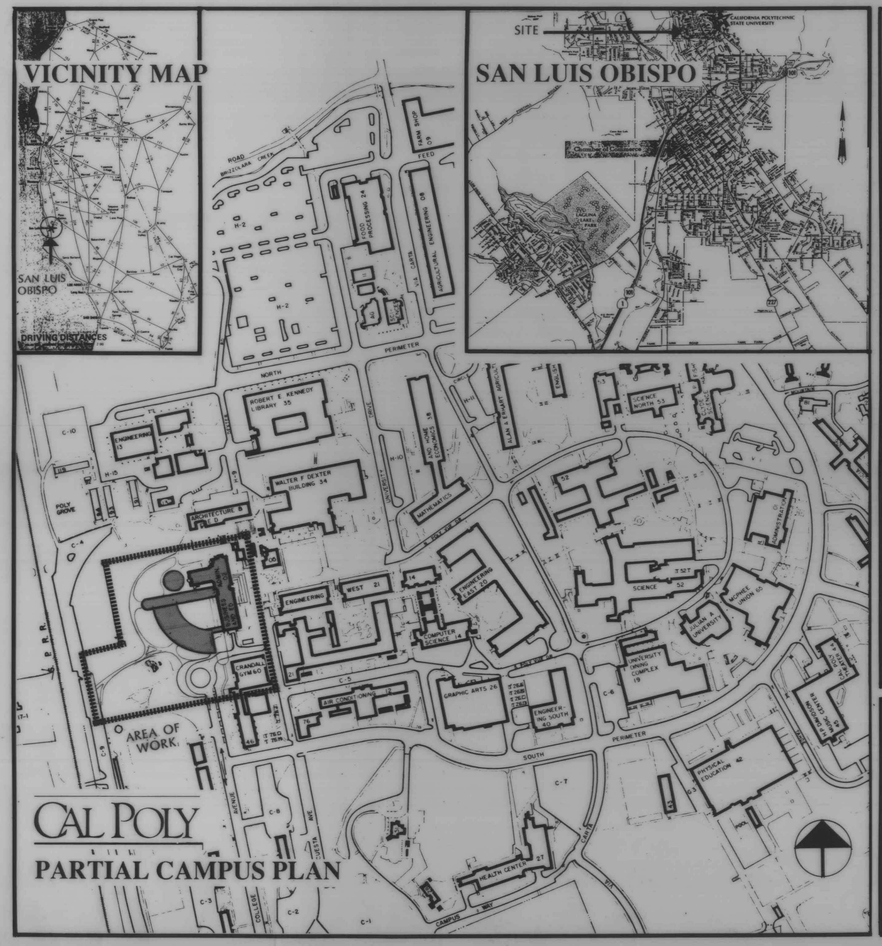
CIVIL ENGINEER
CARROLL/RESOURCES ENGINEERING & MANAGEMENT
310 N. Bayshore Blvd.
San Mateo, CA 94401 415/571-6400
415/571-1029 FAX

LANDSCAPE ARCHITECT
AMPHION ENVIRONMENTAL, INC.
1330 Broadway Suite 300
Oakland CA 94612 415/893-9888
415/893-9887 FAX

CAL POLY

BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SAN LUIS OBISPO CALIFORNIA



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LIST OF SYMBOLS

LIST OF DRAWINGS

T-1 TITLE, PROJECT INFORMATION SHEET

CIVIL

C-1 SITE IMPROVEMENTS
C-2 DETAILS
C-3 DEMOLITION

LANDSCAPE

L-1 IRRIGATION PLAN
L-2 PLANTING PLAN
L-3 DETAILS

ARCHITECTURAL

A1.1 SITE PLAN
A2.1 MAIN ADDITION, GROUND FLOOR PLAN
A2.2 MAIN ADDITION, FIRST FLOOR PLAN
A2.3 MAIN ADDITION, SECOND FLOOR PLAN
A2.4 MAIN ADDITION, THIRD FLOOR PLAN
A2.5 LECTURE HALL FLOOR PLAN, REFLECTED CEILING PLAN, EXTERIOR ELEVATIONS
A2.6 EXISTING BUILDING GROUND FLOOR PLAN
A2.7 EXISTING BUILDING FIRST FLOOR PLAN
A2.8 EXISTING BUILDING SECOND FLOOR PLAN, BUILDING SECTION

A3.1 MAIN ADDITION & LECTURE HALL ROOF PLAN

A4.1 MAIN ADDITION, GROUND FLOOR PLAN REFLECTED CEILING
A4.2 MAIN ADDITION, FIRST FLOOR PLAN REFLECTED CEILING
A4.3 MAIN ADDITION, SECOND FLOOR PLAN REFLECTED CEILING
A4.4 MAIN ADDITION, THIRD FLOOR PLAN - REFLECTED CEILING
A4.5 EXISTING BUILDING, FIRST & SECOND FLOOR REFLECTED CEILING PLANS

A5.1 EXTERIOR ELEVATIONS, MAIN ADDITION
A5.2 EXTERIOR ELEVATIONS, MAIN ADDITION
A5.3 EXTERIOR ELEVATIONS, BUILDING SECTIONS MAIN ADDITION
A5.4 EXISTING BUILDING EXTERIOR ELEVATIONS

A6.1 WALL SECTIONS
A6.2 WALL SECTIONS

A7.1 STAIR PLANS & SECTIONS

A8.1 LECTURE HALL, ELEVATIONS, SECTIONS

STRUCTURAL

S1.1 GENERAL NOTES & TYPICAL DETAILS

S2.1 MAIN ADDITION FOUNDATION PLAN
S2.2 MAIN ADDITION FIRST FLOOR FRAMING PLAN
S2.3 MAIN ADDITION SECOND FLOOR FRAMING PLAN
S2.4 MAIN ADDITION THIRD FLOOR & LOW ROOF FRAMING PLAN
S2.5 MAIN ADDITION ROOF FRAMING PLAN
S2.6 LECTURE HALL FOUNDATION & FRAMING PLANS

S3.1 BUILDING SECTIONS
S3.2 BUILDING SECTIONS
S3.3 BUILDING SECTIONS
S3.4 BUILDING SECTIONS
S3.5 BUILDING SECTIONS
S3.6 BUILDING SECTIONS

S4.1 FRAMING ELEVATIONS
S4.2 FRAMING ELEVATIONS
S4.3 FRAMING ELEVATIONS

S5.1 WALL SECTIONS
S5.2 WALL SECTIONS
S5.3 SECTIONS
S5.4 SECTIONS AND DETAILS

S6.1 DETAILS
S6.2 DETAILS
S6.3 DETAILS
S6.4 DETAILS
S6.5 DETAILS
S6.6 DETAILS
S6.7 DETAILS

S7.1 STAIR SECTIONS
S7.2 STAIR SECTIONS
S7.3 STAIR DETAILS

S8.1 EXISTING BUILDING FRAMING PLANS
S8.2 EXISTING BUILDING SECTIONS
S8.3 EXISTING BUILDING DETAILS

MECHANICAL

M1 MECHANICAL SITE PLAN
M2 MAIN ADDITION GROUND FLOOR MECHANICAL PLAN
M3 MAIN ADDITION FIRST FLOOR MECHANICAL PLAN
M4 MAIN ADDITION SECOND FLOOR MECHANICAL PLAN & SECTIONS
M5 MAIN ADDITION THIRD FLOOR MECHANICAL PLAN & SECTIONS
M6 LECTURE HALL MECHANICAL PLANS & SECTIONS
M7 EXISTING BUILDING GROUND FLOOR MECHANICAL PLAN
M8 EXISTING BUILDING FIRST FLOOR MECHANICAL PLAN
M9 EXISTING BUILDING SECOND FLOOR MECHANICAL PLAN
M10 MAIN ADDITION SECTIONS
M11 EXISTING BUILDING SECTIONS
M12 DETAILS & SECTIONS
M13 DETAILS
M14 MAIN ADDITION HOT WATER/STEAM PIPING DIAGRAM
M15 EXISTING BUILDING HOT WATER/STEAM PIPING DIAGRAM
M16 AIR HANDLER AND VAV SCHEDULES
M17 MECHANICAL LEGEND & SCHEDULES
M18 CONTROLS
M19 CONTROLS
M20 CONTROLS

PLUMBING

P1 MAIN ADDITION GROUND FLOOR PLUMBING PLAN
P2 MAIN ADDITION FIRST FLOOR PLUMBING PLAN
P3 MAIN ADDITION SECOND FLOOR PLUMBING PLAN
P4 MAIN ADDITION THIRD FLOOR PLUMBING PLAN
P5 LECTURE HALL PLUMBING PLAN
P6 EXISTING BUILDING GROUND FLOOR PLUMBING PLAN
P7 EXISTING BUILDING FIRST FLOOR PLUMBING PLAN
P8 EXISTING BUILDING SECOND FLOOR PLUMBING PLAN
P9 PLUMBING LEGEND, SCHEDULES & DETAILS

ELECTRICAL

E1 SYMBOLS LIST AND NOTES
E2 ELECTRICAL SITE PLAN
E3 GROUND FLOOR POWER AND SIGNAL
E4 GROUND FLOOR LIGHTING PLAN
E5 FIRST FLOOR POWER AND SIGNAL
E6 FIRST FLOOR LIGHTING PLAN
E7 SECOND FLOOR POWER AND SIGNAL
E8 SECOND FLOOR LIGHTING PLAN
E9 THIRD FLOOR POWER AND SIGNAL
E10 THIRD FLOOR LIGHTING PLAN
E11 LECTURE HALL ELECTRICAL PLAN
E12 EXISTING BUILDING POWER AND SIGNAL
E13 EXISTING BUILDING LIGHTING PLAN
E14 ONE LINE DIAGRAM
E15 FIRE ALARM RISER DIAGRAM AND TELEPHONE/DATA RISER DIAGRAM
E16 ELECTRICAL SCHEDULES
E17 ELECTRICAL DETAILS
E18A EXISTING BUILDING GROUND FLOOR LIGHTING & POWER & SIGNAL PLAN

UNIVERSITY'S CONSULTANT- HAZARDOUS MATERIALS

AB1 EXISTING BUSINESS ADMINISTRATION AND EDUCATION BUILDING GROUND FLOOR PLAN ASBESTOS ABATEMENT
AB2 EXISTING BUSINESS ADMINISTRATION AND EDUCATION BUILDING FIRST FLOOR PLAN ASBESTOS ABATEMENT
AB3 EXISTING BUSINESS ADMINISTRATION AND EDUCATION BUILDING SECOND FLOOR PLAN ASBESTOS ABATEMENT

3 MAR 1989

24 AUG 90 ISSUED FOR BIDDING

T-1

003 T1 Partial Campus Plan & Detail List 1989-03-03

KMD8300 3042V- 97074

Certificate of Compliance (Part 1 of 2) — Prescriptive Requirements CF-1A

NEW CAL POLY B.A. & ED. BUILDING — APR 1 0 1989 (Date of Certificate)
Project Title — For Enforcement Agency Use Only

Kaplan/McLaughlin/Diaz — Project Architect/Engineer — Building Permit Number
Calif. Polytechnic State University — Project Location — Plan Checked By / Date
San Luis Obispo, California — City/Town — Field Checked By / Date
Kaplan/McLaughlin/Diaz 415/398-5191 — Documentation Author/Firm, Telephone — Approved By / Date

Principal Designer. The proposed building will be in substantial compliance with the California Building Energy Efficiency Standards provided it is built according to the plans and specifications and provided future improvements are completed according to the requirements indicated on this Certificate of Compliance. The plans and specifications have been prepared to include all significant energy conservation features required for compliance with the Standards. Building areas that are unconditioned and/or not subject to the standards are indicated on the plans.

3 March 1989 (Plans dated) — 3 March 1989 (Specs dated)
Signature — 5/11/89 (Date)
Roy Latka, President (Name/Title)
Kaplan/McLaughlin/Diaz (Company)
222 Vallejo Street (Address)
San Francisco, CA 94111 (City/State/Zip)
415/398-5191 (Telephone) — C-7256 (Cal. License No.)

Owner. The energy conservation features and performance specifications indicated on this document and on the plans and specifications shall apply to future alterations, unless compliance is demonstrated anew and a new Certificate of Compliance is submitted. A copy of this Certificate will be retained and transmitted to future tenants, subsequent owners or others with responsibility for making improvements or modifications to the building. If this certificate is lost, a new Certificate may be required before a permit is issued for alterations. Unconditioned areas are indicated on the plans and, if those areas are conditioned in the future, they must be made to comply with the applicable energy standards then in effect.

General

1	Unconditioned or Multi-tenant shell?	N	
2	CEC Occupancy Type	High-rise office	
3	UBC Occupancy Group/Division	B-2	
4	Edition of Standards	July 88	date
5	Conditioned Floor Area	54080	sf
6	Unconditioned Floor Area	5270	sf
	1st Generation Occupancy Types		
7	Location Code Number	NA	
8	Occupancy Code Number	NA	
9	Maximum Allowable Uoverall	NA	Btu/h-sf-F
10	Standard OTTV	NA	Btu/h-sf
	2nd Generation Occupancy Types		
11	Climate Zone	5	
12	Package Selected	C	
13	HVAC Power Criteria Set (if applic.)	Table 2-53W5-IV	

Note: List other options and requirements significant for compliance below or on an attached supplement. For example, include tenant improvement specifications. Additional requirements should be further detailed in the energy compliance documentation. Attachment becomes part of Certificate of Compliance.

14	Supplement Attached?	N	(Y/N)

Certificate of Compliance (Part 2 of 2) — Prescriptive Compliance CF-1A

NEW CAL POLY B.A. & ED. BUILDING — APR 1 0 1989 — 54080 (Cond. Flr Area) — For Enforcement Agency Use Only
Kaplan/McLaughlin/Diaz — High-rise office (CEC Occ Type) — Plan Checked By / Date

Note. More than one Part 2 may be submitted, but all must reference the same Part 1. The person responsible for the design compliance for each major building system acknowledges the following compliance statement by signing the appropriate space below.

Compliance Statement. The proposed building improvements substantially comply with the requirements indicated on the Certificate of Compliance for this building, dated ______. The plans and specifications include the significant energy conservation features and the compliance documentation is consistent with the plans and specifications.

Envelope — New Building — 3 March 1989 — Roy Latka, President — Kaplan/McLaughlin/Diaz — 222 Vallejo Street — San Francisco CA 94111 — 415/398-5191 — C-7256

Lighting — Pkg C/Climate Zone 5 — New Building — Charles Silverman, Vice President — Silverman & Light — 1201 Park Ave, Suite 100 — Emeryville, CA 94608

Mechanical — Robert J. Alessi, President — CAPITAL ENGINEERING CONSULTANTS, INC — 1500 Folsom Boulevard, Suite 100 — Sacramento, CA 95826 — 916-386-8888 — M14745

Certificate of Compliance (Part 1 of 2) — Prescriptive Requirements CF-1A

NEW LECTURE HALL, CAL POLY — APR 1 0 1989 — For Enforcement Agency Use Only
Kaplan/McLaughlin/Diaz
Calif. Polytechnic State University
San Luis Obispo, California
Kaplan/McLaughlin/Diaz 415/398-5191

3 March 1989 — 3 March 1989 — 5/11/89
Roy Latka, President
Kaplan/McLaughlin/Diaz
222 Vallejo Street
San Francisco, CA 94111
415/398-5191 — C-7256

General: Lowrise office

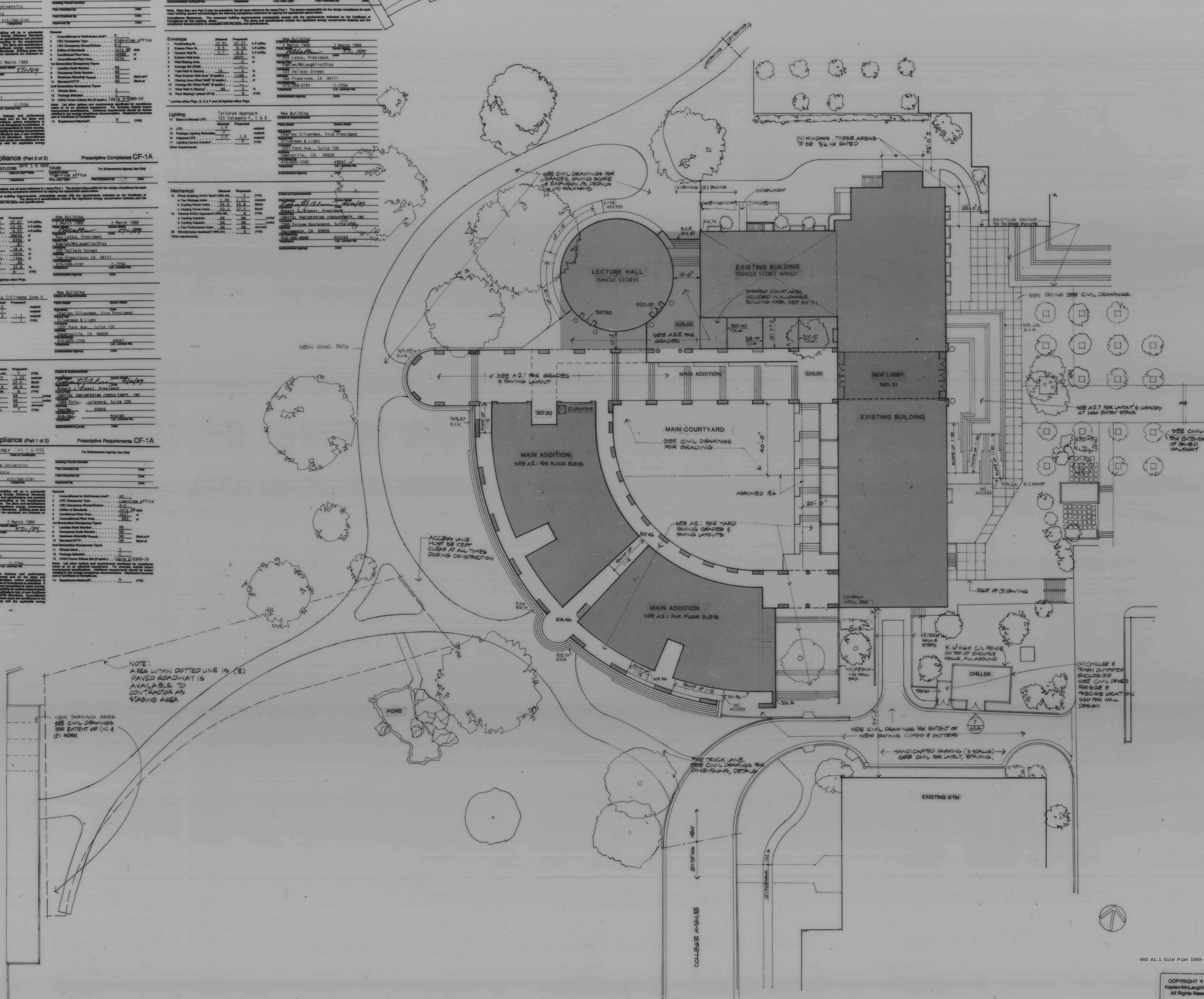
Certificate of Compliance (Part 2 of 2) — Prescriptive Compliance CF-1A

NEW LECTURE HALL, CAL POLY — APR 1 0 1989 — Lowrise office — Kaplan/McLaughlin/Diaz

Envelope — New Building — 3 March 1989 — Roy Latka, President — Kaplan/McLaughlin/Diaz — 222 Vallejo Street — San Francisco, CA 94111 — 415/398-5191 — C-7256

Lighting — Tailored Approach, IES Category F, C & B — New Building — Charles Silverman, Vice President — Silverman & Light — 1201 Park Ave, Suite 100 — Emeryville, CA 94608 — 415/655-1200 — E8647

Mechanical — Robert J. Alessi, President — CAPITAL ENGINEERING CONSULTANTS, INC — 1500 Folsom Boulevard, Suite 100 — Sacramento, CA 95826 — 916-386-8888 — M14745



KAPLAN
McLAUGHLIN
DIAZ
ARCHITECTURE
PLANNING
C-7256
222 VALLEJO
SAN FRANCISCO, CA 94111
415-398-5191

CAL POLY
SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE
SITE PLAN

REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE: 1" = 20'-0"
DATE: 3 Mar 1989

003 A1.1 Site Plan 1989-03-03

SHEET A1.1

Certificate of Compliance (Part 1 of 2) — Prescriptive Requirements CF-1A

EXISTING CAL POLY B.A. & ED. BUILDING — APR 10 1989
Project Title — Date of Certificate
Kaplan/McLaughlin/Diaz
Project Architect/Engineer
Calif. Polytechnic State University
Project Location
San Luis Obispo, California
City/Town
Kaplan/McLaughlin/Diaz — 415/398-5191
Documentation Author/Firm — Telephone

For Enforcement Agency Use Only
Building Permit Number
Plan Checked By — Date
Field Checked By — Date
Approved By — Date

Principal Designer. The proposed building will be in substantial compliance with the California Building Energy Efficiency Standards provided it is built according to the plans and specifications and provided future improvements are completed according to the requirements indicated on this Certificate of Compliance. The plans and specifications have been prepared to include all significant energy conservation features required for compliance with the Standards. Building areas that are unconditioned and/or not subject to the standards are indicated on the plans.

3 March 1989 — 3 March 1989
Plans dated — Specs dated
[signature] — 5/11/89
Signature — Date
Roy Latka, President
Name/Title
Kaplan/McLaughlin/Diaz
Company
222 Vallejo Street
Address
San Francisco, CA 94111
City/State/Zip
415/398-5191 — C-7256
Telephone — Cal. License No.

Owner. The energy conservation features and performance specifications indicated on this document and on the plans and specifications shall apply to future alterations, unless compliance is demonstrated anew and a new Certificate of Compliance is submitted. A copy of this Certificate will be retained and transmitted to future tenants, subsequent owners or others with responsibility for making improvements or modifications to the building. If this certificate is lost, a new Certificate may be required before a permit is issued for alterations. Unconditioned areas are indicated on the plans and, if these areas are conditioned in the future, they must be made to comply with the applicable energy standards then in effect.

General

1	Unconditioned or Multi-tenant shell?	No	
2	CEC Occupancy Type	Low-rise office	
3	UBC Occupancy Group/Division	B-2	
4	Edition of Standards	July 88	date
5	Conditioned Floor Area	52,732	sf
6	Unconditioned Floor Area	2,475	sf
	1st Generation Occupancy Types		
7	Location Code Number	NA	
8	Occupancy Code Number	NA	
9	Maximum Allowable $U_{overall}$	NA	Btu/h-sf-F
10	Standard OTTV	NA	Btu/h-sf
	2nd Generation Occupancy Types		
11	Climate Zone	5	
12	Package Selected	C	
13	HVAC Power Criteria Set (if applic.)	NA	

Note: List other options and requirements significant for compliance below or on an attached supplement. For example, include tenant improvement specifications. Additional requirements should be further detailed in the energy compliance documentation. Attachment becomes part of Certificate of Compliance.

14 Supplement Attached? No (Y/N)

Certificate of Compliance (Part 2 of 2) — Prescriptive Compliance CF-1A

EXISTING CAL POLY B.A. & ED. BUILDING — APR 10 1989 — 52,732 SF
Project Title — Date of Certificate — Cond. Flr Area
Kaplan/McLaughlin/Diaz — Low-rise office
Documentation Author/Firm — Telephone — CEC Occ. Type
For Enforcement Agency Use Only
Plan Checked By — Date

Note. More than one Part 2 may be submitted, but all must reference the same Part 1. The person responsible for the design compliance for each major building system acknowledges the following compliance statement by signing the appropriate space below.

Compliance Statement. The proposed building improvements substantially comply with the requirements indicated on the Certificate of Compliance for this building, dated ________. The plans and specifications include the significant energy conservation features and the compliance documentation is consistent with the plans and specifications.

Envelope

		Allowed	Proposed	
1	Roof/Ceiling R_t	NA	3.51	h-F-sf/Btu
2	Exterior Floor R_t	NA	2.72	h-F-sf/Btu
3	Opaque Wall R_t	NA	2.82	h-F-sf/Btu
4	Exterior Wall Area		25,996	sf
5	Wall Glazing Area		4,031	sf
6	Average SC (Wall)		.834	
7	Total Wall % Glazing	NA	13.4	%
8	West Exterior Wall Area* (if applic.)		8,095	sf
9	Glazing Area (West Wall)* (if applic.)		1,485	sf
10	Average SC (West Wall)* (if applic.)		.69	
11	West Wall % Glazing*	NA	15.5	%
12	Roof Glazing? (attach CF-6)		N	(Y/N)

* Lowrise office Pkgs. D, E,& F and all highrise office Pkgs.

New Building
Extent of Improvements
3 March 1989 — 3 March 1989
Plans dated — Specs dated
[signature] — 5/11/89
Signature — Date
Roy Latka, President
Name/Title
Kaplan/McLaughlin/Diaz
Company
222 Vallejo Street
Address
San Francisco, CA 94111
City/State/Zip
415/398-5191 — C-7256
Telephone — Cal. License No.
Enforcement Agency — Date

Lighting

13 Basis of Allowed LPD ________

		Allowed	Proposed	
14	LPD			watts/sf
15	Package Lighting Reduction			watts/sf
16	Adjusted LPD			watts/sf
17	Lighting Control Credits?			(Y/N)

Other requirements:
Revisions reslut in obvious reduction of connected watts. Compliance forms not required.

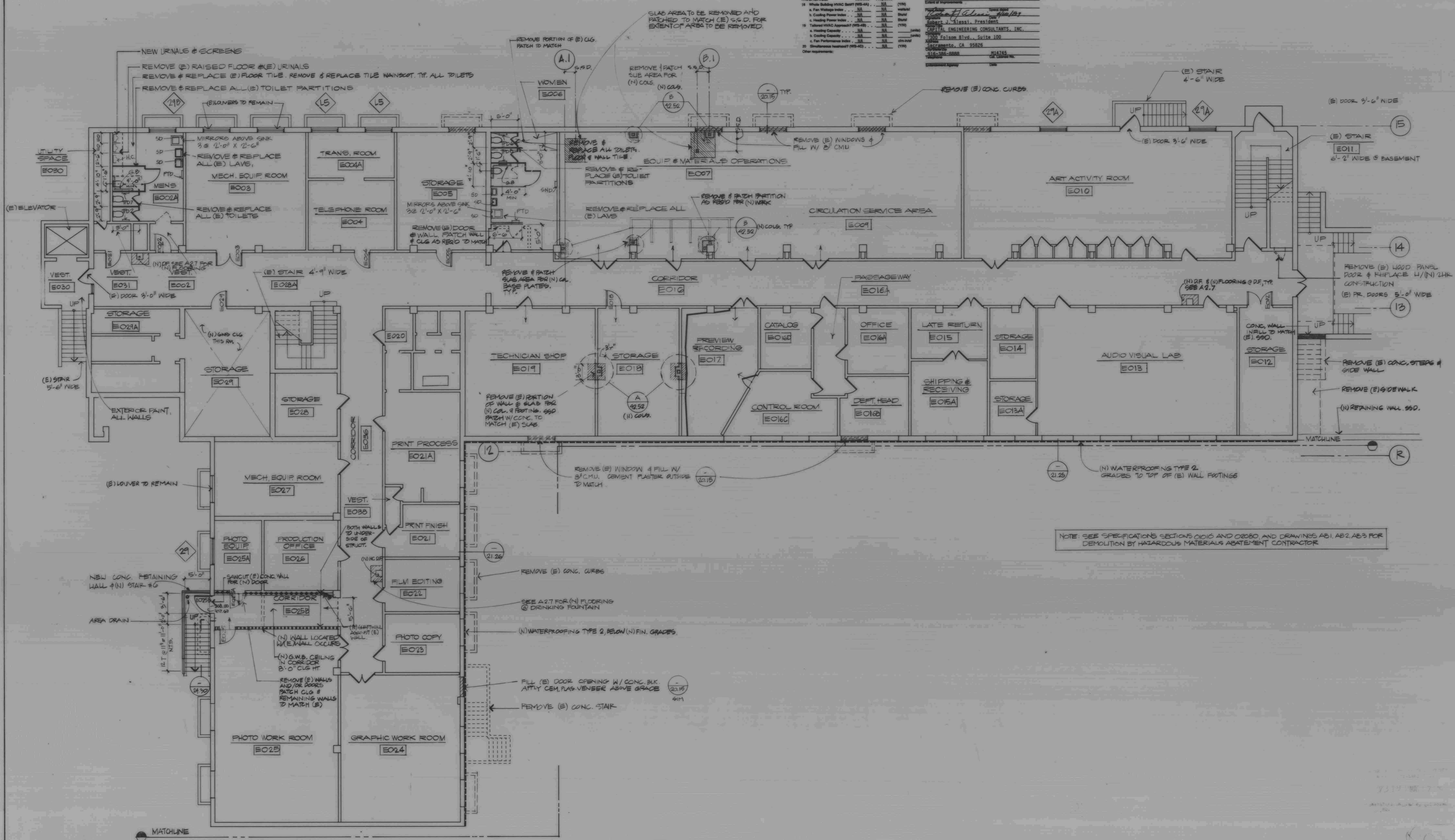
New Building
Extent of Improvements
Plans dated — Specs dated
Signature — Date
Charles Silverman, Vice President
Name/Title
Silverman & Light
Company
1201 Park Ave., Suite 100
Address
Emeryville, CA 94608
City/State/Zip
415/655-1200 — H8647
Telephone — Cal. License No.
Enforcement Agency — Date

Mechanical

		Allowed	Proposed	
18	Whole Building HVAC Set? (WS-4A)		NA	(Y/N)
	a. Fan Wattage Index	NA	NA	watts/sf
	b. Cooling Power Index	NA	NA	Btu/sf
	c. Heating Power Index	NA	NA	Btu/sf
19	Tailored HVAC Approach? (WS-4B)		NA	(Y/N)
	a. Heating Capacity	NA	NA	(units)
	b. Cooling Capacity	NA	NA	(units)
	c. Fan Performance Index	NA	NA	cfm-in/sf
20	Simultaneous heat/cool? (WS-4C)		NA	(Y/N)

Other requirements:

Extent of Improvements
Plans dated — Specs dated
[signature] — 4/10/89
Signature — Date
Robert J. Alessi, President
Name/Title
CAPITAL ENGINEERING CONSULTANTS, INC.
Company
7300 Folsom Blvd., Suite 100
Address
Sacramento, CA 95826
City/State/Zip
916-386-8888 — M14745
Telephone — Cal. License No.
Enforcement Agency — Date

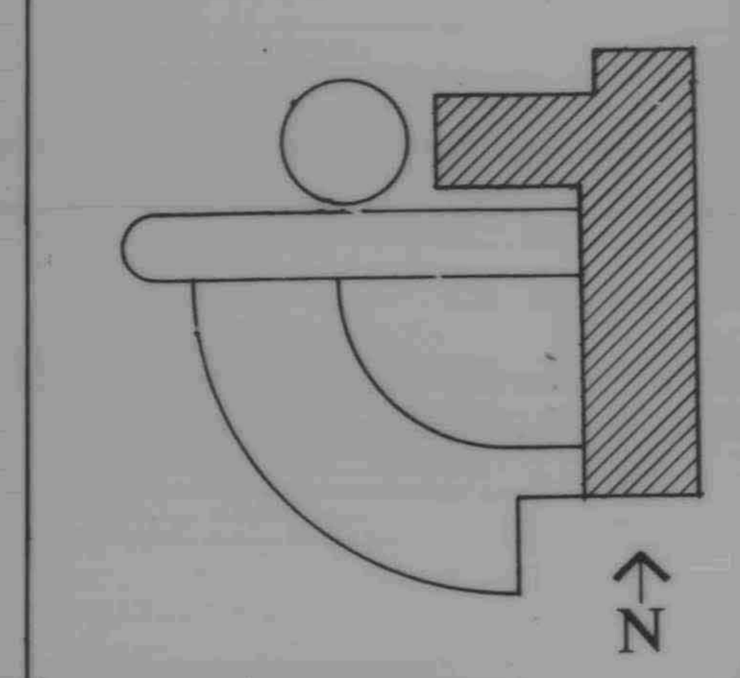


NOTE: SEE SPECIFICATIONS SECTIONS 01010 AND 02080 AND DRAWINGS AB1, AB2, AB3 FOR DEMOLITION BY HAZARDOUS MATERIALS ABATEMENT CONTRACTOR

KAPLAN McLAUGHLIN DIAZ
ARCHITECTURE PLANNING
[signature] C7256
222 VALLEJO
SAN FRANCISCO, CA 94111
415 398-5191

WALL TYPES LEGEND

SYMBOL	DESCRIPTION	DETAIL
	EXISTING PARTITION TO BE REMOVED	
	EXISTING PARTITION TO REMAIN	
	NON-COMBUSTIBLE GWB PARTITION	42.10
	1-HOUR RATED GWB PARTITION	42.11
	2-HOUR RATED GWB PARTITION	42.13
	1-HOUR RATED SHAFTWALL	42.12
	2-HOUR RATED SHAFTWALL	42.14
	ACOUSTIC TREATMENT IN ADDITION TO CONSTR. DESCRIBED ABOVE	42.17



KEY PLAN

CAL POLY
SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE
EXISTING BUILDING GROUND FLOOR PLAN

REVISIONS

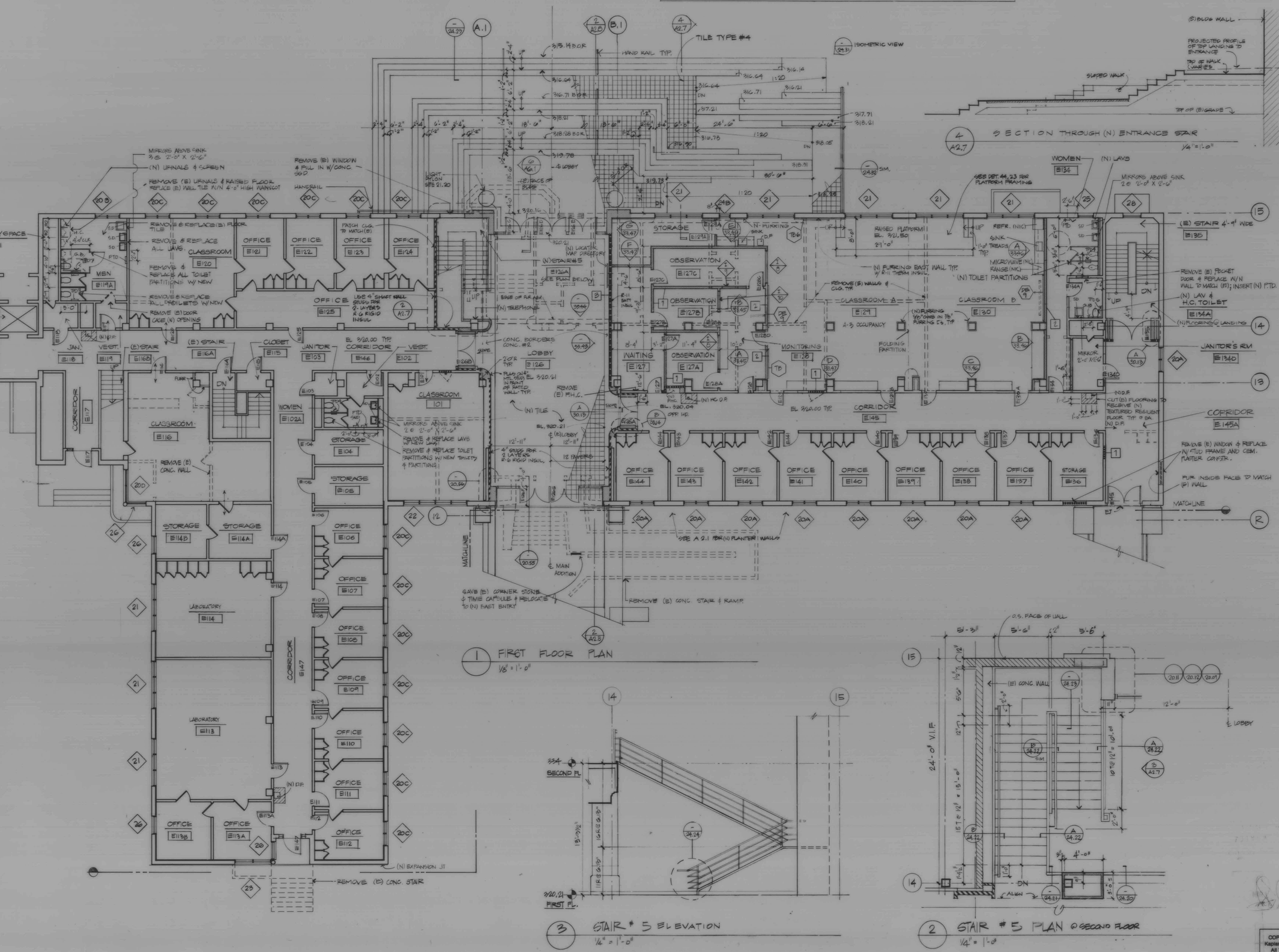
NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE 1/8" = 1'-0"
DATE 3 Mar 1989
SHEET A2.6
73

KMQ8300 3042V - 107328

NOTES

1. SEE STRUCTURAL DRAWINGS FOR ADDITIONAL INFO ON DEMOLITION OF EXIST. EXTERIOR CONC. WALLS
2. REMOVE (E) BLINDS/CURTAINS, ETC. AT ALL WINDOWS FOR (N) WINDOW REPLACEMENT.
3. FOR ROOMS NOT LISTED IN ROOM FINISH SCHED:
   - 3A. PATCH (E) WALL W/ (N) FURRING & PLASTER TO MATCH REMAINING WALL WHERE (E) WALL RADIATORS ARE TO BE REMOVED — SEE MECH. DRWGS FOR ROOMS AFFECTED
   - 3B. PATCH WALLS WHERE (N) DRINKING FOUNTAINS INSTALLED
4. SEE A4.5 FOR CEILING DEMOLITION NOTES
5. SEE A3.1 FOR (E) ROOF DEMOLITION.
6. SEE SPECIFICATION SECTIONS 02080 AND 01010, AND DRAWINGS AD1, AD2, AD3 FOR DEMOLITION TO BE DONE BY HAZARDOUS MATERIALS ABATEMENT CONTRACTOR



KAPLAN McLAUGHLIN DIAZ

ARCHITECTURE PLANNING

C7252

222 VALLEJO
SAN FRANCISCO, CA 94111
415 398 5191

WALL TYPES LEGEND

SYMBOL	DESCRIPTION	DETAIL
	EXISTING PARTITION TO BE REMOVED	
	EXISTING PARTITION TO REMAIN	
	NON-COMBUSTIBLE GWB PARTITION	- 42.10
	1-HOUR RATED GWB PARTITION	- 42.11
	2-HOUR RATED GWB PARTITION	- 42.13
	1-HOUR RATED SHAFTWALL	- 42.15
	2-HOUR RATED SHAFTWALL	- 42.14
	ACOUSTIC TREATMENT IN ADDITION TO CONSTR. DESCRIBED ABOVE	- 42.17

KEY PLAN

CAL POLY

SAN LUIS OBISPO

BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE

EXISTING BUILDING FIRST FLOOR PLAN

REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE: AS NOTED

DATE: 3 Mar 1989

SHEET: A2.7

NOTE: SEE SPECIFICATION SECTIONS 01010 AND 02080 AND DRAWINGS AB1, AB2, AB3 FOR DEMOLITION BY HAZARDOUS MATERIALS ABATEMENT CONTRACTOR

REMOVE & REPLACE ALL (E) PARTITIONS W/ NEW PARTITIONS
(N) URINALS & SCREENS
REMOVE (E) RAISED FLOOR & URINALS
REMOVE & REPLACE FLOOR TILE & TILE WAINSCOT W/ NEW TILE
MIRRORS ABOVE SINK 3 @ 2'-0" X 2'-6"

REMOVE (E) FLOOR, EXT & INT. WALLS, CEILING, AND DOORS SHOWN DASHED S.I.S.D.

(N) STAIR #5 E2

MIRRORS ABOVE SINK 2 @ 2'-0" X 2'-6"

WOMEN E209A

REMOVE & REPLACE ALL (E) TOILETS W/ NEW TOILETS

UTILITY SPACE E201

REMOVE & REPLACE ALL (E) LAVS. W/ NEW LAVS

VEN E202A

CLASSROOM E203

CLASSROOM E204

(E) 10" CONC. WALL

R-11 BATT INSUL

OPEN TO BELOW

CLASSROOM E206

PROVIDE R-11 BATT INSUL THIS WALL

CLASSROOM E207

CLASSROOM E208

REMOVE & REPLACE (E) LAVATORIES W/ NEW LAVATORIES

REMOVE & REPLACE (E) TOILET PARTITIONS W/ NEW TOILET PARTITIONS

REMOVE & REPLACE ALL (E) TOILETS W/ NEW TOILETS

REMOVE & REPLACE ALL (E) TOILETS W/ NEW TOILETS

(E) STAIR 4'-9" WIDE E210A

REMOVE & REPLACE FLR TILE & TILE WAINSCOT W/ NEW TILE

(N) FLOORING AT TOP LANDING ONLY

(E) ELEV.

REMOVE & RELOCATE (E) B&C, FNL.

RELOCATE FHC

(E) FLOORING

VEST. E201

VEST. E202

CORRIDOR E221

PASSAGEWAY E205

CORRIDOR E222

VEST. E209

JANITOR E210

(N) 2'-0" X 2'-8" (N) FLOORING SEE A2.7

VEST. E200

(E) STAIR 4'-1" WIDE E220

SEE DET 10.19 FOR FLOORING LAYOUT

REMOVE (E) WALL

CORRIDOR WALLS USE 4" SHAFT WALL STUDS FOR 2 LAYERS R-4 RIGID INSUL.

REMOVE (E) CABINETS

CONTINUATION OF STAIR ENCLOSURE

MECHANICAL E219

STORAGE E218

CLASSROOM E217 (1180 S.F. OL < 50) B-2 OCCUPANCY

PASSAGEWAY E216

CLASSROOM E215

CLASSROOM E214

STORAGE E213

CLASSROOM E212

STORAGE E212A

STORAGE E212B

(N) FLOORING

PASSAGEWAY E211

REMOVE (E) WALL

SAWCUT CONC. WALL FOR (N) DOOR

REMOVE (E) WINDOWS. PURR & PLASTER TO MATCH (E) WALL

MATCHLINE

REMOVE (E) DOOR & REPLACE W/ (N) FURRING & GWB TO MATCH

REMOVE (E) WINDOW & SAWCUT CONC. SILL FOR (N) DOOR

(E) ROOF

1 SECOND FLOOR PLAN

(N) 1HR ENCLOSURE WALL TO UNDERSIDE OF CONC. ROOF SLAB
R-30 BATT INSUL @ CEILING
R-11 BATT INSUL @ WALLS
(N) 5/8" G.W.B. C.L.G. W/ VENEER PLASTER 2 HR RATED SHAFT WALL CONSTR.
SEE 14.10 FOR REVEAL AT G.W.B. & VENEER PLASTER WALL
SECOND FL. +334.00
FIRST FL. +320.21
SEE 5/A2.7 FOR SECTION @ (N) EXTERIOR STAIR
R-30 INSUL
SUPP'T FRAMING & BRACING
(E) CLG
CLASSROOM
EXPS. EASE
VENEER PLASTER
(N) CONC. FLOOR SLD.
(N) WATERPROOFING TYPE 2 SEE A2.9 FOR FULL EXTENT SEE 21.25 FOR DETAIL

2 BUILDING SECTION

KAPLAN McLAUGHLIN DIAZ
ARCHITECTURE PLANNING
222 VALLEJO
SAN FRANCISCO, CA 94111
415-398-5191

WALL TYPES LEGEND

SYMBOL	DESCRIPTION	DETAIL
	EXISTING PARTITION TO BE REMOVED	
	EXISTING PARTITION TO REMAIN	
	NON-COMBUSTIBLE GWB PARTITION	- 12.10
	1-HOUR RATED GWB PARTITION	- 12.11
	2-HOUR RATED GWB PARTITION	- 12.13
	1-HOUR RATED SHAFTWALL	- 12.12
	2-HOUR RATED SHAFTWALL	- 12.14
	ACOUSTIC TREATMENT IN ADDITION TO CONSTR. DESCRIBED ABOVE	- 12.17

KEY PLAN

CAL POLY
SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE

EXISTING BUILDING
SECOND FLOOR PLAN
BUILDING SECTION

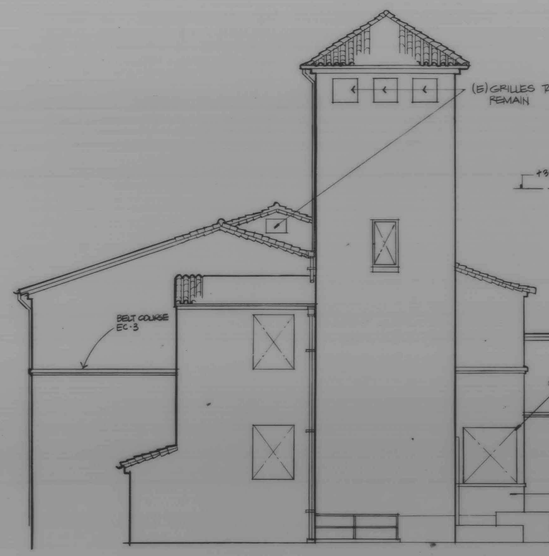
REVISIONS

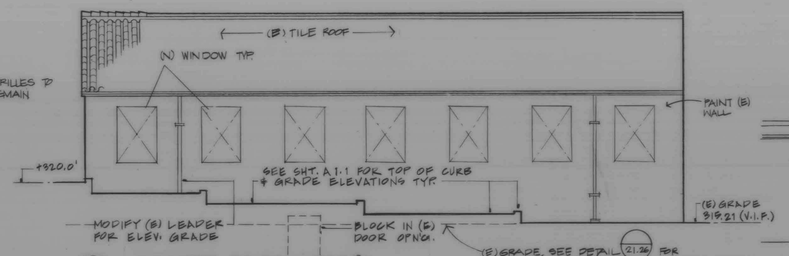
NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE 1/8"=1'-0"

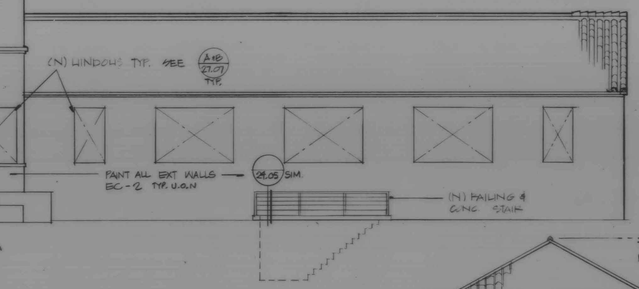
DATE 3 Mar 1989

SHEET A2.8

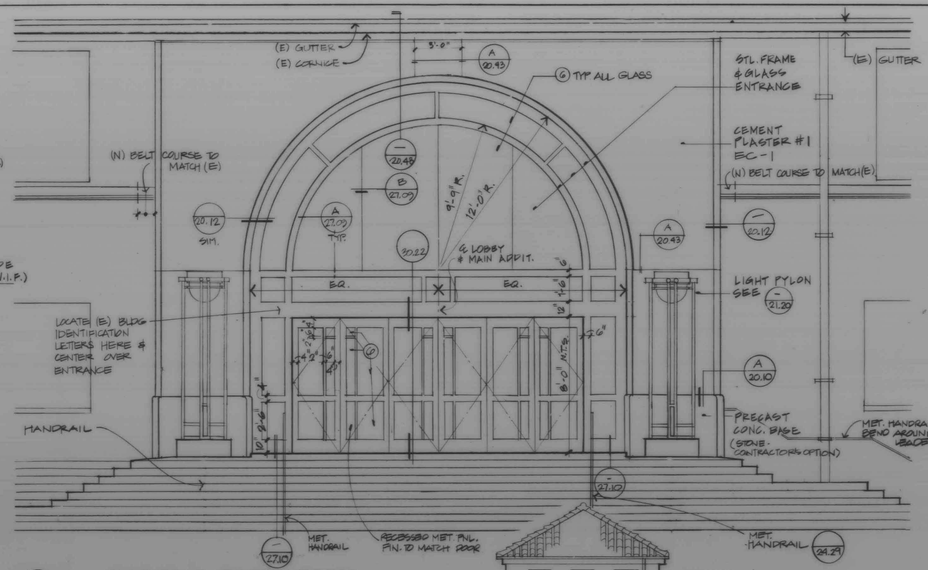




4 / - SOUTH ELEVATION

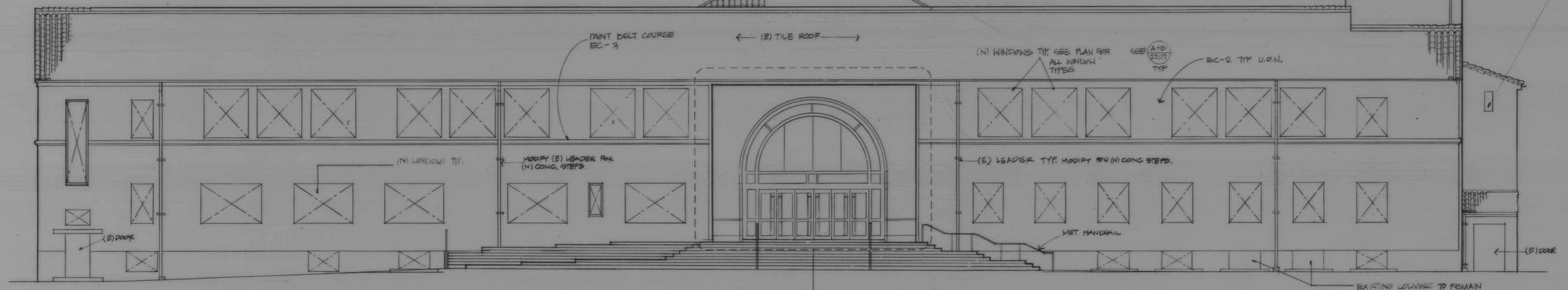


3 / - NORTH ELEVATION



5 / - PARTIAL ELEVATION

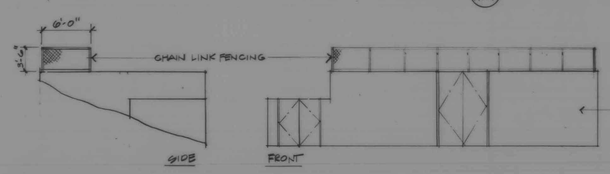
1/4" = 1'-0"



5 / A5.4

2 / - EAST ELEVATION

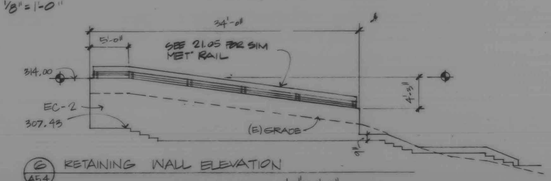
1/8" = 1'-0"



7 / A5.4 CHILLER/DUMPSTER ENCLOSURE

1/8" = 1'-0"

S.S.D FOR EXTENT OF WALL DEMOLITION FOR (N) ENTRANCE. SAVE (E) BLDG. IDENTIFICATION LETTERS FOR MOUNTING ON (N) ENTRANCE



6 / A5.4 RETAINING WALL ELEVATION

1/8" = 1'-0"

1 / - WEST ELEVATION

1/8" = 1'-0"

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SHEET TITLE
EXISTING BUILDING EXTERIOR ELEVATIONS

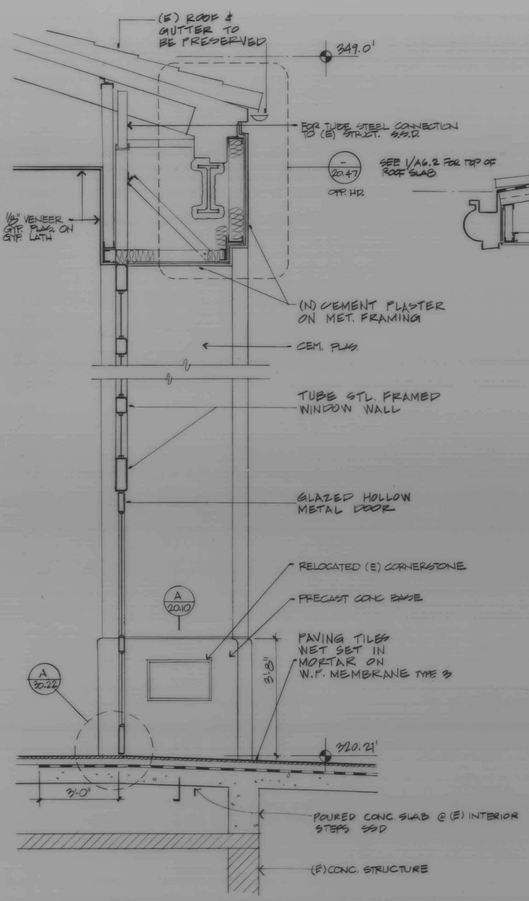
REVISIONS

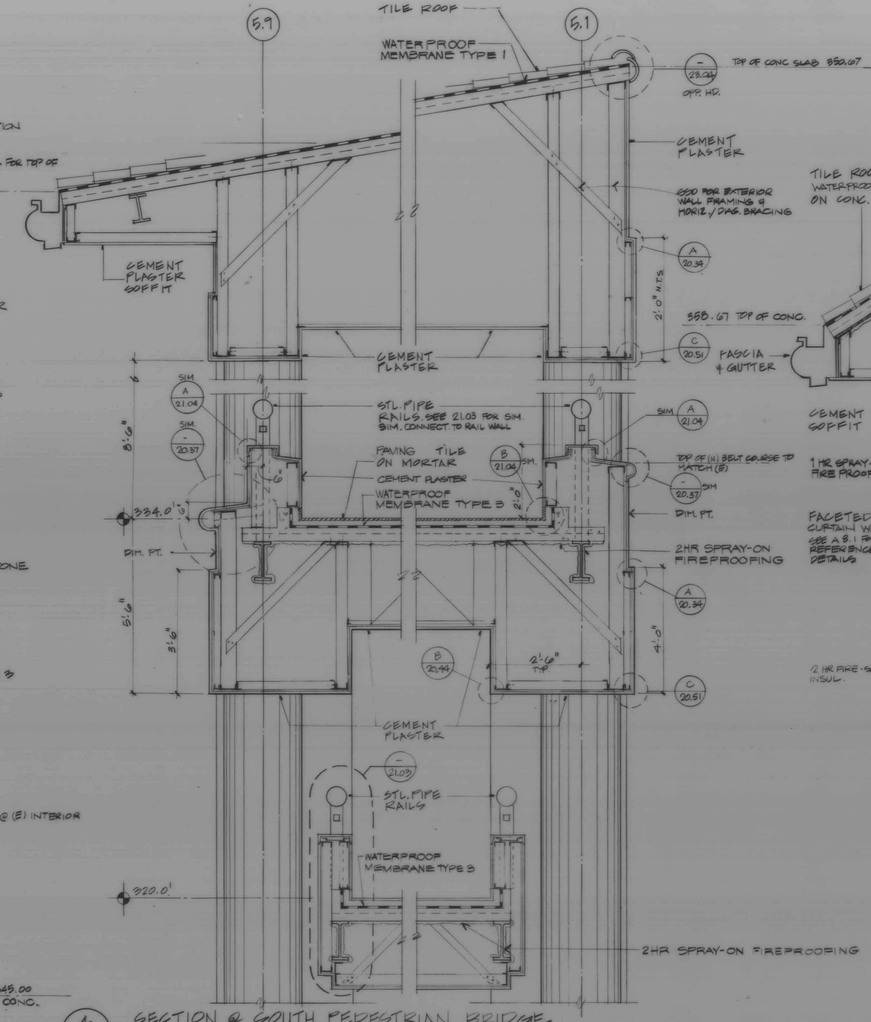
NO	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

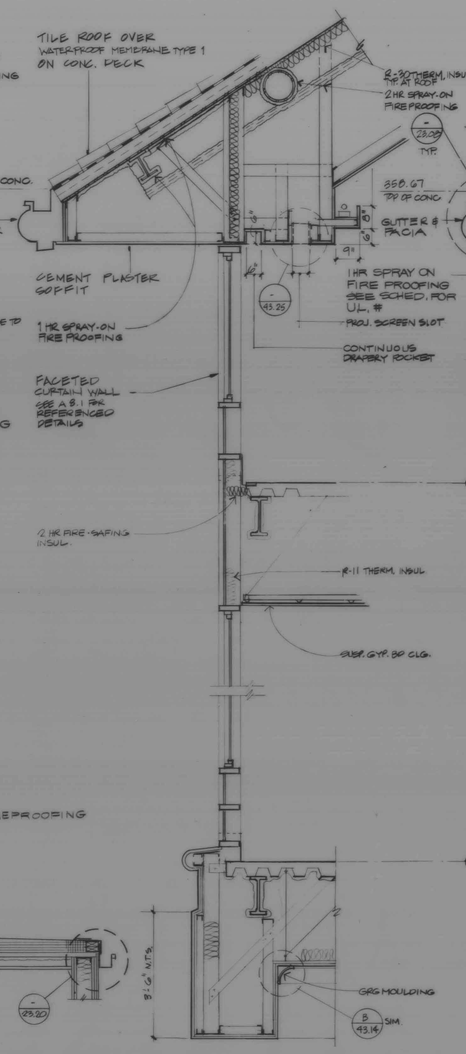
SCALE: AS NOTED
DATE: 3 Mar 1989

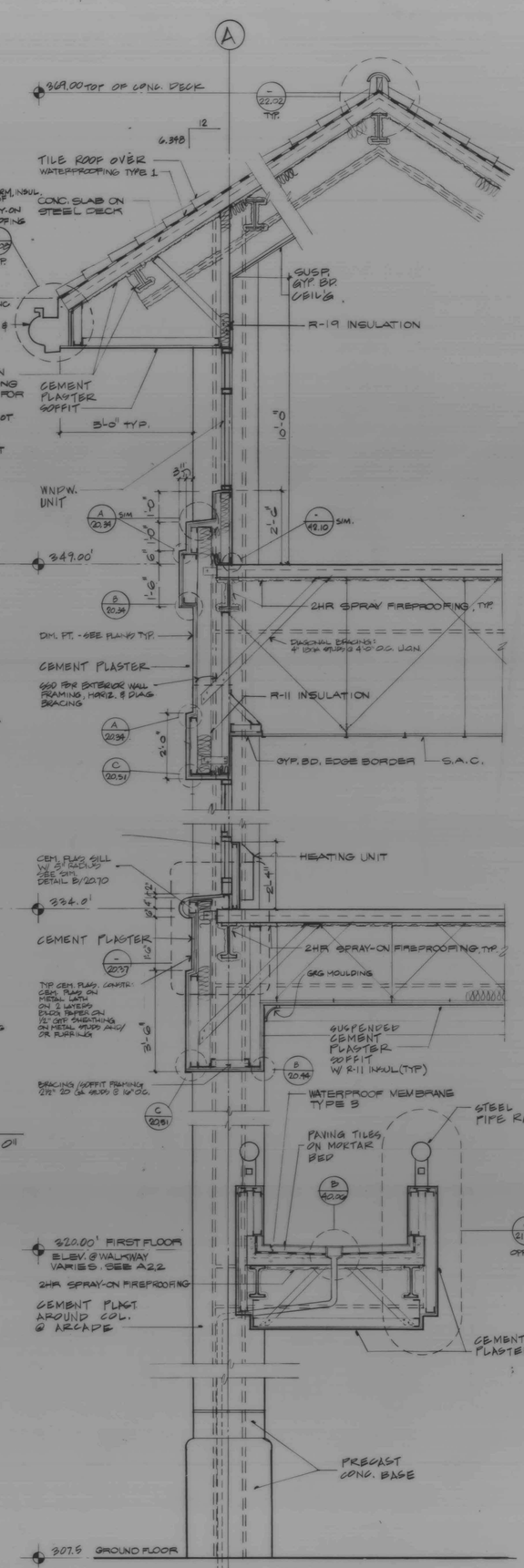
SHEET: A5.4

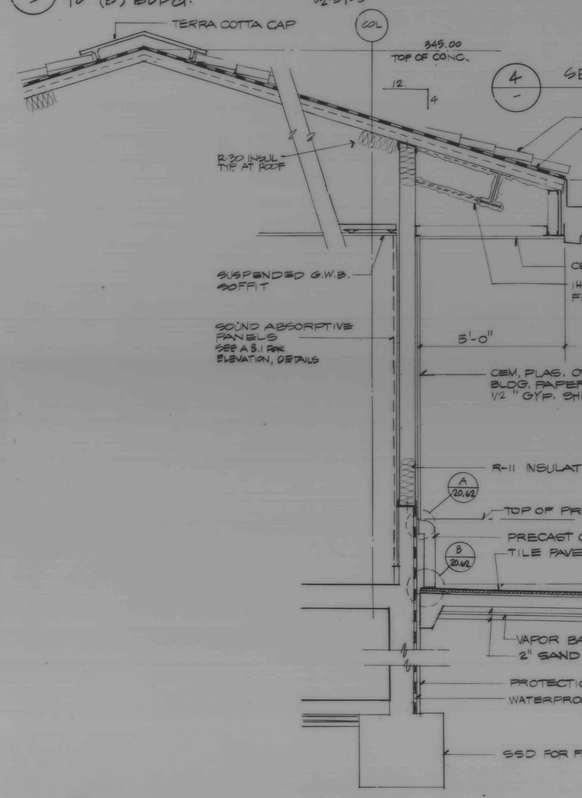
KMD8300 3D42V - 117819



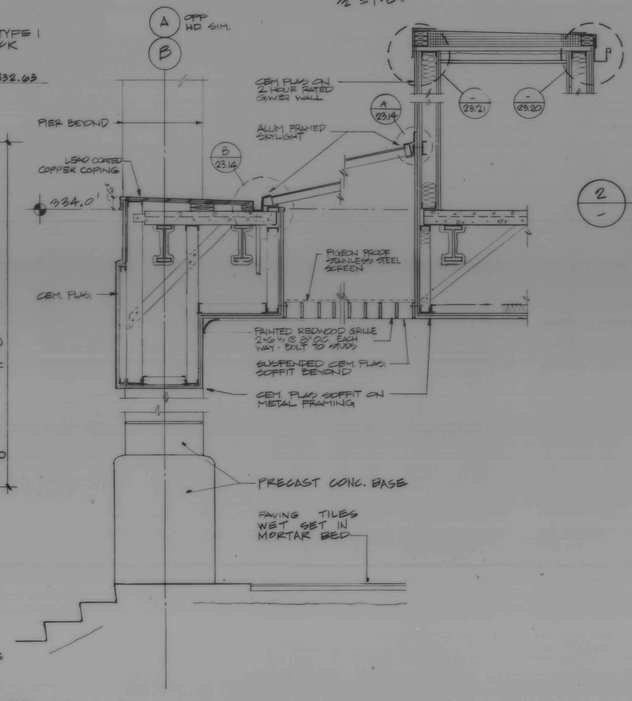








5 — SECTION AT LECTURE HALL



3 — SECTION AT EAST-WEST WING LINK

2 — SECTION @ RADIUSED END EAST-WEST WING
1/2"=1'-0"
PER TYP. NOTES SEE 1/AG.1

1 — SECTION @ EAST-WEST WING
1/2"=1'-0"

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FIRE PROOFING SCHEDULE

A. COLUMNS, 2 HRS
WF 14 x 38: U.L. #X723
14 x 257 AND LARGER: U.L. #X704
ALL OTHER WF COLS: U.L. #X701
STEEL TUBES 4 x 4 x 3/16 MIN: U.L. #X771

B. FLOORS
STEEL DECKS, 2 HRS: U.L. #D739
PRIMARY BEAMS, 2 HRS: U.L. #N706
SECONDARY BEAMS, 2 HRS: U.L. #N706

C. ROOF
PRIMARY BEAMS, 2 HRS: U.L. #S701
SECONDARY BEAMS, 1 HR: U.L. #S701
ROOF DECK, 1 HR: U.L. #P711
STEEL PIPE BEAM, 2 HRS: U.L. #X771

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SHEET TITLE
WALL SECTIONS

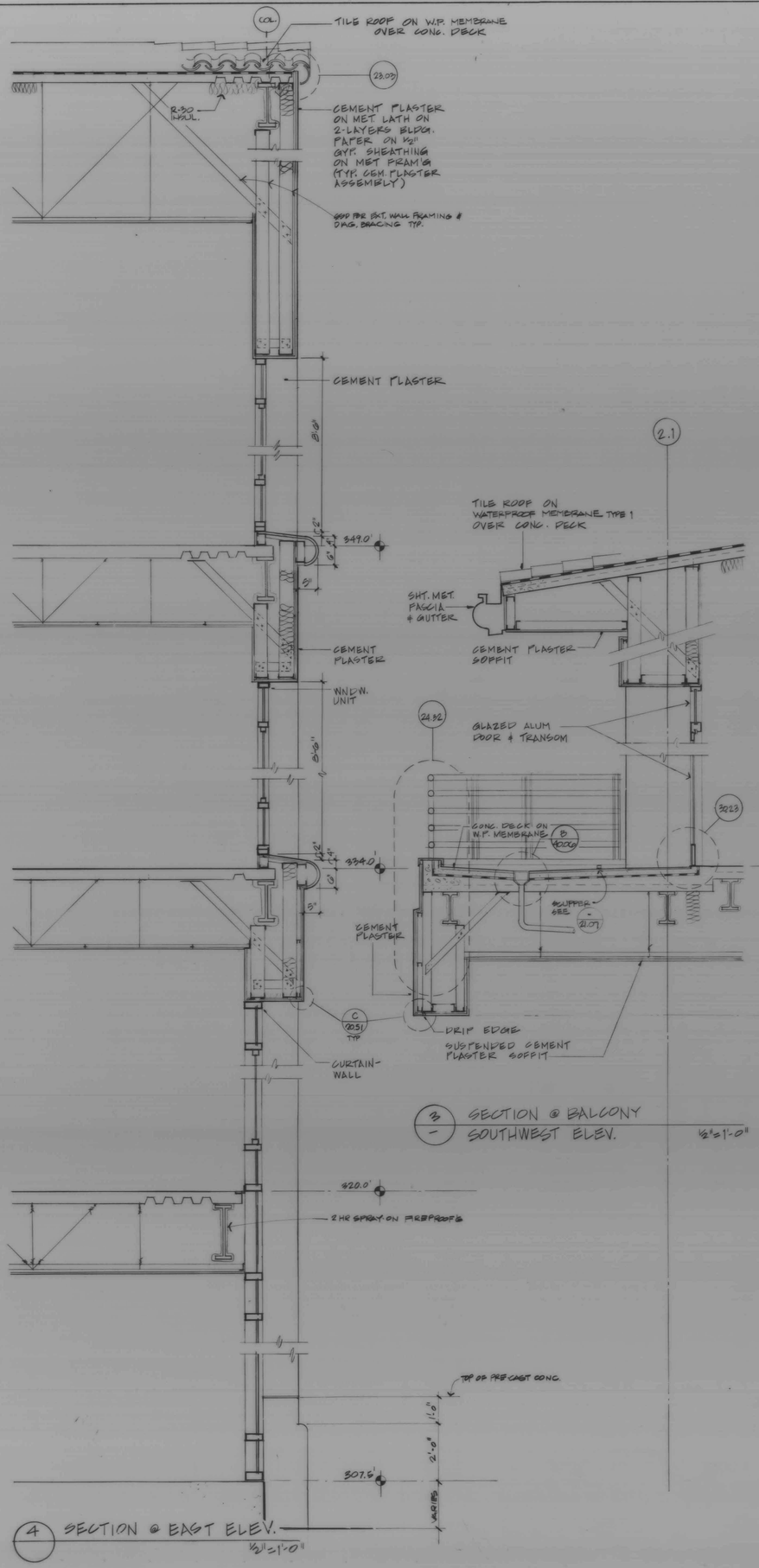
REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE 1/2" = 1'-0"

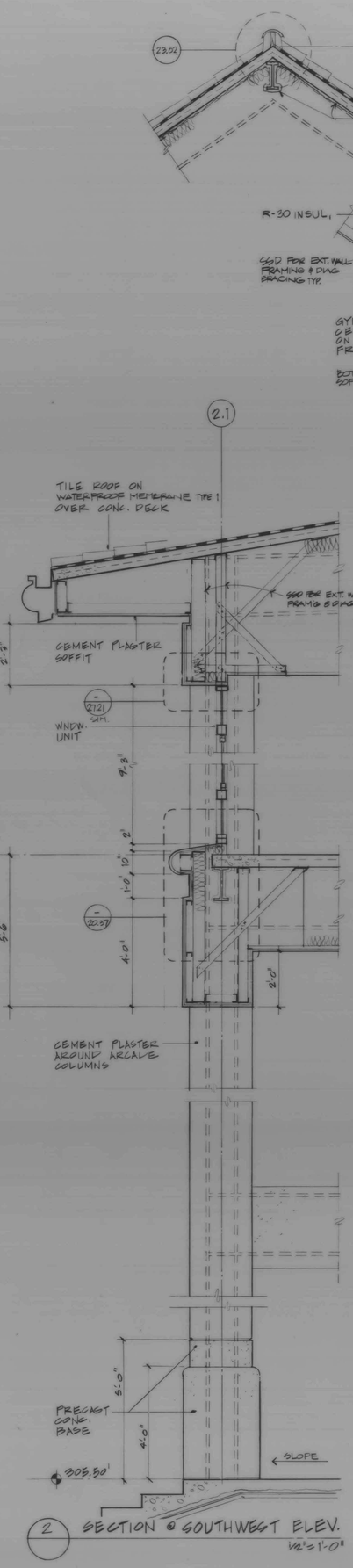
DATE 3 Mar 1989

SHEET **A6.1**



3/- SECTION @ BALCONY SOUTHWEST ELEV. ½"=1'-0"

4 SECTION @ EAST ELEV. ½"=1'-0"



2 SECTION @ SOUTHWEST ELEV. ½"=1'-0"

1 SECTION @ NORTHEAST ELEV. ½"=1'-0"

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A. COLUMNS, 2 HRS
WF 14 x 38: U.L. #X723
14 x 257 AND LARGER: U.L. #X704
ALL OTHER WF COLS: U.L. #X701
STEEL TUBES 4 x 4 x 3/16 MIN: U.L. #X771

B. FLOORS
STEEL DECKS, 2 HRS: U.L. #D739
PRIMARY BEAMS, 2 HRS: U.L. #N706
SECONDARY BEAMS, 2 HRS: U.L. #N706

C. ROOF
PRIMARY BEAMS, 2 HRS: U.L. #S701
SECONDARY BEAMS, 1 HR: U.L. #S701
ROOF DECK, 1 HR: U.L. #P711
STEEL PIPE BEAM, 2 HRS: U.L. #X771

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SHEET TITLE
WALL SECTIONS

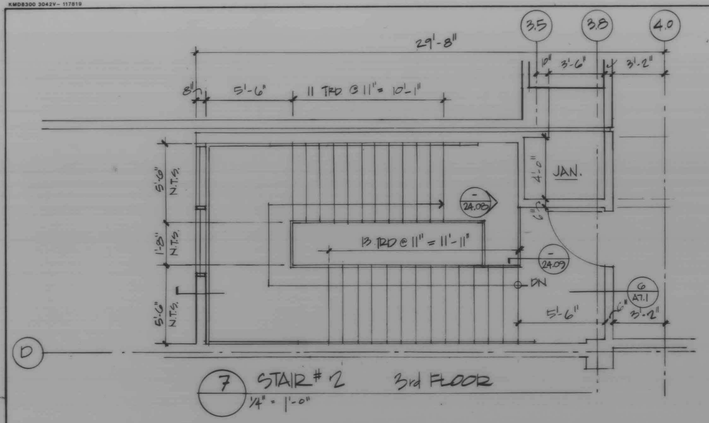
REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

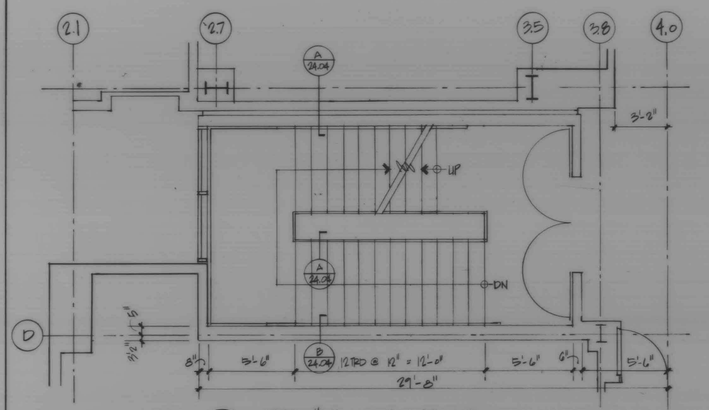
SCALE ½"=1'-0"

DATE 3 Mar 1989

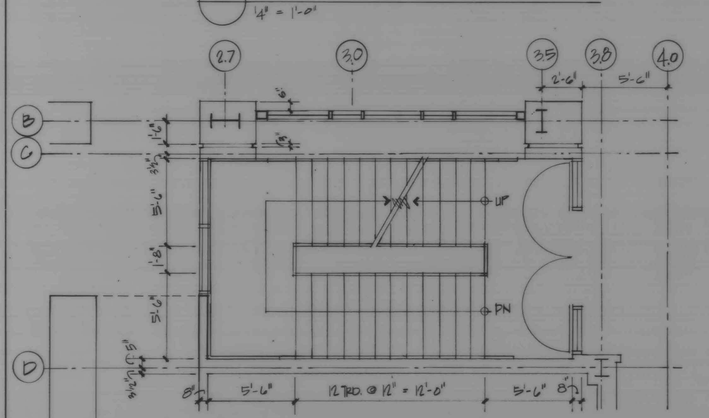
SHEET A6.2



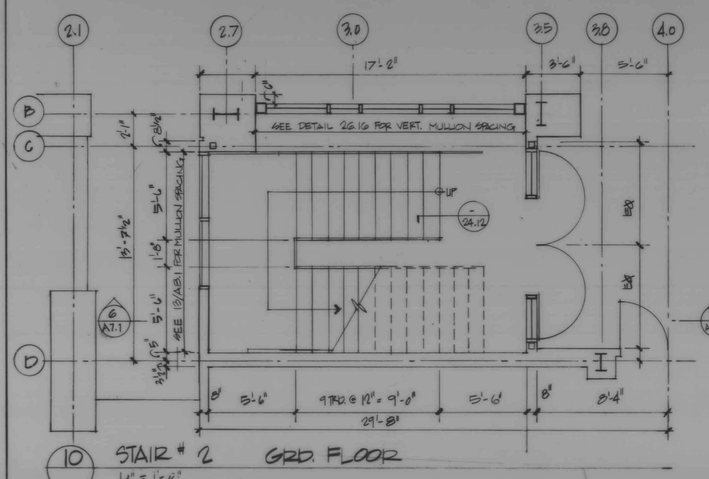
7 STAIR # 2 3rd FLOOR
1/4" = 1'-0"



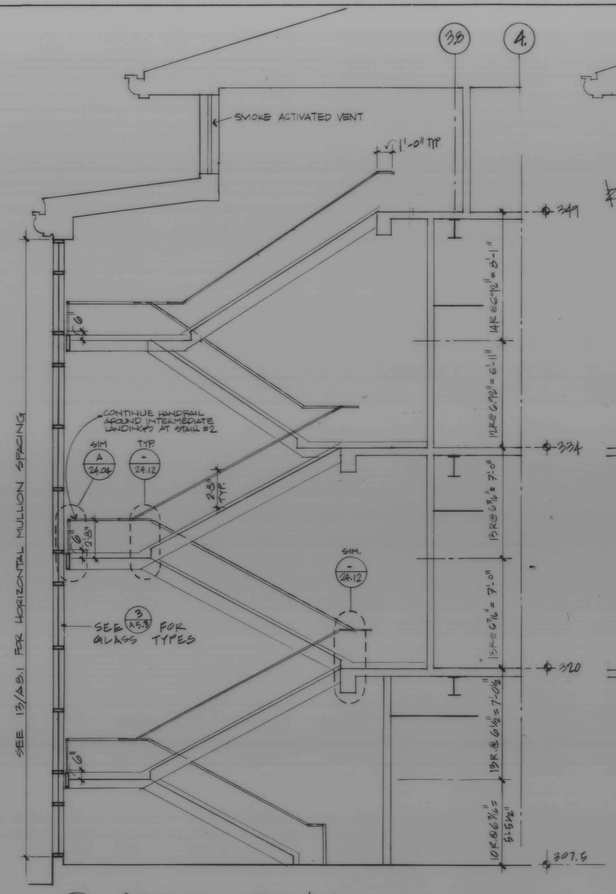
8 STAIR # 2 2nd FLOOR
1/4" = 1'-0"



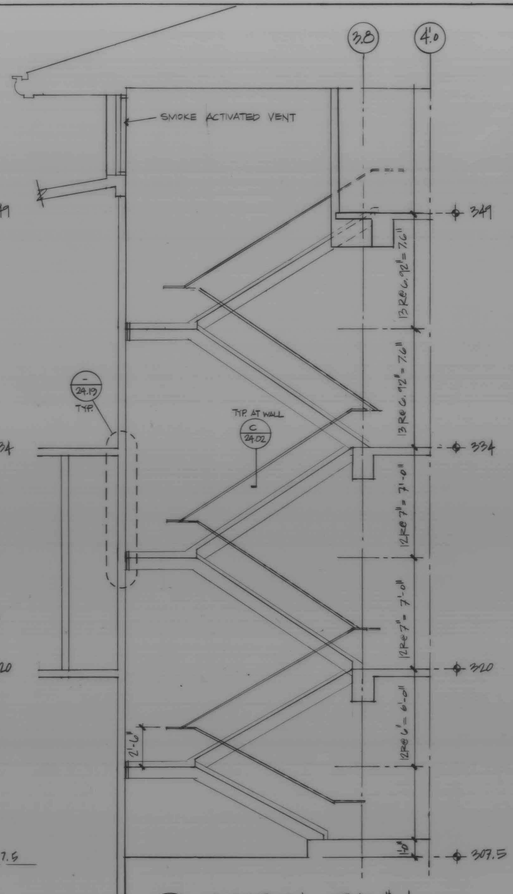
9 STAIR # 2 1st FLOOR
1/4" = 1'-0"



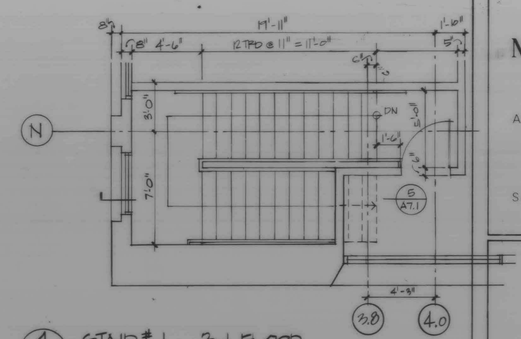
10 STAIR # 2 GRD. FLOOR
1/4" = 1'-0"



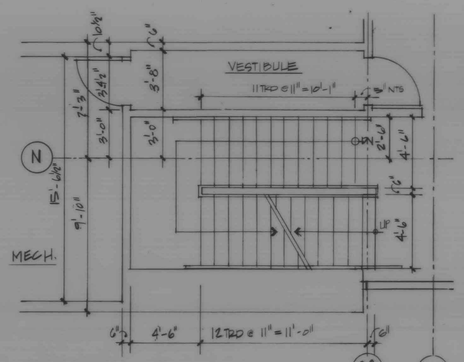
6 SECTION STAIR # 2
1/4" = 1'-0"



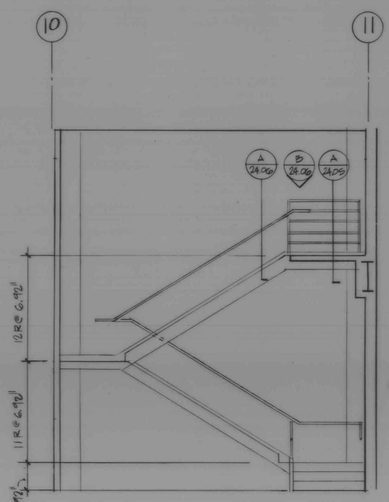
5 SECTION STAIR # 1
1/4" = 1'-0"



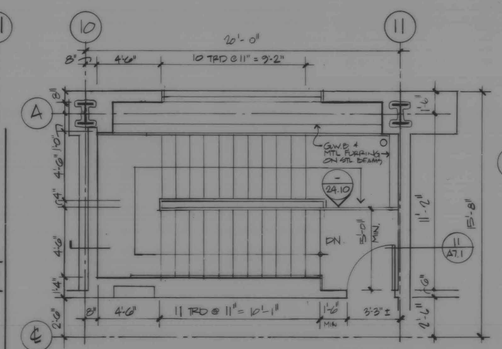
4 STAIR # 1 3rd FLOOR
1/4" = 1'-0"



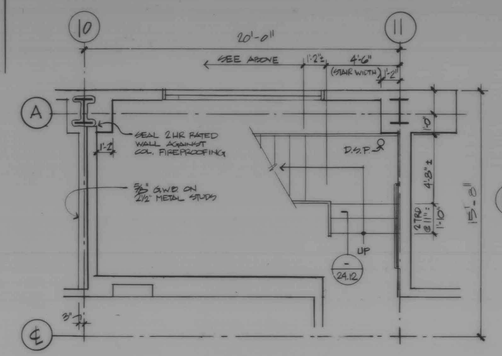
3 STAIR # 1 2nd FLOOR
1/4" = 1'-0"



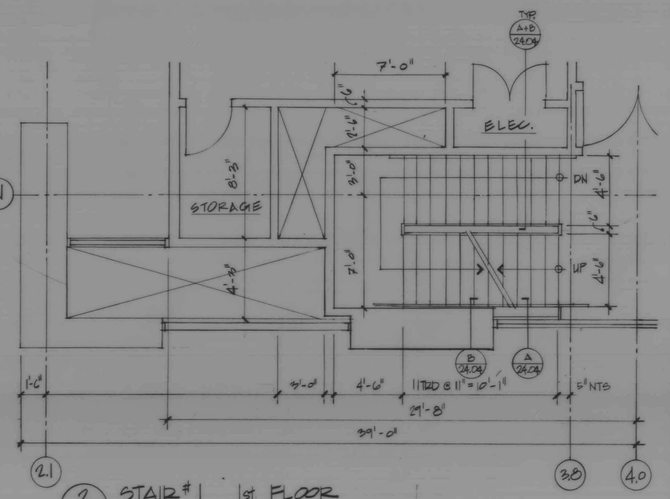
11 SECTION STAIR # 3
1/4" = 1'-0"



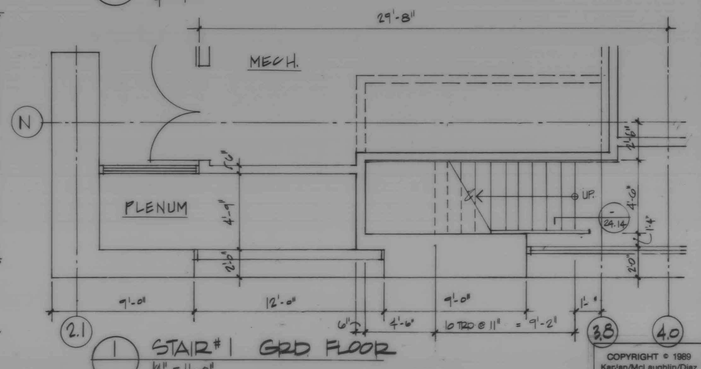
12 STAIR # 3 3rd FLOOR
1/4" = 1'-0"



13 STAIR # 3 2nd FLOOR
1/4" = 1'-0"



2 STAIR # 1 1st FLOOR
1/4" = 1'-0"



1 STAIR # 1 GRD FLOOR
1/4" = 1'-0"

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SHEET TITLE

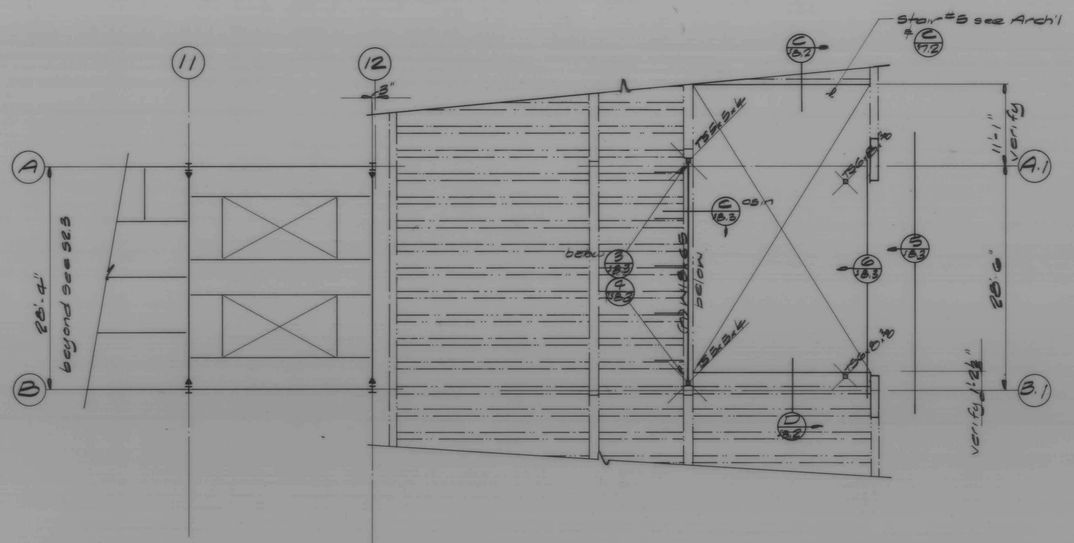
REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

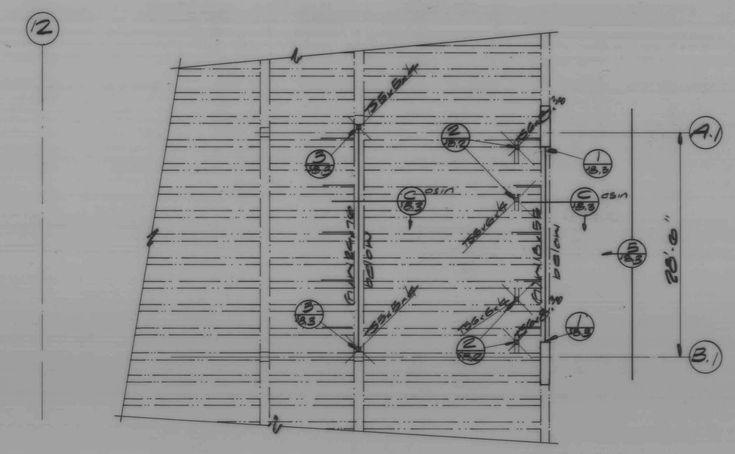
SCALE: AS NOTED

DATE: 3 Mar 1989

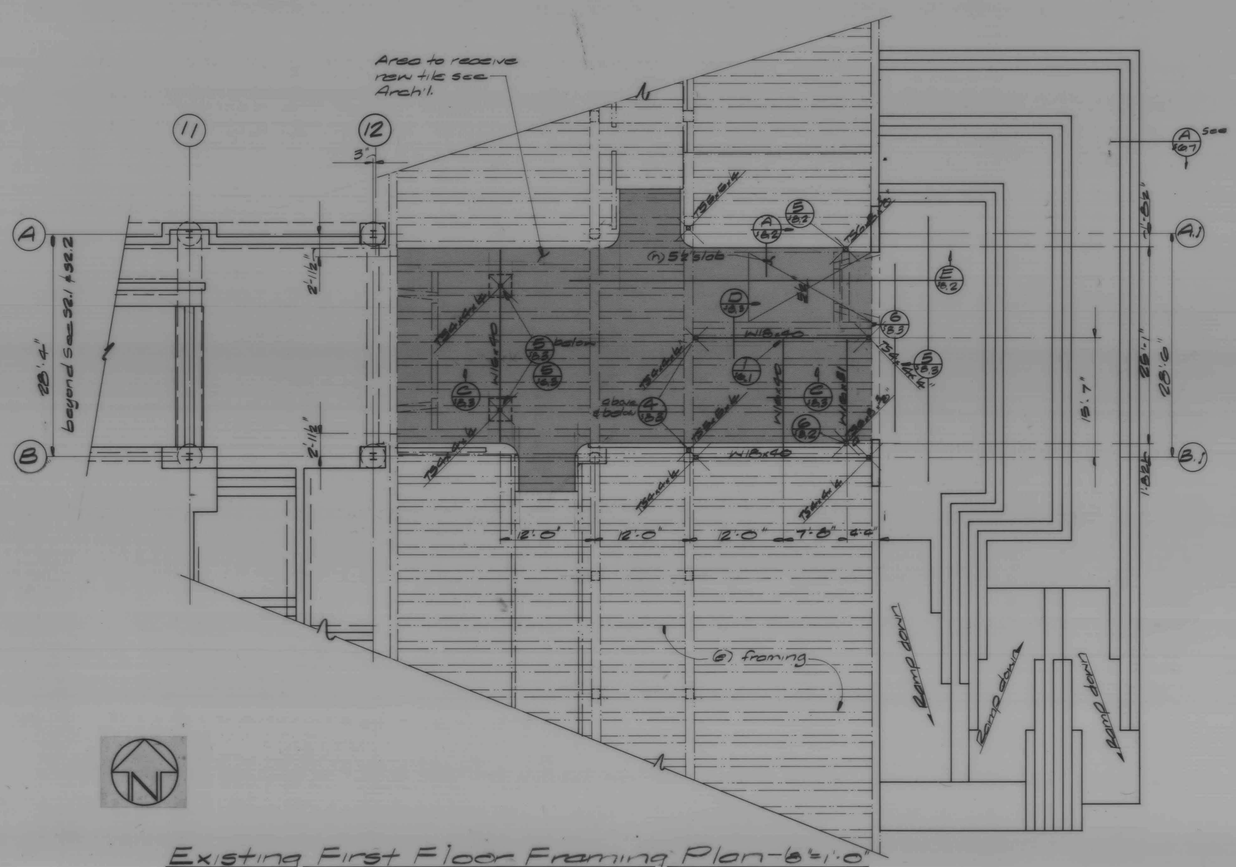
SHEET: A7.1



Existing Second Floor Framing Plan - 1/8" = 1'-0"



Existing Roof Framing Plan - 1/8" = 1'-0"



Existing First Floor Framing Plan - 1/8" = 1'-0"

003 S8.1 Existing Building Framing Plans 1989-03-03

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REGISTERED PROFESSIONAL ENGINEER
M. TODD THORP
No. 2990
Exp. 6/30/92
STRUCTURAL
STATE OF CALIFORNIA

CAL POLY

SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE
EXISTING BUILDING FRAMING PLANS

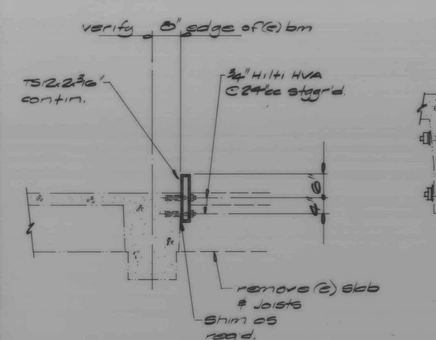
REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

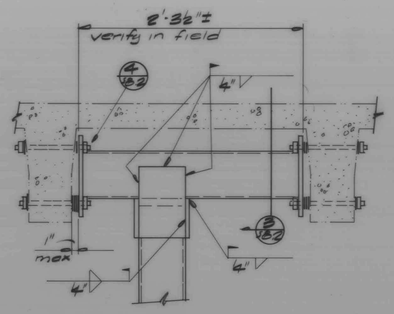
SCALE 1/8" = 1'-0"

DATE 3-3-89

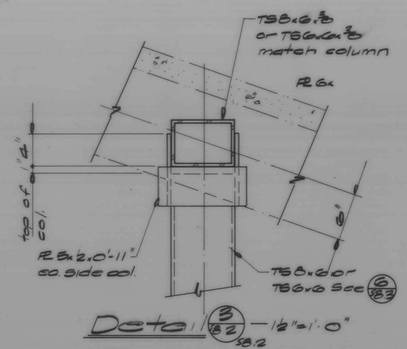
SHEET **S8.1**



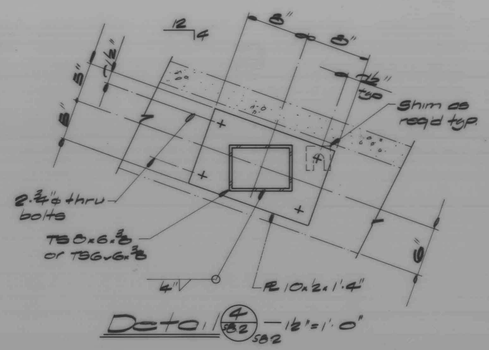
Detail 1/S8.2 — 3/4" = 1'-0"



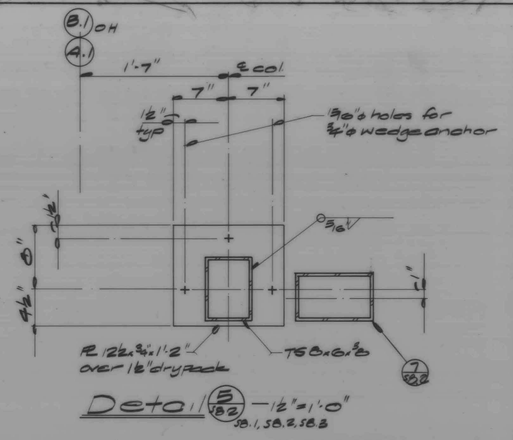
Detail 2/S8.2 — 1½" = 1'-0"



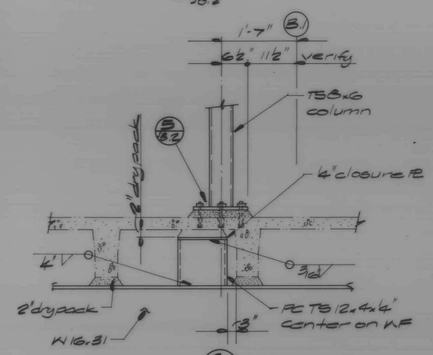
Detail 3/S8.2 — 1½" = 1'-0"



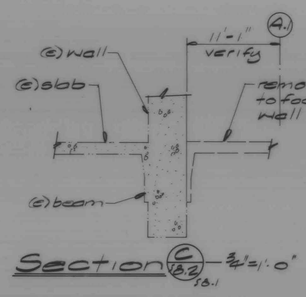
Detail 4/S8.2 — 1½" = 1'-0"



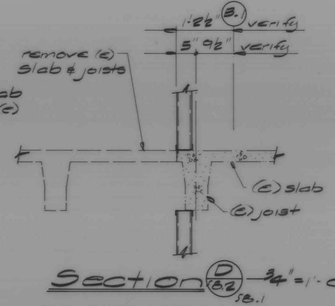
Detail 5/S8.2 — 1½" = 1'-0"
S8.1, S8.2, S8.3



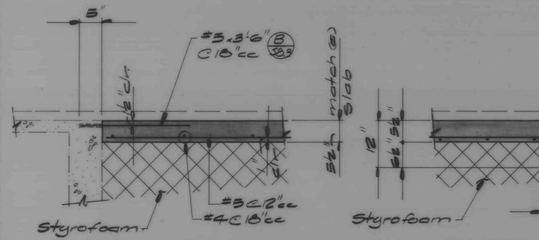
Detail 6/S8.2 — ¾" = 1'-0"



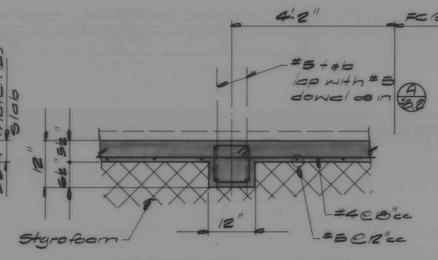
Section C/S8.2 — ¾" = 1'-0"
S8.1



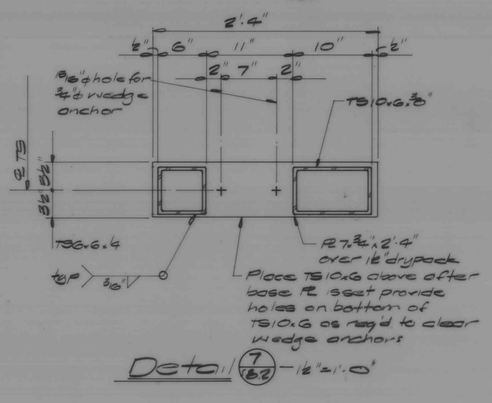
Section D/S8.2 — ¾" = 1'-0"
S8.1



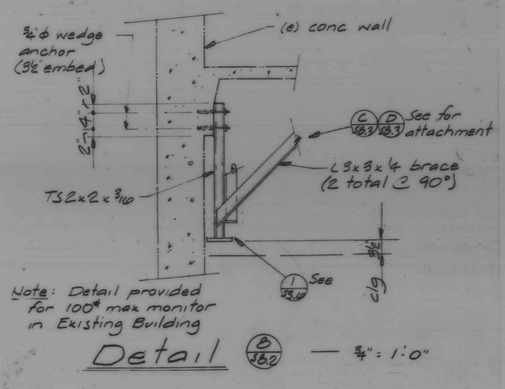
Section A/S8.2 — ¾" = 1'-0"
S8.1, S8.2



Section B/S8.2 — ¾" = 1'-0"
S8.2

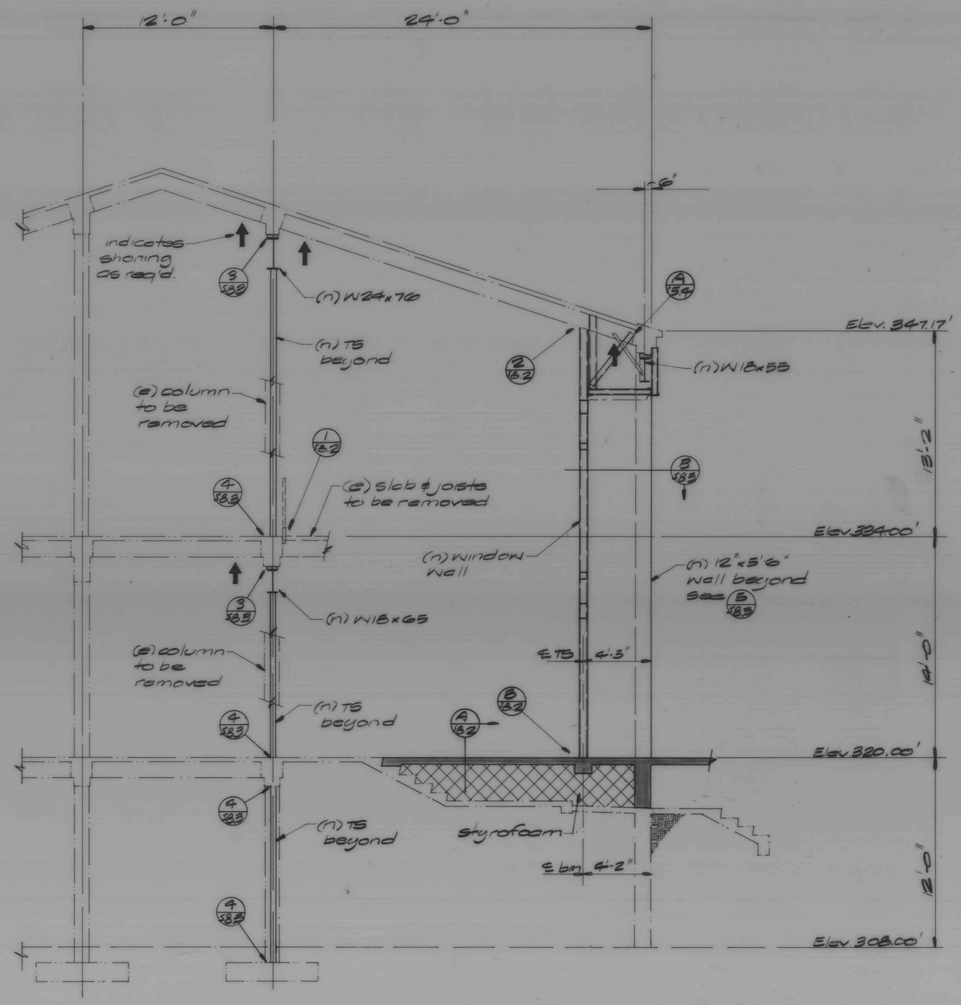


Detail 7/S8.2 — 1½" = 1'-0"



Note: Detail provided for 100# max monitor in Existing Building

Detail 8/S8.2 — ¾" = 1'-0"



Section E/S8.2 — ¼" = 1'-0"
S8.1

003 S8.2 Existing Building Sections 1989-03-03

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REGISTERED PROFESSIONAL ENGINEER
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STATE OF CALIFORNIA

CAL POLY
SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE
EXISTING BUILDING SECTIONS

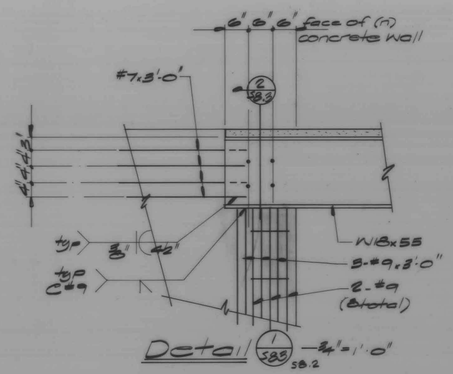
REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

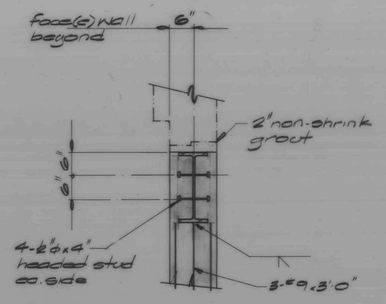
SCALE: AS Noted
DATE: 3-3-89

SHEET: S8.2

KWD8300 3042V- 117819



Detail 1/S8.3 — 3/4"=1'-0"



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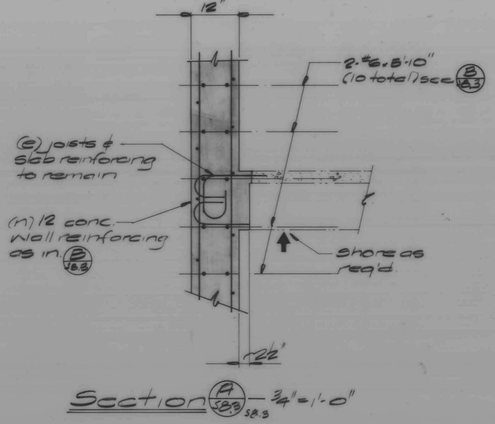
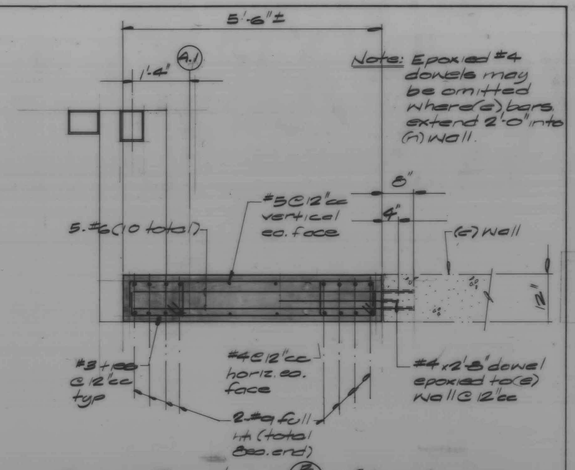
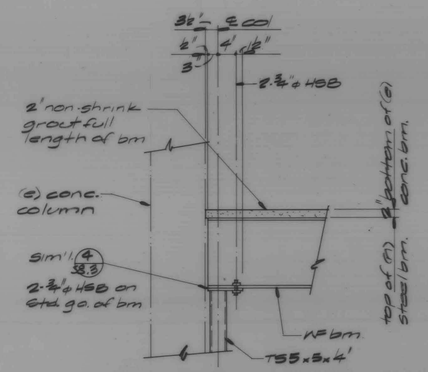


Section A/S8.3 — 3/4"=1'-0"



Plan Section B/S8.3 — 3/4"=1'-0"



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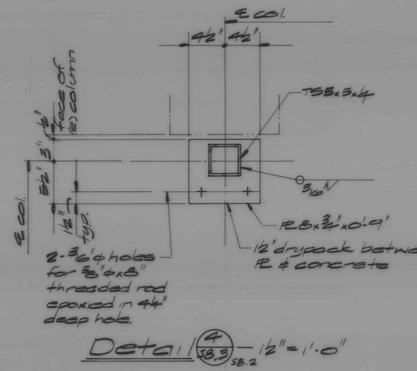

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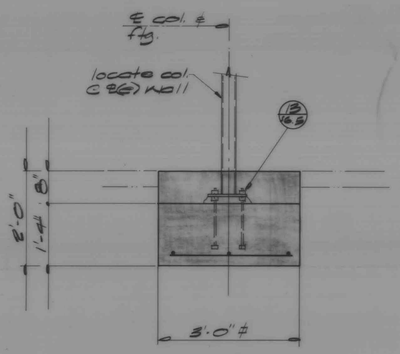

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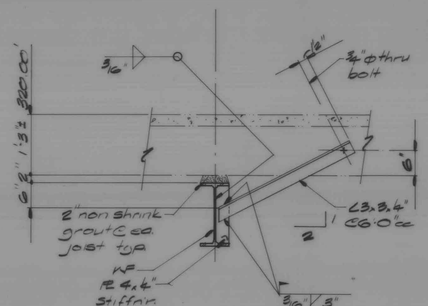
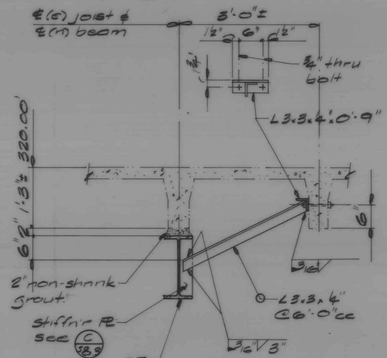
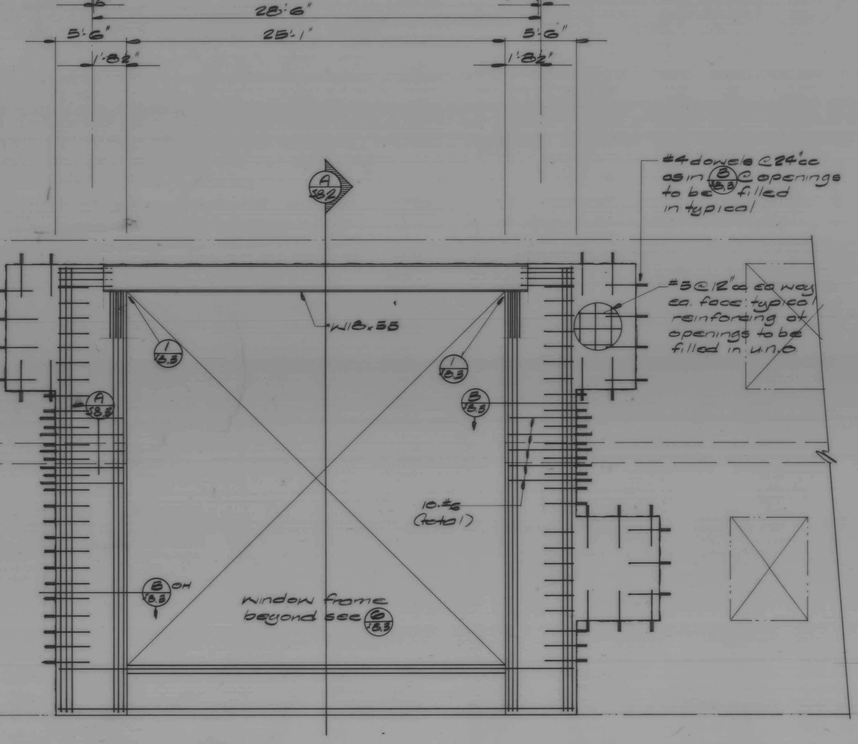


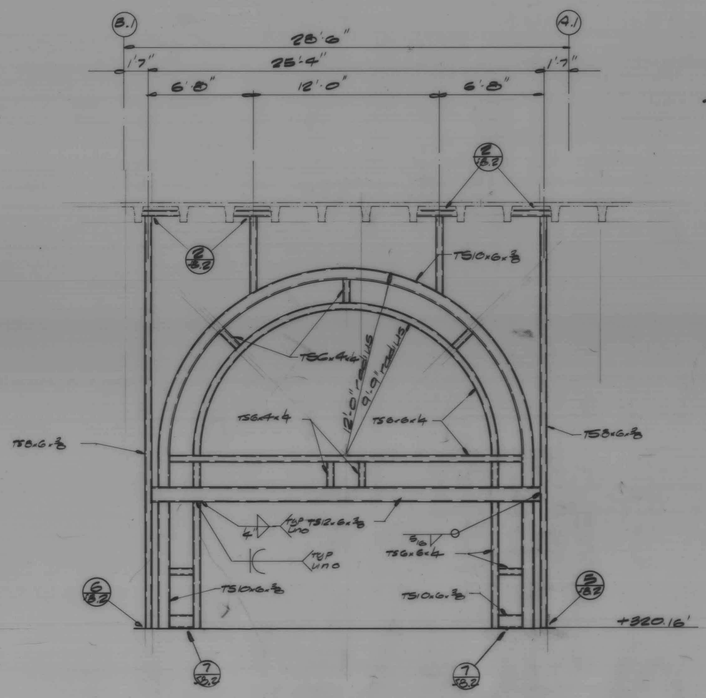
Section C/S8.3 — 3/4"=1'-0"



Section D/S8.3 — 3/4"=1'-0"



Wall Elevation B/S8.3 — 1/4"=1'-0"



Elevation @ West Entry 6/S8.3 — 1/4"=1'-0"

003 S8.3 Existing Building Details 1989-03-03

KAPLAN McLAUGHLIN DIAZ
ARCHITECTURE PLANNING
222 VALLEJO
SAN FRANCISCO, CA 94111
415-398-5191

BUEHLER & BUEHLER ASSOCIATES
STRUCTURAL ENGINEERS, INC.
7300 Folsom Blvd., Suite 203
Sacramento, Ca. 95826
(916) 381-8181

REGISTERED PROFESSIONAL ENGINEER — M. TODD THORP — No. 2930 — Exp. 6/30/92 — STRUCTURAL — STATE OF CALIFORNIA

CAL POLY
SAN LUIS OBISPO
BUSINESS ADMINISTRATION AND EDUCATION BUILDING

SHEET TITLE
EXISTING BUILDING DETAILS

REVISIONS

NO.	DATE	DESCRIPTION
	24 AUG 90	ISSUED FOR BIDDING

SCALE: as noted
DATE: 3-3-89

SHEET: S8.3

Fire Protection Analysis

Cotchett Education Building

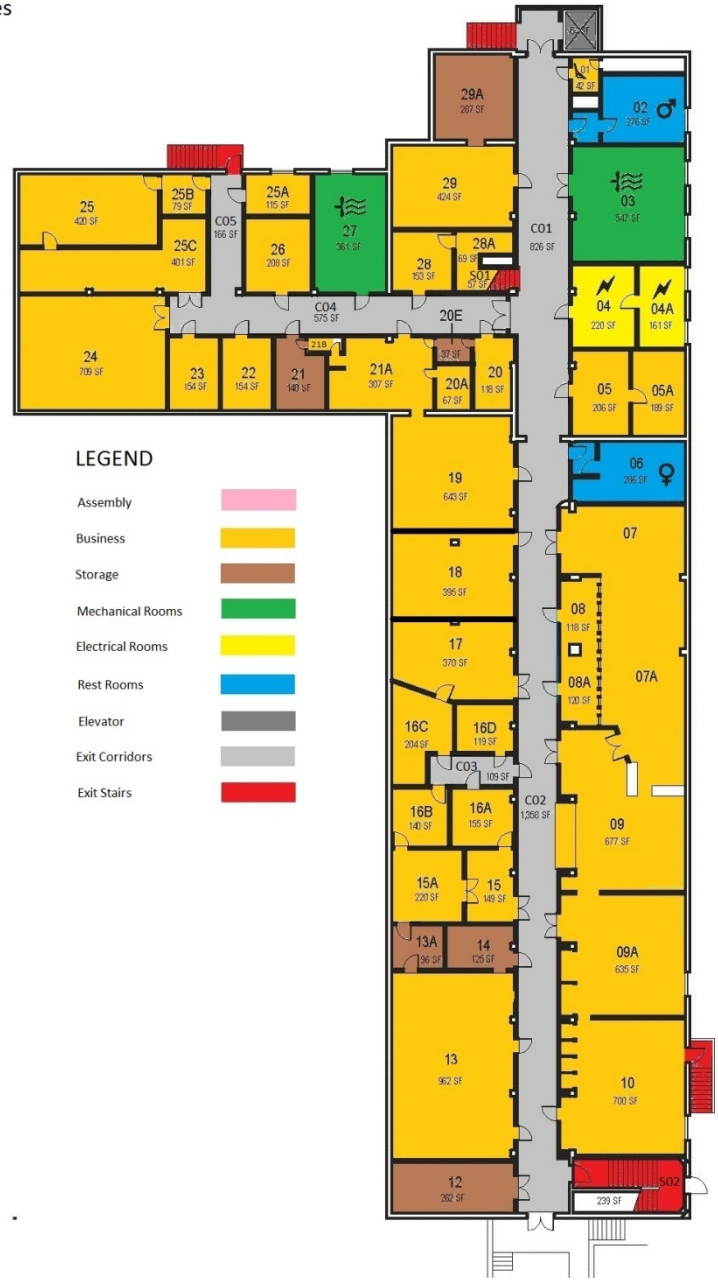
Appendix 3

Occupancies

Appendix 2

Basement
Occupancies

Building 002-0
Page 1 of 3



O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg

CAL POLY
SAN LUIS OBISPO
Facility Services Facilities Planning and Capital Projects

Cotchett Education Building

www.facilities.calpoly.edu

Basement

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'

Appendix 2

First Floor
Occupancies

O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg

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Ground Floor

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'

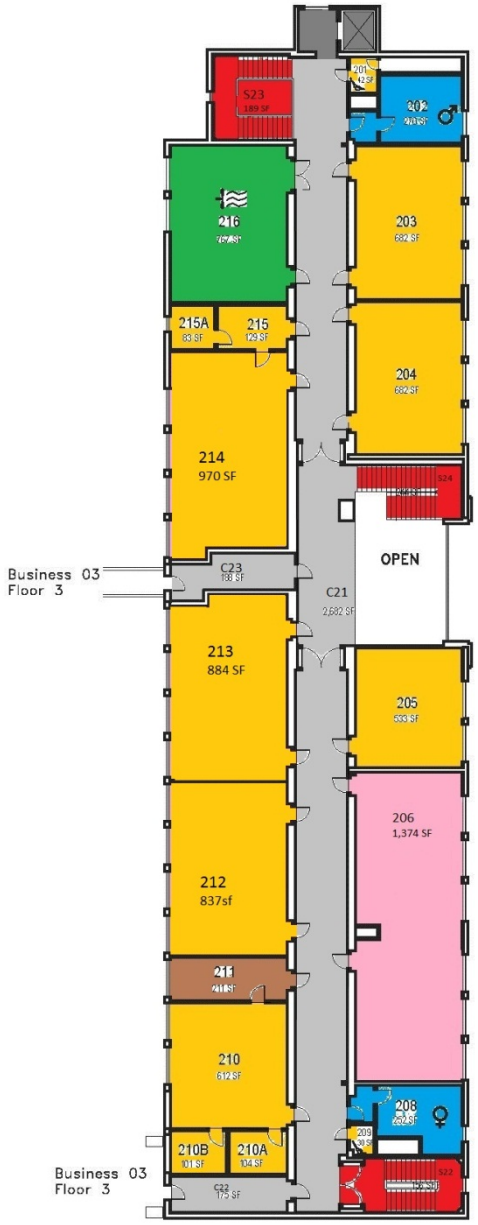
Appendix 2

Second Floor

Occupancies

LEGEND

- Assembly
- Business
- Storage
- Mechanical Rooms
- Electrical Rooms
- Rest Rooms
- Elevator
- Exit Corridors
- Exit Stairs



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Second Floor

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

1"=30'

Fire Protection Analysis

Cotchett Education Building

Appendix 4

Occupant Loads

Appendix 4 **BASEMENT**

Room	Room Title	Area	Occupant Load Factor	Occupants	Use	Occupancy
		SF	SF / Person	Persons		
0001-00	Janitor's Closet	42	100	1	Business	Business
0002-00	Men's Room	276	100	3	Business	Business
0003-00	Mech Room	547	100	6	Business	Business
0004-00	Electrical Room	220	100	3	Business	Business
0004-A0	Electrical Room	161	100	2	Business	Business
0005-00	Maint Rpr Sp	206	100	3	Business	Business
0005-A0	Admin Office	189	100	2	Business	Business
0006-00	Rest Room	286	100	3	Business	Business
0007-00	Support Office	358	100	4	Business	Business
0007-A0	Support Office	708	100	8	Business	Business
0008-00	Support Office	118	100	2	Business	Business
0008-A0	Support Office	119	100	2	Business	Business
0009-00	Support Office	676	100	7	Business	Business
0009-A0	Support Office	635	100	7	Business	Business
0010-00	Spec Inst Sup	699	100	7	Business	Business
0012-00	Gen Storage	262	500	1	Storage	Storage
0013-00	Spec Inst Sup	961	100	10	Business	Business
0013-A0	Gen Storage	96	500	1	Storage	Storage
0014-00	Gen Storage	125	500	1	Storage	Storage

0015-00	Staff Office	149	100	2	Business	Business
0015-A0	Admin Office	219	100	3	Business	Business
0016-A0	Support Office	155	100	2	Business	Business
0016-B0	Staff Office	139	100	2	Business	Business
0016-C0	Staff Office	203	100	3	Business	Business
0016-D0	Support Office	119	100	2	Business	Business
0017-00	Maint Rpr Sp	370	100	4	Business	Business
0018-00	Maint Rpr Sp	395	100	4	Business	Business
0019-00	Maint Rpr Sp	642	100	7	Business	Business
0020-00	Support Office	118	100	2	Business	Business
0020-A0	Staff Office	66	100	1	Business	Business
0020-E0	Gen Storage	37	500	1	Storage	Storage
0021-00	Staff Office	140	100	2	Business	Business
0021-A0	Gen Storage	307	500	1	Storage	Storage
0021-B0	Office	21	100	1	Business	Business
0022-00	Staff Office	154	100	2	Business	Business
0023-00	Staff Office	154	100	2	Business	Business
0024-00	Conf Room	708	100	8	Business	Business
0025-00	Spec Inst Sup	420	100	5	Business	Business
0025-A0	Spec Inst Sup	115	100	2	Business	Business
0025-B0	Office	79	100	1	Business	Business
0025-C0	Spec Inst Sup	400	100	4	Business	Business
0026-00	Admin Use	208	100	3	Business	Business
0027-00	Mech Room	361	100	4	Business	Business

0028-00	Maint Rpr Sp	153	100	2	Business	Business
0028-A0	Gen Storage	68	500	1	Storage	Storage
0029-00	Maint Rpr Sp	424	100	5	Business	Business
0029-A0	Gen Storage	286	500	1	Storage	Storage
C01	Corridor	826	100	9	Business	Business
C02	Corridor	1358	100	14	Business	Business
C03	Corridor	109	100	2	Business	Business
C04	Corridor	575	100	6	Business	Business
C05	Corridor	166	100	2	Business	Business
S01	Stair	57	0	0	Stair	Stair
S02	Stair	239	0	0	Stair	Stair
Total	**Basement**	**16624**		**183**		

Appendix 4

FIRST FLOOR

Room	**Room** Title	**Area**	Occupant Load Factor	**Occupants**	Use	Occupancy
		SF	SF / Person	**Persons**		
0101-00	**UpDiv** Teach Lab	**542**	20	**28**	Teaching Lab	Business
0102-00	**Rest** Room	**108**	100	**2**	Business	Business
0103-00	**Janitor's** Closet	**25**	100	**1**	Business	Business
0104-00	**Faculty** Office	**109**	100	**2**	Business	Business
0105-00	**Faculty** Office	**119**	100	**2**	Business	Business
0106-00	**Admin** Office	**153**	100	**2**	Business	Business
0107-00	**Faculty** Office	**151**	100	**2**	Business	Business
0108-00	**Faculty** Office	**151**	100	**2**	Business	Business
0109-00	**Faculty** Office	**151**	100	**2**	Business	Business
0110-00	**Faculty** Office	**151**	100	**2**	Business	Business
0111-00	**Faculty** Office	**151**	100	**2**	Business	Business
0112-00	**Faculty** Office	**151**	100	**2**	Business	Business
0113-00	**Lecture**	**612**	20	**31**	Classroom	Business
0113-A0	**Faculty** Office	**140**	100	**2**	Business	Business
0113-B0	**Faculty** Office	**145**	100	**2**	Business	Business
0114-00	**UpDiv** Teach Lab	**553**	20	**28**	Teaching Lab	Business
0114-C0	**Staff** Office	**159**	100	**2**	Business	Business

0114-D0	**Staff** Office	**129**	100	**2**	Business	Business
0115-00	**Janitor's** Closet	**26**	100	**1**	Business	Business
0116-00	**Admin** Use	**454**	100	**5**	Business	Business
0116-A0	**Admin** Use	**153**	100	**2**	Business	Business
0118-00	**Janitor's** Closet	**42**	100	**1**	Business	Business
0119-00	**Rest** Room	**272**	100	**3**	Business	Business
0120-00	**Staff** Office	**508**	100	**6**	Business	Business
0121-00	**Support** Office	**217**	100	**3**	Business	Business
0122-A0	**Staff** Office	**148**	100	**2**	Business	Business
0122-B0	**Staff** Office	**148**	100	**2**	Business	Business
0123-00	**Staff** Office	**148**	100	**2**	Business	Business
0124-00	**Admin** Office	**246**	100	**3**	Business	Business
0125-00	**Spec** Instruction	**255**	20	**13**	Classroom	Business
0125-A0	**Spec** Instruction	**121**	20	**7**	Classroom	Business
0125-B0	**Spec** Instruction	**119**	20	**6**	Classroom	Business
0125-C0	**Spec** Instruction	**182**	20	**10**	Classroom	Business
0126-00	**Lecture**	**1,072**	15	**72**	Assembly	Assembly
0126-A0	**Spec** Instruction	**200**	20	**10**	Classroom	Business
0126-B0	**Gen** Storage	**145**	500	**1**	Storage	Storage
0127-00	**UpDiv** Teach Lab	**1,070**	15	**72**	Assembly	Assembly
0128-00	**Rest** Room	**308**	100	**4**	Business	Business
0129-00	**Phone**	**73**	100	**1**	Business	Business
0130-00	**Faculty** Office	**145**	100	**2**	Business	Business
0131-00	**Faculty** Office	**145**	100	**2**	Business	Business

0132-00	**Faculty** Office	**145**	100	**2**	Business	Business
0133-00	**Faculty** Office	**145**	100	**2**	Business	Business
0134-00	**Faculty** Office	**145**	100	**2**	Business	Business
0135-00	**Faculty** Office	**145**	100	**2**	Business	Business
0136-00	**Faculty** Office	**145**	100	**2**	Business	Business
0137-00	**Faculty** Office	**145**	100	**2**	Business	Business
0138-00	**Faculty** Office	**147**	100	**2**	Business	Business
C11	**Corridor**	**734**	100	**8**	Business	Business
C12	**Corridor**	**1481**	100	**15**	Business	Business
C13	**Corridor**	**882**	100	**9**	Business	Business
C14	**Corridor**	**372**	100	**4**	Business	Business
C15	**Corridor**	**806**	100	**9**	Business	Business
S12	**Stair**	**272**	0	**0**	Stair	Stair
S13	**Stair**	**116**	0	**0**	Stair	Stair
Total	**First** Floor	**15577**		**405**		

Appendix 4 **SECOND** FLOOR

Room	**Room** Title	**Area**	Occupant Load Factor	**Occupants**	Use	Occupancy
		SF	SF / Person	**Persons**		
0201-00	**Janitor's** Closet	**42**	100	**1**	Business	Business
0202-00	**Rest** Room	**270**	100	**3**	Business	Business
0203-00	**Lecture**	**682**	20	**35**	Classroom	Business
0204-00	**Lecture**	**682**	20	**35**	Classroom	Business
0205-00	**Lecture**	**533**	20	**27**	Classroom	Business
0206-00	**Lecture**	**1,373**	15	**92**	Assembly	Assembly
0208-00	**Rest** Room	**252**	100	**3**	Business	Business
209	**Janitor's** Closet	**30**	100	**1**	Business	Business
0210-00	**Lecture**	**611**	20	**31**	Classroom	Business
0210-A0	**Lecture** Serv	**103**	100	**2**	Business	Business
0210-B0	**Lecture** Serv	**100**	100	**1**	Business	Business
0211-00	**Gen** Storage	**210**	500	**1**	Storage	Storage
0212-00	**Lecture**	**837**	20	**42**	Classroom	Business
0213-00	**Lecture**	**884**	20	**45**	Classroom	Business
0214-00	**Lecture**	**970**	20	**49**	Classroom	Business
0215-00	**Lecture** Serv	**129**	100	**2**	Business	Business
0215-A0	**Lecture** Serv	**82**	100	**1**	Business	Business
0216-00	**Mech** Room	**216**	100	**3**	Business	Business

C21	**Corridor**	**2682**	100	**27**	Business	Business
C22	**Corridor**	**175**	100	**2**	Business	Business
C23	**Corridor**	**188**	100	**2**	Business	Business
S22	**Stair**	**156**	0	**0**	Stair	Stair
S23	**Stair**	**189**	0	**0**	Stair	Stair
S24	**Stair**	**244**	0	**0**	Stair	Stair
Total	**Second Floor**	**11640**		**405**		

Fire Protection Analysis

Cotchett Education Building

Appendix 5

Email from Rex Wolf

William,
URLs;
http://ssl.afd.calpoly.edu/facs_edelivery_secured/001/Archives/ 002lkOP83E5/
http://ssl.afd.calpoly.edu/facs_edelivery_secured/001/Archives/003_Kioa94kd/
The building was extensively remodeled when the Business building was built. The fire alarm drawing for Business does not appear to have any work in Education. The Education building, built in the 1940's, current fire alarm system was likely modified over the years with internal resources and without much documentation.

User Name: PlanroomWeb (case sensitive)

Password: LvL2DcS! (case sensitive) – Good only this quarter

Try different browsers if connection fails. Internet Explorer is not recommended at this time.

Firefox is fine for download but do not use their new internal pdf viewer; It has no pdf layer or bookmark functionality.

Do not open large PDF files with your browser! Save to your computer.

These documents are Classification Level 2: Internal Use Only. By being granted access you are expected to be familiar with proper handling.

Information Classification and Handling Standard

Also simple floor plans in PDF & CAD are unsecured here;
http://afd.calpoly.edu/facilities/maps.asp?pid=7

Attached are our current Fire Protection Plans for that building in AutoCAD.

…Rex

Rex Wolf, Architect
Plan Room Coordinator
Facilities
California Polytechnic State University
San Luis Obispo

-----Original Message-----
From: William Beasland [mailto:wbeaslan@calpoly.edu]
Sent: Tuesday, May 14, 2013 6:29 PM
To: Cal Poly Maps
Subject: Fwd: Planroom Access

I am a student in the Fire Protection Engineering Master's Degree program.

I am using the Cotchett Education Building as my project building and will be needing access to fire alarm plans and specifications for use in the project this quarter and additional plans and specifications in future quarters.

Thank you for your help.

Sincerely,

William J. Beasland

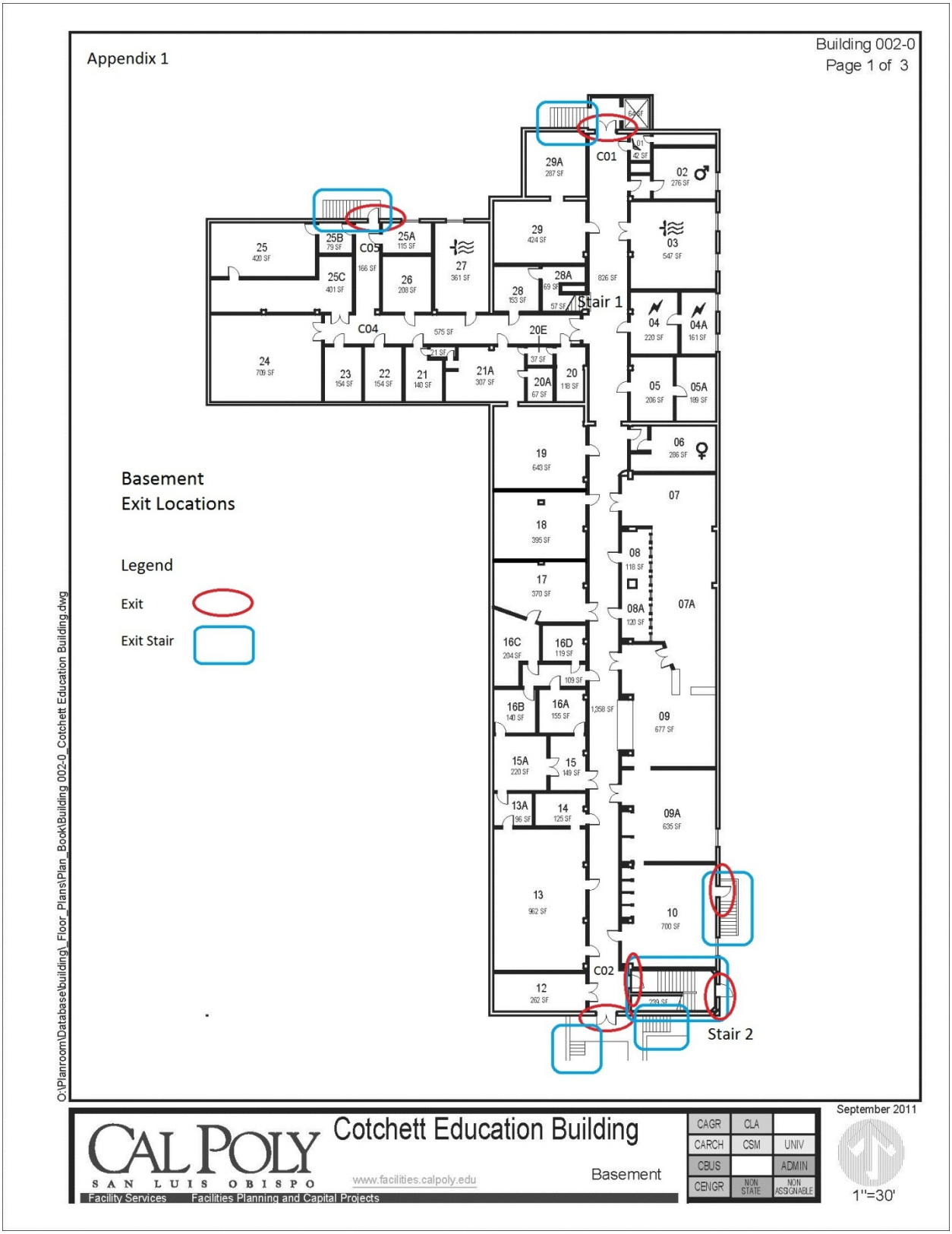
865-621-9072

Fire Protection Analysis

Cotchett Education Building

Appendix 6

Exit Locations


Appendix 1
Building 002-0
Page 1 of 3
Basement
Exit Locations
Legend
Exit
Exit Stair
Stair 1
Stair 2
C01
C02
C04
C05
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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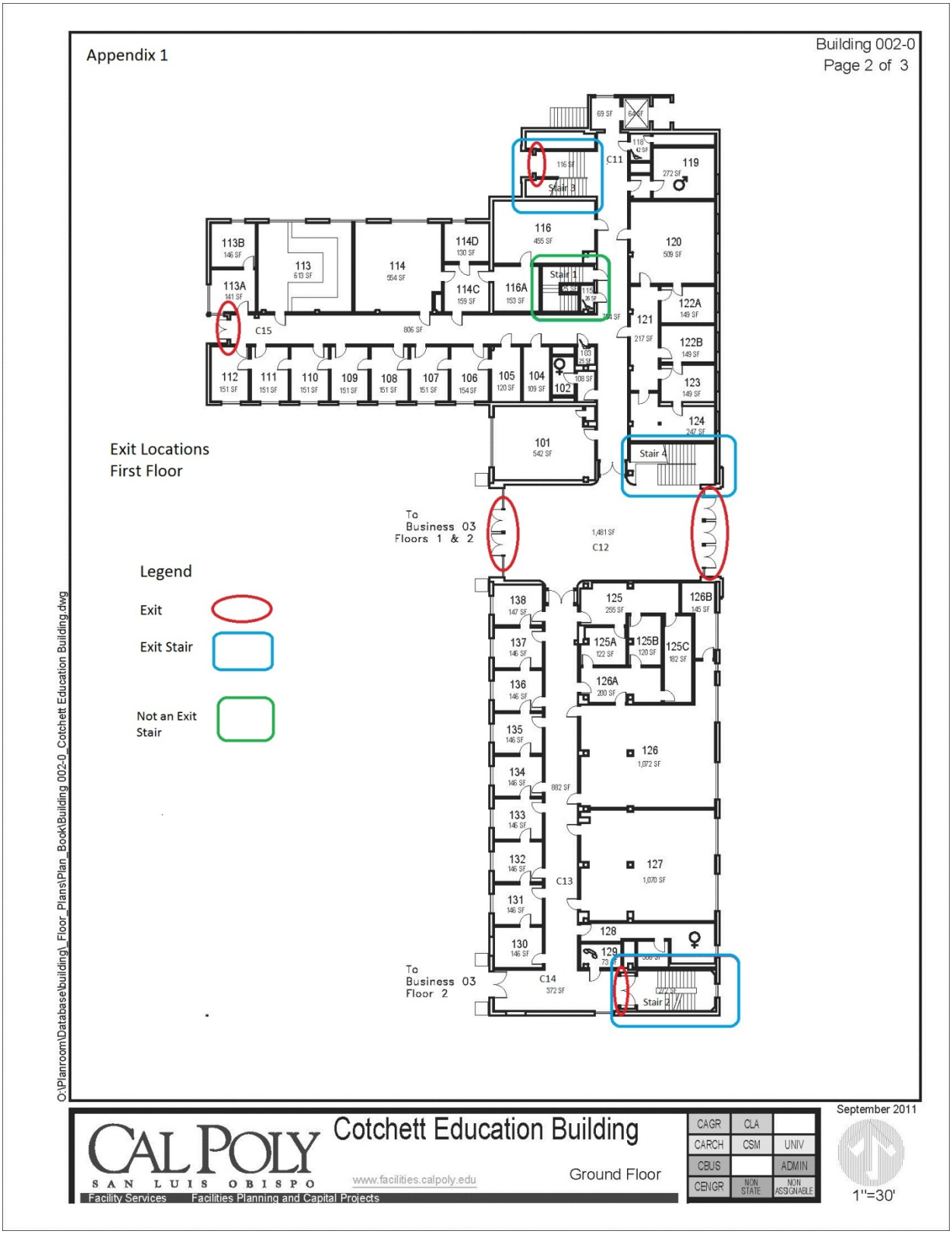
Cotchett Education Building
Basement
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'


Appendix 1
Building 002-0
Page 2 of 3
Exit Locations
First Floor
Legend
Exit
Exit Stair
Not an Exit
Stair
To
Business 03
Floors 1 & 2
To
Business 03
Floor 2
Stair 1
Stair 2
Stair 3
Stair 4
C11
C12
C13
C14
C15
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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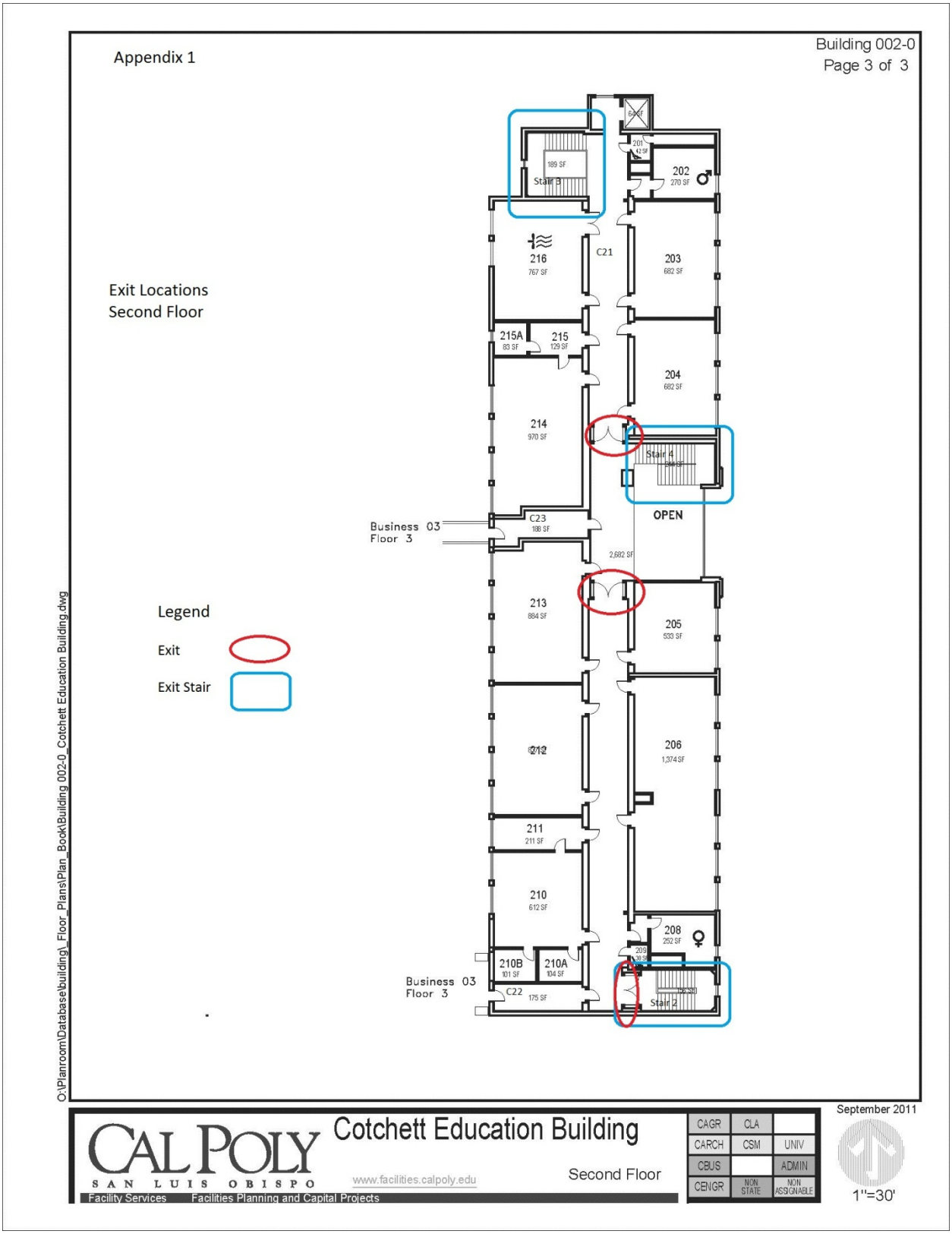
Ground Floor
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'


Appendix 1
Building 002-0
Page 3 of 3
Exit Locations
Second Floor
Legend
Exit
Exit Stair
Business 03
Floor 3
Business 03
Floor 3
OPEN
Stair 3
Stair 4
Stair 2
216
767 SF
215A
83 SF
215
129 SF
214
970 SF
213
884 SF
212
211
211 SF
210
612 SF
210B
101 SF
210A
104 SF
C22
175 SF
C23
188 SF
C21
189 SF
201
42 SF
202
270 SF
203
682 SF
204
682 SF
205
533 SF
206
1,374 SF
208
252 SF
2,682 SF
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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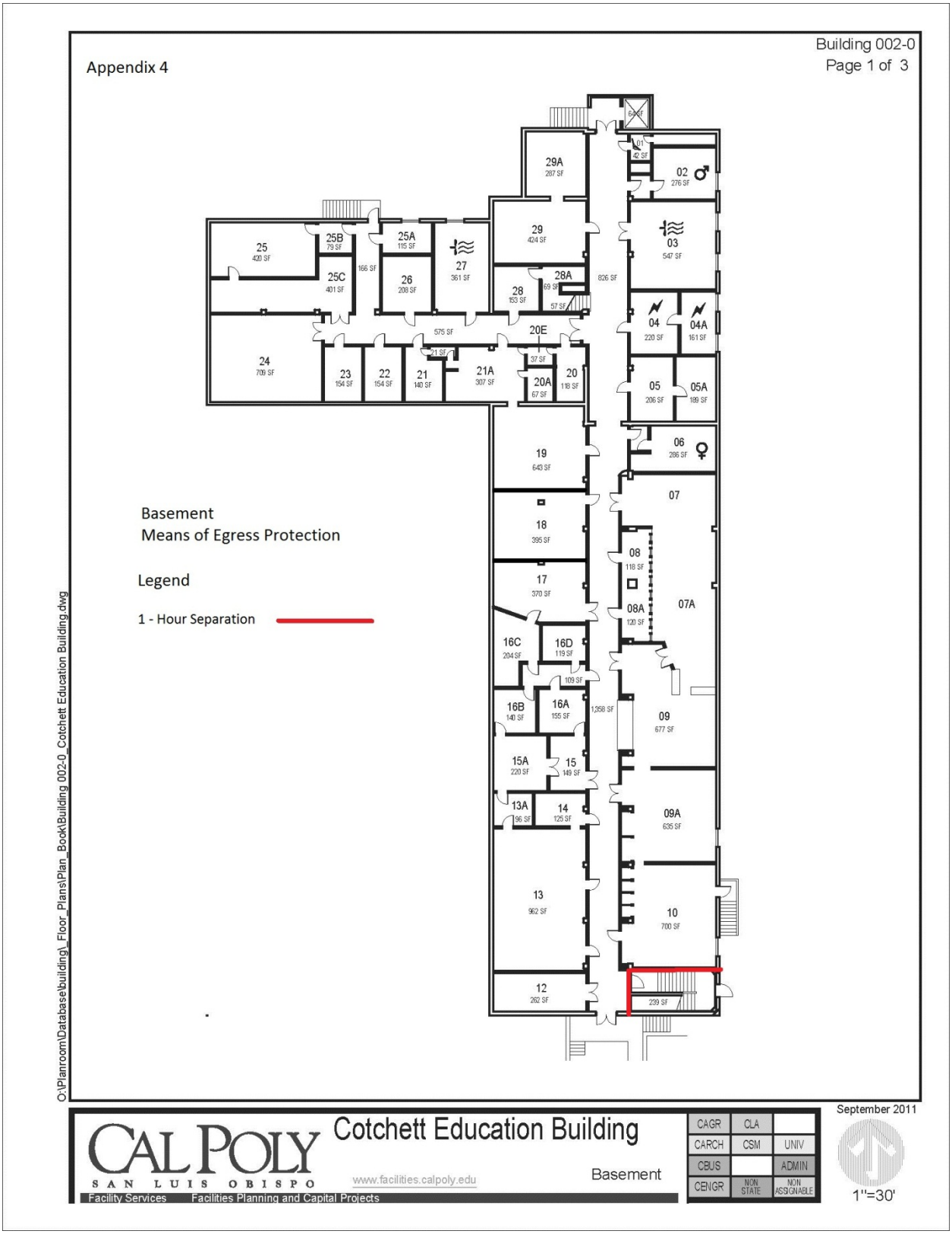
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'

Fire Protection Analysis

Cotchett Education Building

Appendix 7

Means of Egress Protection


Appendix 4
Building 002-0
Page 1 of 3
Basement
Means of Egress Protection
Legend
1 - Hour Separation
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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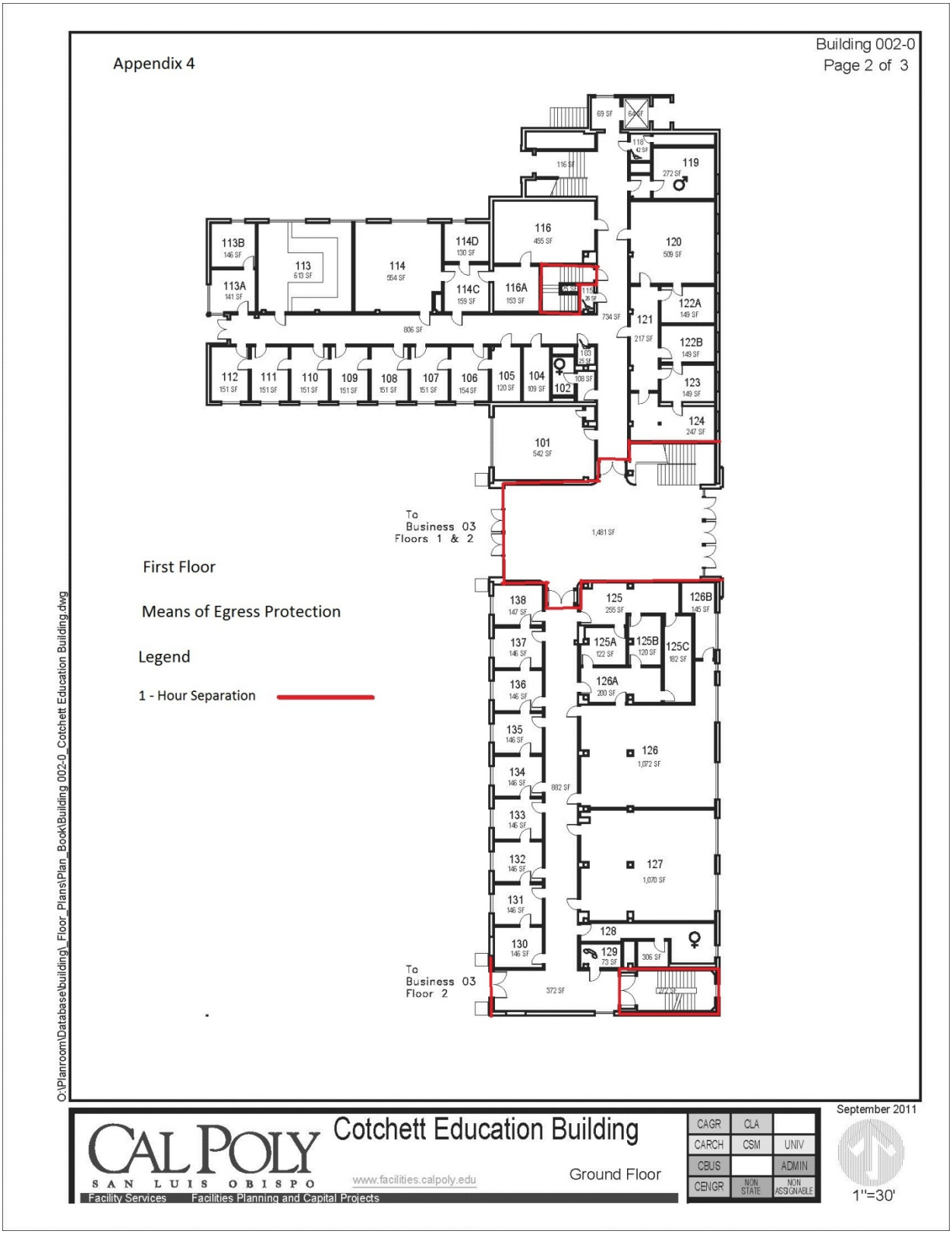
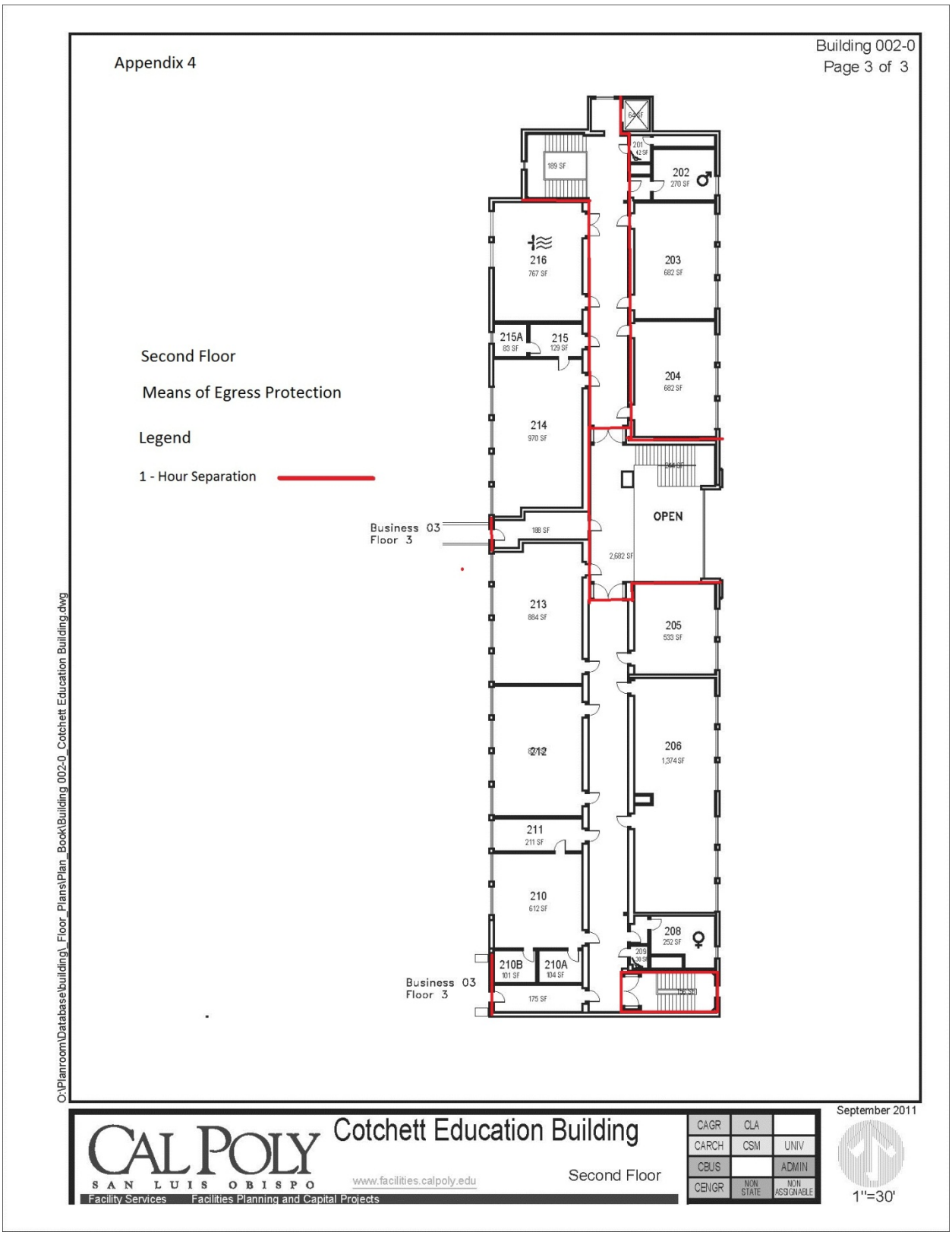
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'


Appendix 4
Building 002-0
Page 2 of 3
First Floor
Means of Egress Protection
Legend
1 - Hour Separation
To Business 03 Floors 1 & 2
To Business 03 Floor 2
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
CAL POLY
SAN LUIS OBISPO
Facility Services
Facilities Planning and Capital Projects
www.facilities.calpoly.edu
Cotchett Education Building
Ground Floor
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'


Appendix 4
Building 002-0
Page 3 of 3
Second Floor
Means of Egress Protection
Legend
1 - Hour Separation
Business 03
Floor 3
Business 03
Floor 3
OPEN
2,682 SF
216
767 SF
215A
83 SF
215
129 SF
214
970 SF
213
884 SF
212
211
211 SF
210
612 SF
210B
101 SF
210A
104 SF
175 SF
202
270 SF
203
682 SF
204
682 SF
205
533 SF
206
1,374 SF
208
252 SF
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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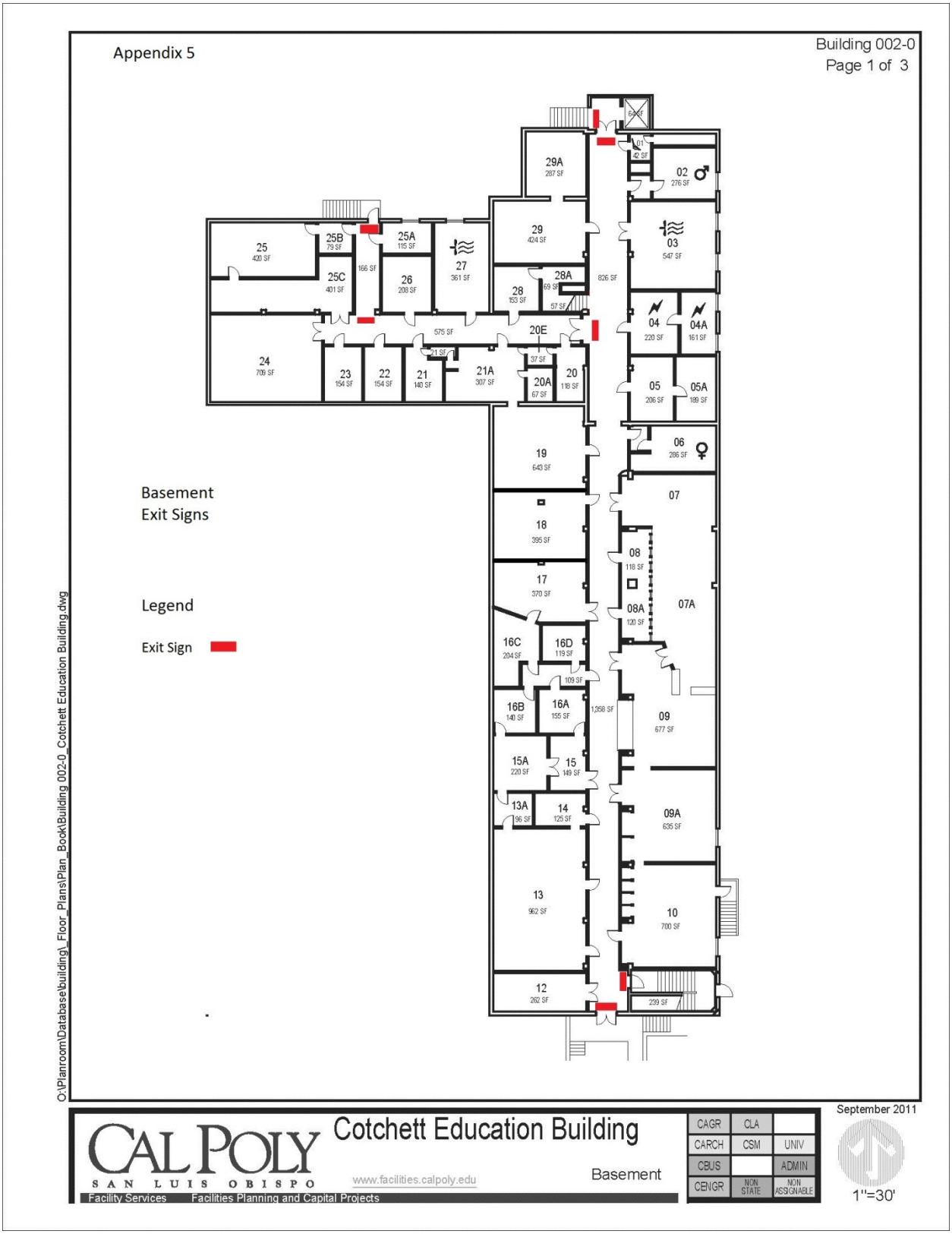
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'

Fire Protection Analysis

Cotchett Education Building

Appendix 8

Exit Signs


Appendix 5
Building 002-0
Page 1 of 3
Basement
Exit Signs
Legend
Exit Sign
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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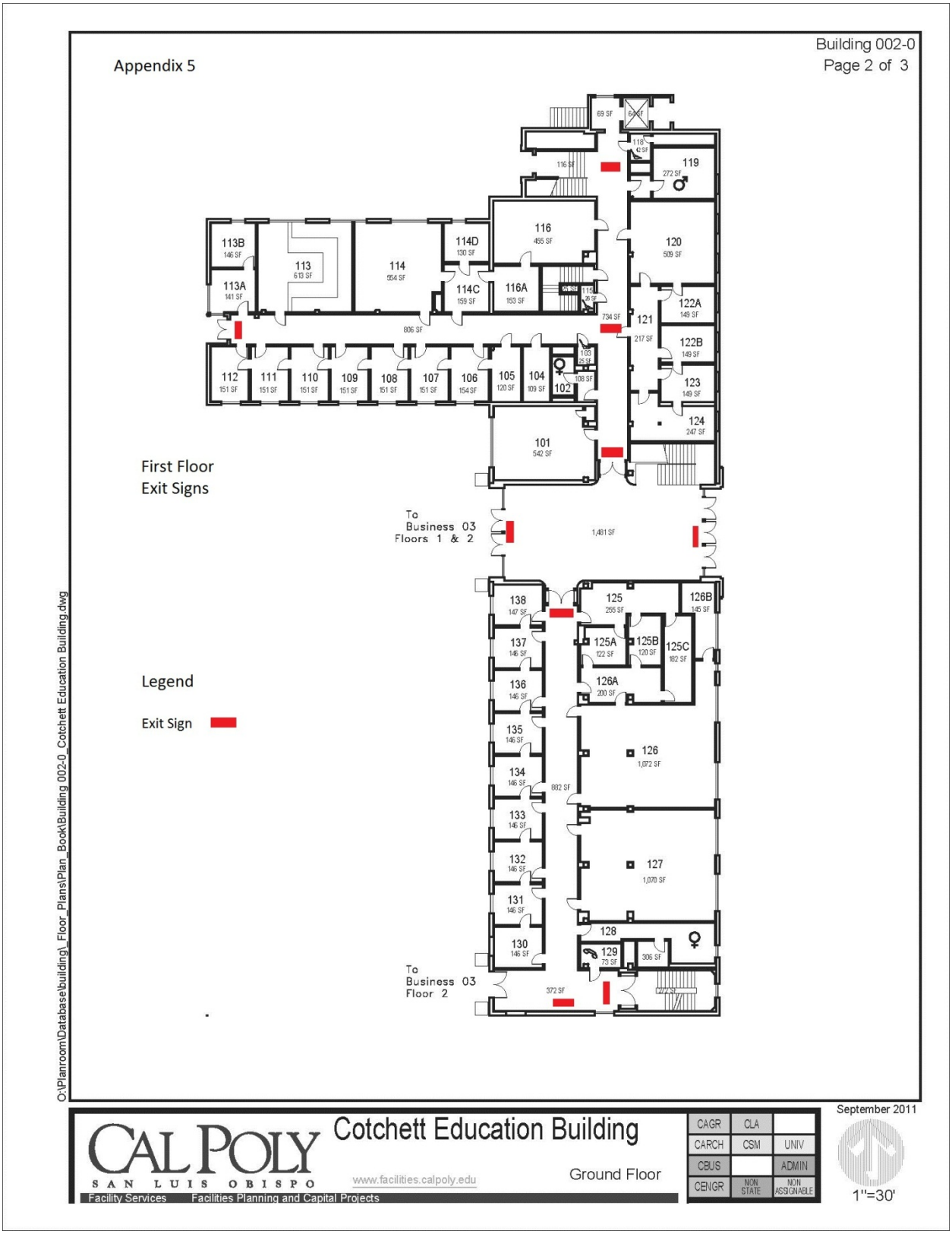
Basement
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'


Appendix 5
Building 002-0
Page 2 of 3
First Floor
Exit Signs
Legend
Exit Sign
To
Business 03
Floors 1 & 2
To
Business 03
Floor 2
O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg
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Cotchett Education Building
Ground Floor
CAGR
CLA
CARCH
CSM
UNIV
CBUS
ADMIN
CENGR
NON STATE
NON ASSIGNABLE
September 2011
1"=30'

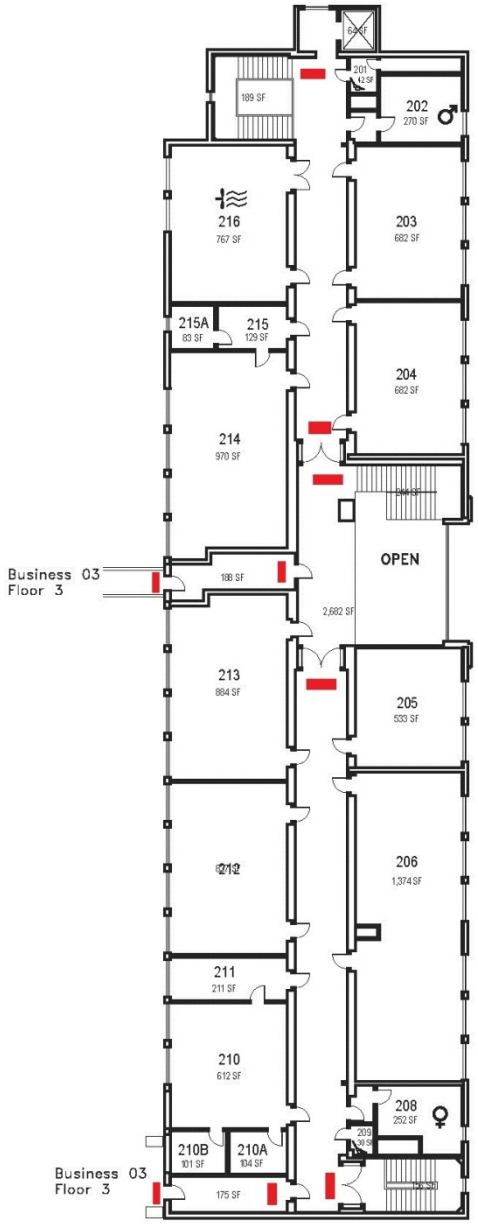
Appendix 5

Building 002-0
Page 3 of 3

Second Floor
Exit Signs

Legend

Exit Sign



O:\Planroom\Database\building_Floor_Plans\Plan_Book\Building 002-0_Cotchett Education Building.dwg

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Second Floor

CAGR	CLA	
CARCH	CSM	UNIV
CBUS		ADMIN
CENGR	NON STATE	NON ASSIGNABLE

September 2011

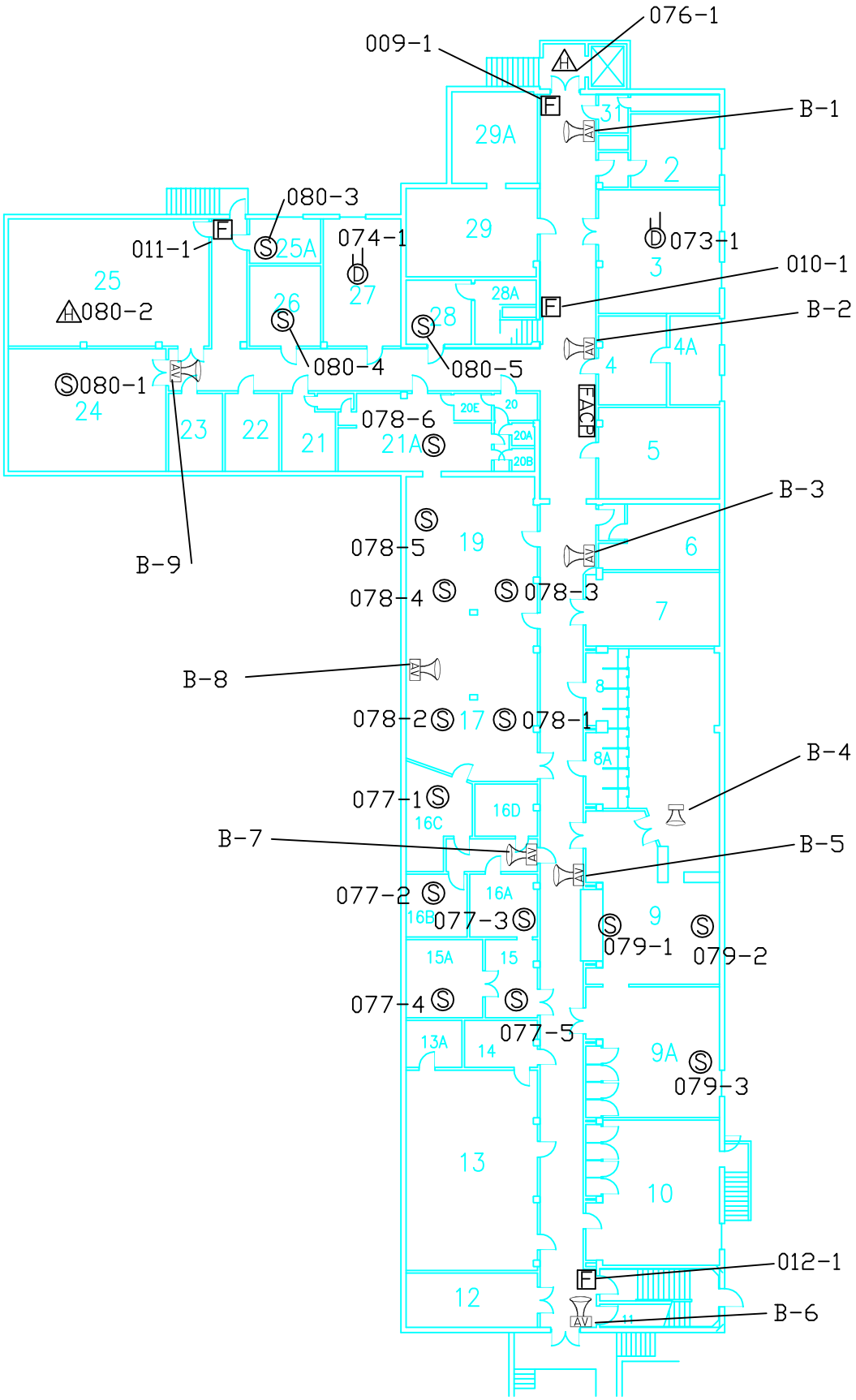
1"=30'

Fire Protection Analysis

Cotchett Education Building

Appendix 9

Fire Alarm Plans



CAL POLY
COMMUNICATIONS SERVICES

EDUCATION BUILDING (02)

Basement

Panel # 0002

DATE	REVISED BY	FILENAME	NOTES	SCALE
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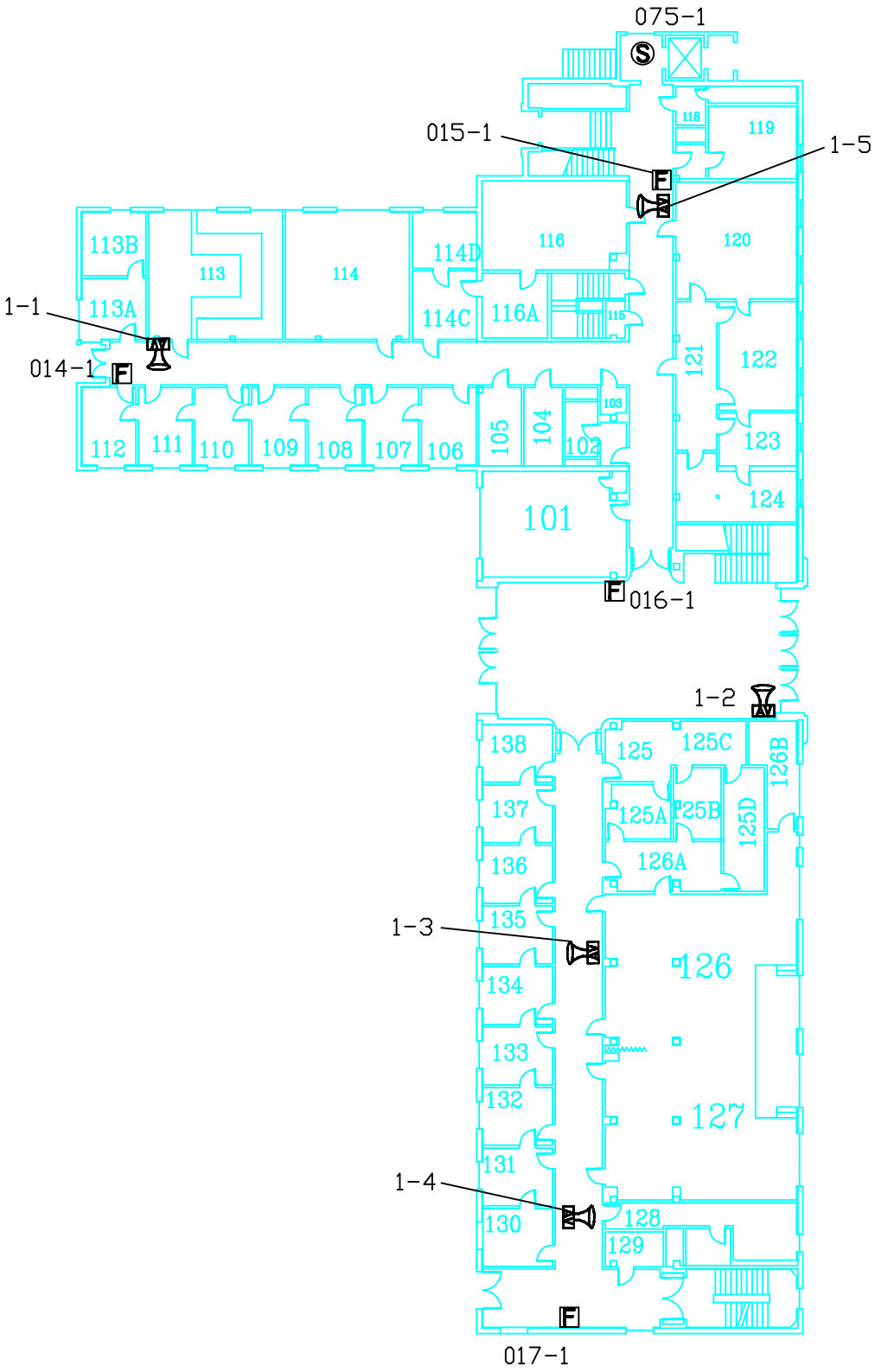
N NORTH



CAL POLY
COMMUNICATIONS SERVICES

EDUCATION BUILDING (02)

First Floor

Panel # 0002

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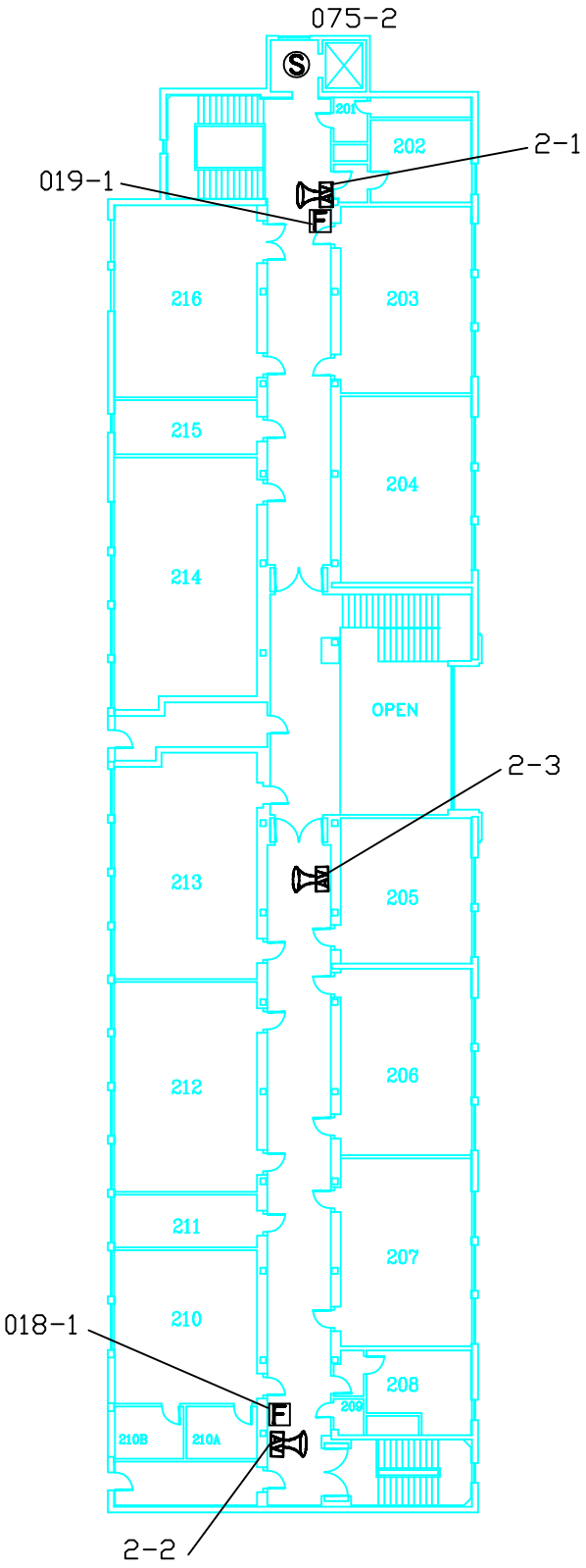
NORTH



CAL POLY
COMMUNICATIONS SERVICES

EDUCATION BUILDING (02)

Second Floor

Panel # 0002

DATE	REVISED BY	FILENAME	NOTES	SCALE
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N
NORTH

Fire Protection Analysis

Cotchett Education Building

Appendix 10

Business Building Fire Alarm Cover Sheet

BUSINESS ADMINISTRATION & EDUCATION BLDG.
CAL POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CALIFORNIA

FIRE ALARM SUPPLIER
SIMPLEX
446 SOUTH HILLVIEW DRIVE
MILPITAS, CALIFORNIA 95035

ELECTRICAL CONTRACTOR
JEPPESEN ELECTRIC
10333 EL CAMINO REAL
ATASCADERO, CALIFORNIA 93423

LEGEND

- FIRE ALARM CONTROL PANEL
  MODEL #4002-8001
  C.S.F.M. #7165-026:154
- (SD) PHOTOELECTRIC SMOKE DETECTOR
  MODEL #2098-9201
  C.S.F.M. #7257-026:132 W/
  2-WIRE BASE
  MODEL #2098-9637
  C.S.F.M. #7257-026:143
  (F) DENOTES DETECTOR W/RELAY
  MODEL #2098-9737
  C.S.F.M. #7300-026:013
- [F] MANUAL PULL STATION
  MODEL #2099-9201
  C.S.F.M. #7150-026:011
- [DD] DUCT DETECTOR
  MODEL #2098-9649
  C.S.F.M. #3240-026:159
- [F] A/V UNIT
  MODEL #4903-9101
  C.S.F.M. #7300-026:115 W/
  SURFACE HORN
  MODEL #2901-9838
  C.S.F.M. #7135-026:139
- [H] 120VAC DOOR HOLDER
  MODEL #2088-9560
  C.S.F.M. #3550-047:1
- [H] DOOR HOLDER
  MODEL #2088-9554
  C.S.F.M. #3550-047:1
- [TS] TAMPER SWITCH
  PROVIDED BY OTHERS
- [FS] FLOWSWITCH
  PROVIDED BY OTHERS

GENERAL NOTES:

1. ALL REQUIREMENTS OF CONTRACT SPECIFICATIONS AND DRAWINGS APPLY.
2. INSTALLATION SHALL CONFORM TO REQUIREMENTS OF APPLICABLE ELECTRICAL CODES.
3. WIRING METHODS AND MATERIALS SHALL CONFORM WITH ALL APPLICABLE SECTIONS OF NEC ARTICLE 760.
4. SEE SIMPLEX 4002 FIELD WIRING SPECIFICATIONS (574-009) FOR ADDITIONAL INSTALLATION REQUIREMENTS.
5. 120VAC 60HZ INPUT POWER FOR FIRE ALARM CONTROLS SHALL BE A DEDICATED, LOCKING BREAKER PROPERLY LABELED, "SOURCE FROM LINE SIDE OF MAIN DISCONNECT" OR "EMERGENCY POWER".
6. ALL WIRING, INCLUDING SHIELDS, MUST BE DRY AND FREE OF SHORTS AND GROUNDS.
7. PROVIDE SIMPLEX WITH ONE COPY OF "AS BUILT" DRAWINGS SO ACCURATE DOCUMENTATION CAN BE MAINTAINED.
8. 120VAC IS NOT PERMITTED IN SAME CONDUIT WITH LOW VOLTAGE WIRING.
9. DO NOT APPLY POWER EXCEPT IN THE PRESENCE OF A FACTORY-TRAINED SIMPLEX TECHNICAL REPRESENTATIVE.
10. ANY SMOKE DETECTOR HEAD INSTALLED BEFORE BUILDING IS CLEANED AND ACCEPTED SHALL BE COVERED TO PROTECT FROM DUST. ANY FALSE ALARMS DUE TO DIRT CONTAMINATED HEADS SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
11. THERE WILL BE NO CONDUIT ENTRY ALLOWED 18" OR LOWER ON THE SIDE PANELS OR THROUGH THE BOTTOM OF ALL CONTROL EQUIPMENT BACKBOXES.

BATTERY CALCULATIONS

SUPERVISORY CURRENT OF FACP	.32
SUPERVISORY CURRENT OF PERIPHERALS	+ 0
TOTAL SUPERVISORY CURRENT OF SYSTEM	= .32
HOURS OF EMERGENCY STANDBY POWER REQUIRED	x 24
TOTAL AMP HOURS STANDBY POWER REQUIRED	= 7.68
ALARM CURRENT OF FACP	.557
ALARM CURRENT OF PERIPHERALS	+ 2.82
TOTAL ALARM CURRENT OF SYSTEM	= 3.38
TOTAL HOURS EMERGENCY ALARM POWER REQUIRED	x .083
TOTAL AMP HOURS ALARM POWER REQUIRED	= .28
TOTAL AMP HOURS BATTERY BACKUP REQUIRED	= 7.96

10.0 AH BATTERIES ARE PROVIDED

OPERATIONAL MATRIX

	ANNUNCIATE ALARM CONDITION AT FIRE ALARM CONTROL PANEL.	ACTIVATE HORNS & STROBES THROUGHOUT BUILDING.	ACTIVATE SUPERVISORY ALARM AT FIRE ALARM CONTROL PANEL.	ANNUNCIATE TROUBLE CONDITION AT FIRE ALARM CONTROL PANEL.	RELEASE DOOR HOLDERS THROUGHOUT BUILDING.	SHUT DOWN ASSOCIATED FAN UNIT.	SEND ALARM SIGNAL TO CENTRAL STATION.	SEND TROUBLE SIGNAL TO CENTRAL STATION.
MANUAL PULL STATION	O	O			O		O	
SMOKE DETECTOR	O	O			O		O	
DUCT DETECTOR	O	O				O		
FLOW SWITCH	O	O			O			
TAMPER SWITCH			O	O				O
SYSTEM TROUBLE				O				O

ZONE SCHEDULE

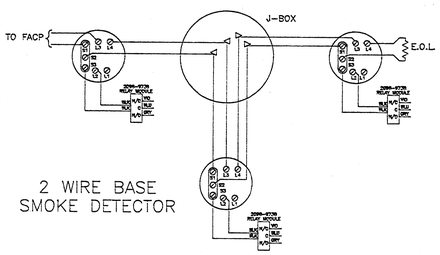
ZONE 1	MANUAL PULL STATION – GROUND FLOOR
ZONE 2	MANUAL PULL STATION – FIRST FLOOR
ZONE 3	SMOKE DETECTOR – FIRST FLOOR
ZONE 4	MANUAL PULL STATION – SECOND FLOOR
ZONE 5	SMOKE DETECTOR – SECOND FLOOR
ZONE 6	MANUAL PULL STATION – THIRD FLOOR
ZONE 7	SMOKE DETECTOR – THIRD FLOOR
ZONE 8	MANUAL PULL STATION – LECTURE HALL
ZONE 9	DUCT DETECTOR – AH-1
ZONE 10	DUCT DETECTOR – AH-2
ZONE 11	DUCT DETECTOR – AH-3
ZONE 12	DUCT DETECTOR – AH-4
ZONE 13	DUCT DETECTOR – AH-5
ZONE 14	DUCT DETECTOR – AH-6
ZONE 15	TAMPER SWITCH
ZONE 16	WATERFLOW SWITCH
ZONE 17	SPARE
ZONE 18	SPARE
ZONE 19	SPARE
ZONE 20	SPARE
ZONE 21	SPARE
ZONE 22	SPARE
ZONE 23	SPARE
ZONE 24	SPARE

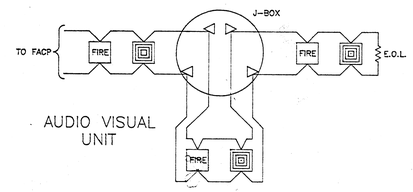
WIRE SCHEDULE

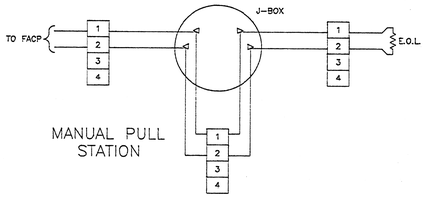
- A – ONE PAIR #14AWG SOLID COPPER FOR INITIATING CIRCUITS
- B – ONE PAIR #14AWG SOLID COPPER INDICATING CIRCUITS
- C – ONE PAIR #14AWG ~~14~~ 12 SOLID COPPER FOR DOOR HOLDERS
- D – ONE PAIR #14AWG ~~14~~ 12 SOLID COPPER FOR ELEVATOR RECALL

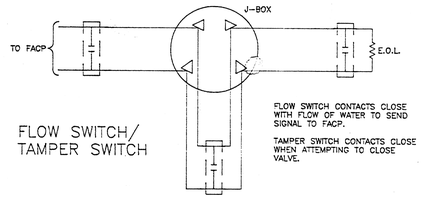
See Sched on plans

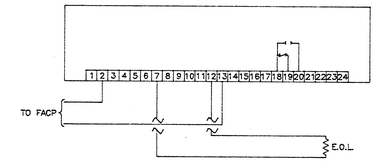
TYPICAL WIRING DETAILS

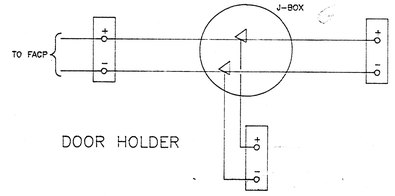












SIGNALING CIRCUIT VOLTAGE DROP CALCULATIONS

CAL POLY SIG CKT #2

DEV. DWG. LABEL / DEVICE #	1st	2nd	3rd	4th	5th	6th	7th	8th
GAUGE WIRE	14.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000
DISTANCE (FT)	418.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AMPS @ DEV	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
RUNNING AMPS	1.3600	0.0000	0.0800	0.1600	0.2400	0.3200	0.4000	0.4800
VOLT. DROP	2.9876	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

TOTAL CKT V.D.= 2.988
CKT VOLTAGE= 24.000
% VOLTAGE DROP= 12.4485

WIRE SIZE	RESIS. /M FT.	CIRC. MILS.
10.000		10380
12.000	1.590	6530
14.000	2.520	4110
16.000	4.020	2580
18.000	6.390	1620
20.000	10.100	1020
22.000	16.200	640

A.J. DIANI CONSTRUCTION CO., INC.
☐ RESUBMITTAL NOT REQUIRED ☑ APPROVED ☐ APPROVED AS NOTED ☐ RESUBMITTAL REQ'D ☐ REJECTED
This submittal has been reviewed for compliance with the contract documents. Approval does not relieve fine Subcontractor/Supplier of the responsibility for conformance to the quality standards as set forth in the contract documents nor does it relieve his responsibility for verification of all conditions relating to this contract.
CK'D DATE 8-29-91
SUBMITTAL NO. 16771-0203-004

RECEIVED
SEP 03 1991
SILVERMAN & LIGHT

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

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AUG 29 1991
B.F.G.C. - S.L.O.

Reviewed by:

RISER

REVISIONS

SIMPLEX
446 S. HILLVIEW DR
MILPITAS, CA 95035
(408) 945-9756
(415) 345-4515

COVER SHEET

BUSINESS ADMINISTRATION & EDUCATION BUILDING
CAL POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CALIFORNIA

Date 07-24-91
Scale NTS
Drawn MME
Job CAL POLY BUS.
Sheet FA-1 of 7 Sheets

Fire Protection Analysis

Cotchett Education Building

Appendix 11

Fire Alarm Equipment

2098-9201, -9203, & -9208 Photoelectric Detectors, 2098-9202 Photo w/Heat Detector, and 2098-9576 Ionization Detector Installation Instructions

GENERAL INFORMATION

Before installing there detectors, make a survey of the area to be covered in accordance with information provided in NFPA 72 E, Sections 4-1 through 4-6 (an overview of which is provided below). For specific applications, refer to Simplex publication "Common Code Requirements For Fire Alarm Systems" — Publication No. FA2-91-010. For additional information, refer to NFPA 72 E and the NEMA Guide For Proper Use of System Smoke Detectors.

SPECIAL CONSIDERATIONS

- Is there human occupancy?
- Contents to be protected.
- Type of construction and use.
- Burning characteristics of contents.
- Air movement - stratification.
- Deflections and obstructions.
- Height of ceilings.
- Surface conditions of ceilings.
- Type of ceiling construction.
- Total area.
- Vent locations - velocities - dilution.

APPLICATIONS

Each detector is capable of providing from 450 to 900 square feet (42 to 84 square meters) of coverage, depending on:

1. Requirements of local codes.
2. Results of engineering evaluation.
3. Physical characteristics of protected area.

   Examples:

   a. Smooth, flat ceiling
      - Detectors may be spaced 30 feet (9 meters) apart.

   b. Ceiling divided by beams of more than 18 in. (46 cm) depth
      - At least one detector will be required in the space between every two beam.

   c. Ceiling divided by beams of more than 8 in. (20 cm) but less than 18 in. (46 cm) depth
      - Reduce the coverage area for each detector, and mount the detector to the bottom of the beams.

Important

Smoke must enter the chamber of the detector. Thus, air flow, air stratification, air velocity, air stagnation, and air migration will affect detector efficiency. Therefore:

- Do not install detectors in areas where temperatures are likely to exceed 100°F (38°C) or fall below 32°F (0°C).
- Do not install detectors on a ceiling within 4 inches (10 cm) of a wall.
- Do not install detectors where forced air ventilation may dilute the smoke before it reaches the detector.
- Do not install detectors in areas where smoke is normally present (kitchens, furnace rooms, laundry rooms, loading docks, rooms with fireplaces, rooms with candles, soldering rooms, etc.).

Suffix "C" following an 8-digit Product ID number denotes ULC-listed product.

PER-21-007 (575-285)
Ed 2 93

- Do not install detectors in areas where there is likely to be steam (in hospital patient rooms with vaporizers, near shower rooms, above large sinks, etc.).
- Do not install detectors above ashtrays in elevator lobbies.
- Wall-mounted detectors should be located 4 to 12 inches (10-30.5 cm) from the ceiling to detector head.
- Protect all detector heads during construction to avoid infiltration of construction debris!

MAINTENANCE

The minimal requirement for detector maintenance should consist of cleaning surface dust by using a vacuum cleaner. Cleaning programs should comply with NFPA and local environments. Cleaning of the internal chamber should be done by Simplex technical representative only.

TEST EQUIPMENT AVAILABLE

2098-9822 (553-394) Extendable Smoke Generator
2098-9809 (553-533) Sensitivity Tester
2098-9814 (553-536) Test and Removal Tool (for use with 2098-9201, -9202, -9203, & -9576)
2098-9815 (553-553) Test and Removal Tool Holder (for use with 553-536 & 553-574)
(553-574) Test and Removal Tool (for use with 2098-9208)

TESTING

Before testing, disconnect city, release devices, and extinguish systems. Notify all appropriate personnel of test. The preferred test is with smoke using a 553-394 Extendable Smoke Generator. If this method is not acceptable or practical, a functional test can be performed by using a Test and Removal Tool. To test the detector, place the test tool around the detector body. This will alarm the detector. To clear the detector, remove the test tool and reset the fire alarm panel.

TABLE 1

SPECIFICATIONS	SMOKE DETECTOR DATA				
Detector	2098-9576	2098-9201	2098-9202	2098-9203	†2098-9208
Type of Detector	Ionization	Photoelectric	Photoelectric with Heat	Photoelectric	Photoelectric
Working Voltage (2-Wire)	15-36.3 VDC	15-36.3 VDC	15-36.3 VDC	15-36.3 VDC	15-32 VDC
Rated Voltage (4-Wire)	17.7-33.0 VDC	17.7-33.0 VDC	17.7-33.0 VDC	17.7-33.0 VDC	17.7-33.0 VDC
Voltage Waveform	Filtered DC * 18V Ripple Max.	Filtered DC * 18V Ripple Max.	Filtered DC * 18V Ripple Max.	Filtered DC * 18V Ripple Max.	Filtered DC † 18V Ripple Max.
Max. Alarm Current	86 mA	86 mA	86 mA	86 mA	86 mA
Surge Current	200 uA	200 uA	200 uA	200 uA	200 uA
Standby Current	40 uA	40 uA	40 uA	40 uA	50 uA
Heat Element Rating	N/A	N/A	135 Degrees F	N/A	N/A
** Compatibility Identifier	2098-9576	2098-9201	2098-9202	2098-9203	2098-9208
Test Procedure	Magnet or 553-536	Magnet or 553-536	Magnet or 553-536	Magnet or 553-536	Magnet or 553-574
Max. Qty. Per Initiating Circuit	See Table 4	See Table 4	See Table 4	See Table 4	See Table 4

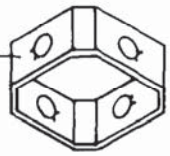
† **CAUTION:** Do not use the 2098-9208 detector with the 2098-9734 power pack. The 2098-9208 does not operate from a full wave, rectified (unfiltered) DC power source.

* When using 2098-9536 four-wire base, full wave, rectified DC can be used.

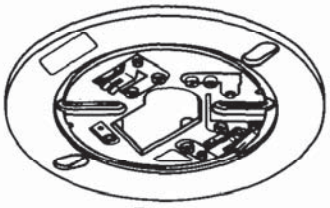
** Compatibility identifier is the PID (model number) found on the panel or module and detector base.

TABLE 2

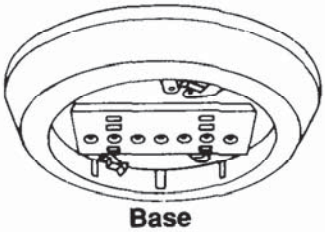
BASE	BOX MOUNTING		
	3 1/2" OCTAGONAL	4" OCTAGONAL	4" SQUARE
2098-9211	Yes	Yes	Yes
2098-9637	Yes	Yes	Yes
2098-9536	Yes	Yes	No



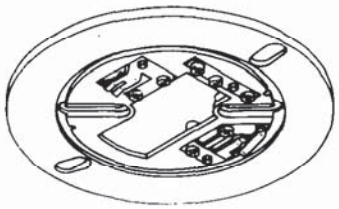
4" (10.16 CM) Octagonal Outlet Box Not Furnished by Simplex Wire per NEC Article 370



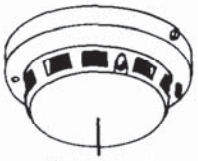
Base 2098-9211



Base 2098-9536

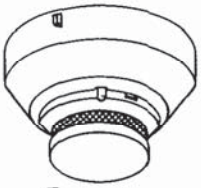


2098-9637 Base



Detector 2098-9201, 2098-9203, OR 2098-9576

Detector 2098-9202



Detector 2098-9208

TABLE 3

INITIATING CIRCUITS OR PANEL PID (MODEL NO.)
2120-7012
2120-7013
2120-7014
2120-7015
2120-7019
2120-7023
2120-7024
2120-7031
2120-7032
2120-7033
4002-5001
4002-5002
4002-5003
4002-5004
4020-0305
4020-7003
4100-5001
4100-5002
4100-5011
4100-5012

TABLE 4

DETECTOR HEADS	COMPATIBLE 2-W BASE	MAX. QTY. OF BASES PER INITIATING CIRCUIT
2098-9201, 2098-9202, 2098-9203, 2098-9208, or 2098-9576	2098-9211 — or —	30 (SeeTable 3 and Note 5)
	2098-9211 with 2098-9738 or 2098-9827	1 (See Note 1)
	2098-9637 — or —	30 (SeeTable 3 and Note 5)
	2098-9637 with 2098-9738 or 2098-9827	1 (See Note 1)

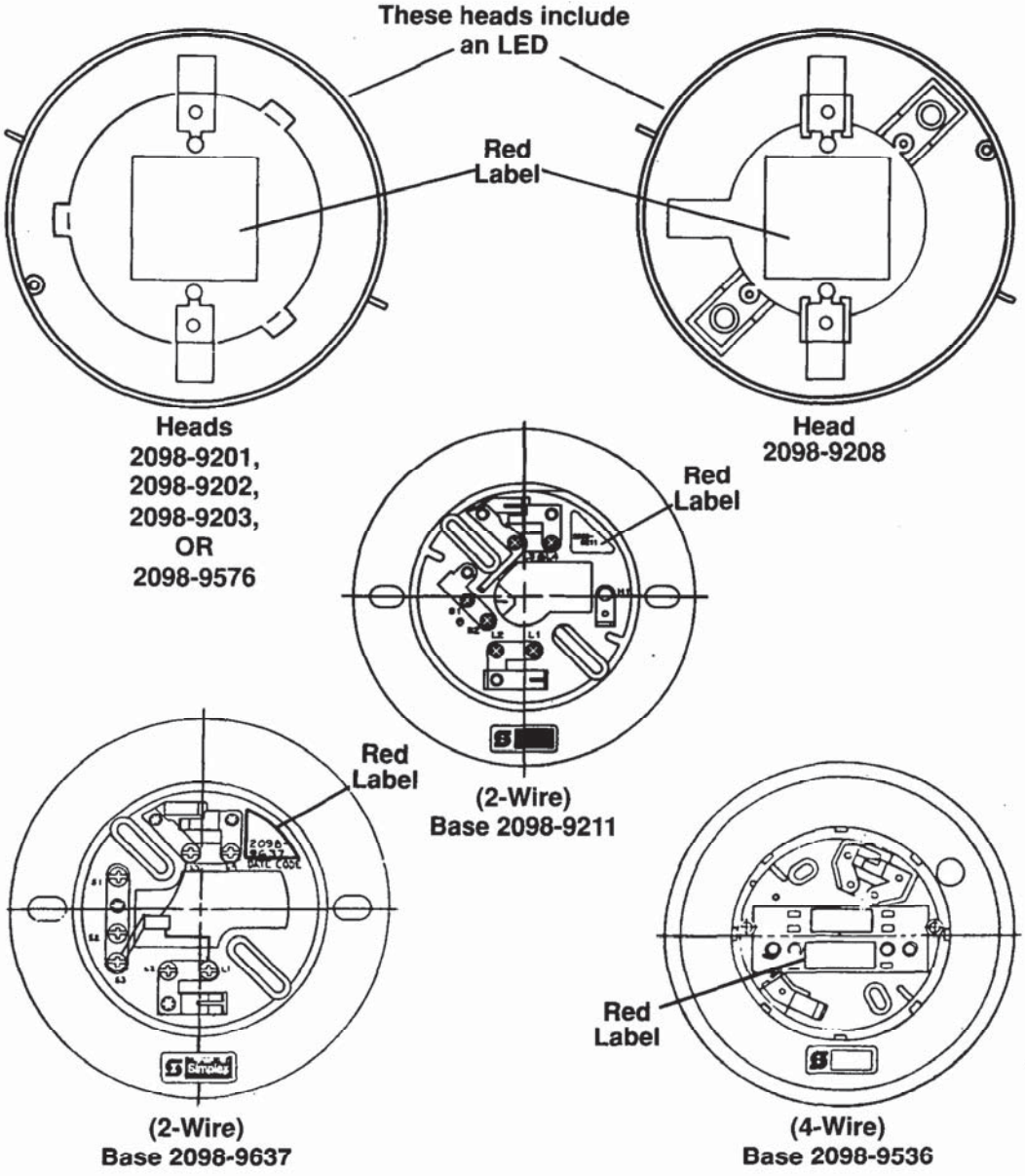
Notes

1. Relay operation cannot be guaranteed unless it is the only device on that zone.
2. Panel compatibility identification marker is the model number of the module or panel.
3. Detector compatibility identification marker is the model number found on the detector label.
4. For detailed interconnection data, see wiring diagrams in Document 841-687.
5. Exceptions for the maximum quantity of 30 bases per initiating circuit are as follows:

Initiating Circuit	Qty. of Bases
2120-0523	20
2120-0527	20
2120-7011	18
2120-7022	18
2120-7805	25
2120-7806	25
4001-9403	18
4001-9404	18
4001-9813	18

WARNING

Red-labeled detector heads MUST only be used with red-labeled bases. Use in any other base will result in a non-functioning detector.

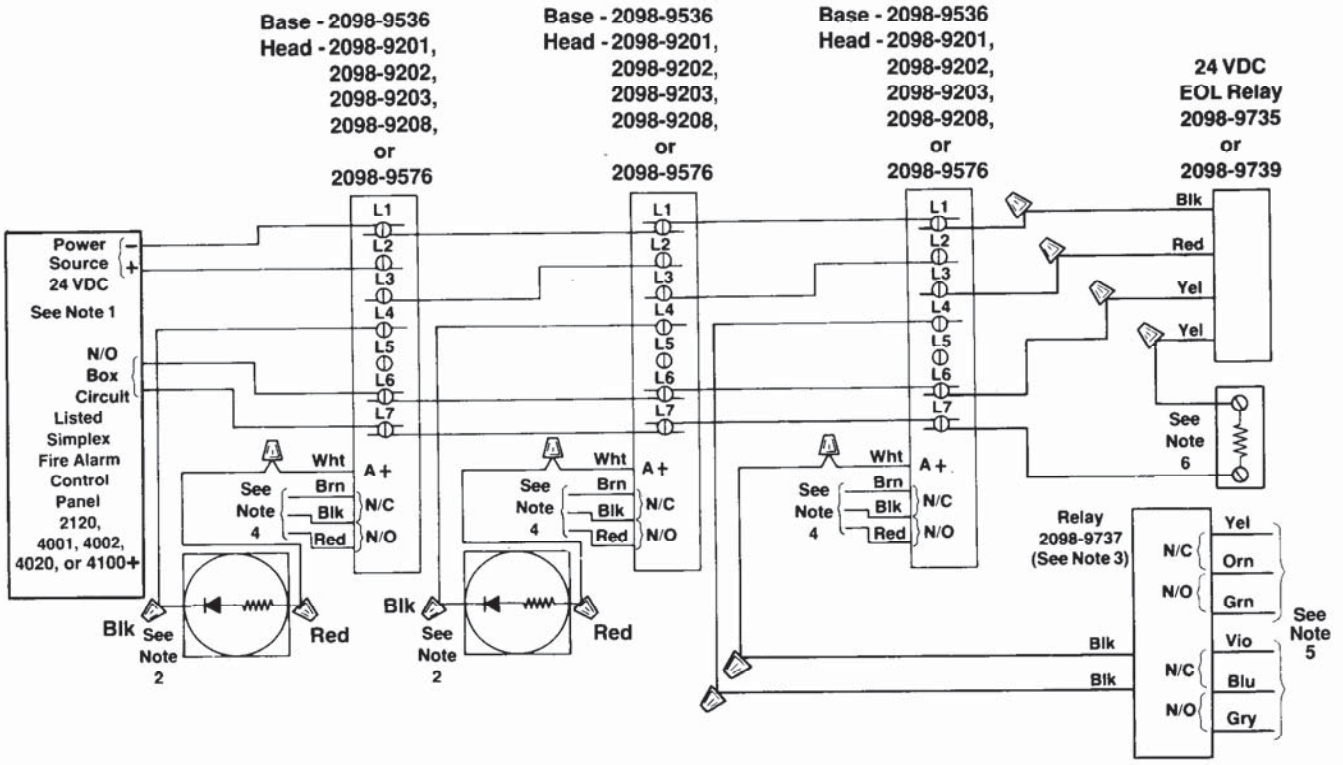


CAUTION

Install the bases in this instruction in accordance with applicable NFPA standards, local codes, and the authorities having jurisdiction. Failure to follow these instructions may result in failure of the detector to initiate an alarm condition. Simplex is not responsible for detectors that have been improperly installed, tested, or maintained.

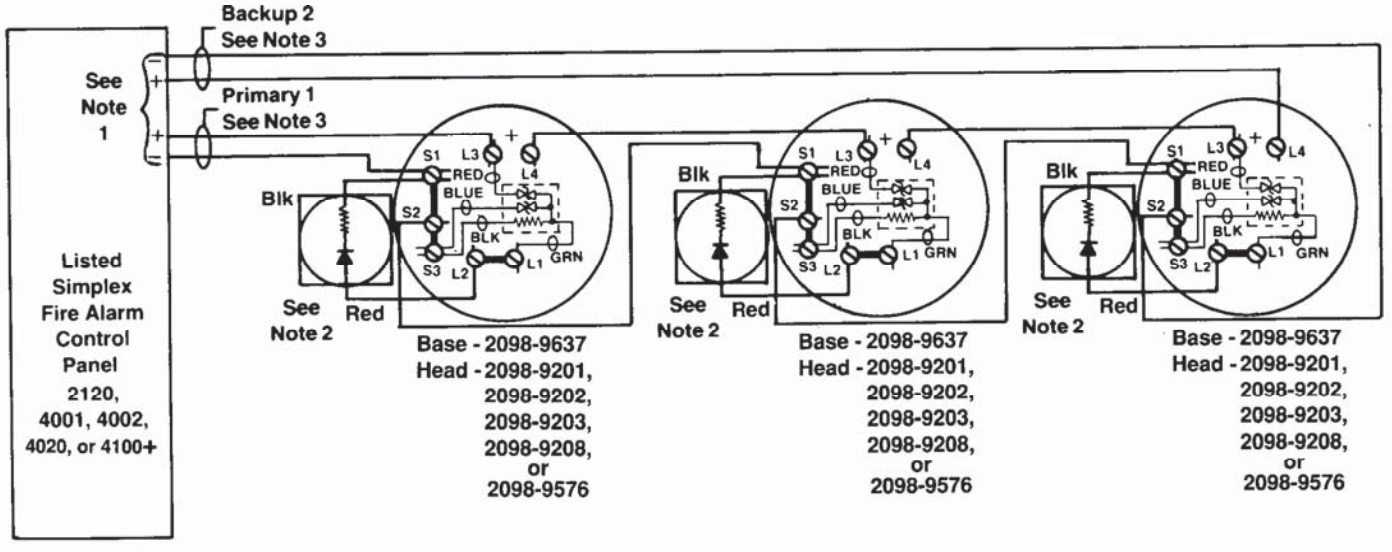
CAUTION

CONNECT WIRING TO TERMINALS AS SHOWN. DO NOT LOOP WIRE UNDER TERMINALS. BREAK WIRE RUN TO PROVIDE SUPERVISION OF CONNECTIONS.



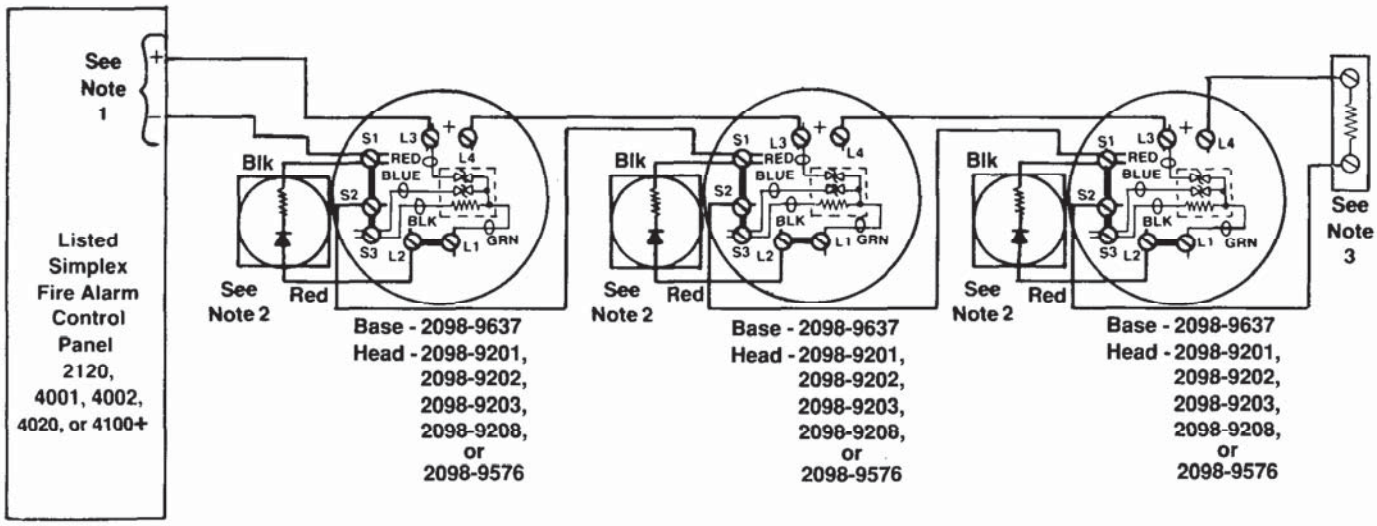
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring. DO NOT USE RELAY if LED is used.
3. DO NOT USE REMOTE LED when relay (2098-9737) is used.
4. Aux. alarm contacts – form C – each rated 1A @ 24VDC or 115VAC, resistive.
5. Aux. alarm contacts – two form C – each rated 3A @ 24VDC or 115VAC, resistive.
6. Refer to wiring diagrams provided with system panel for proper end-of-line resistor value.

2098-9536 BASE CONNECTIONS



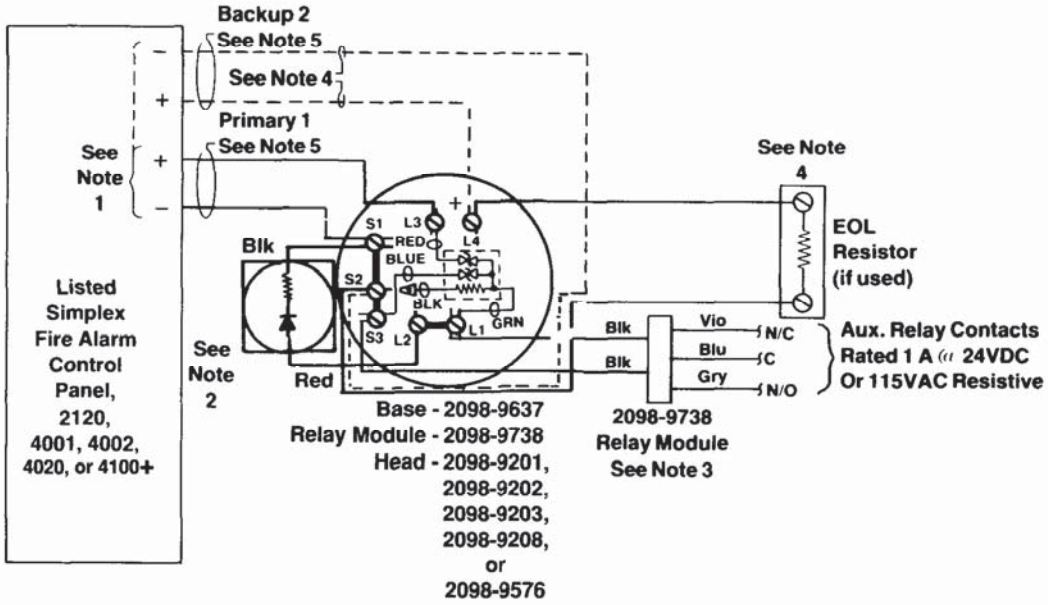
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. It is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9637 BASE CONNECTIONS FOR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT



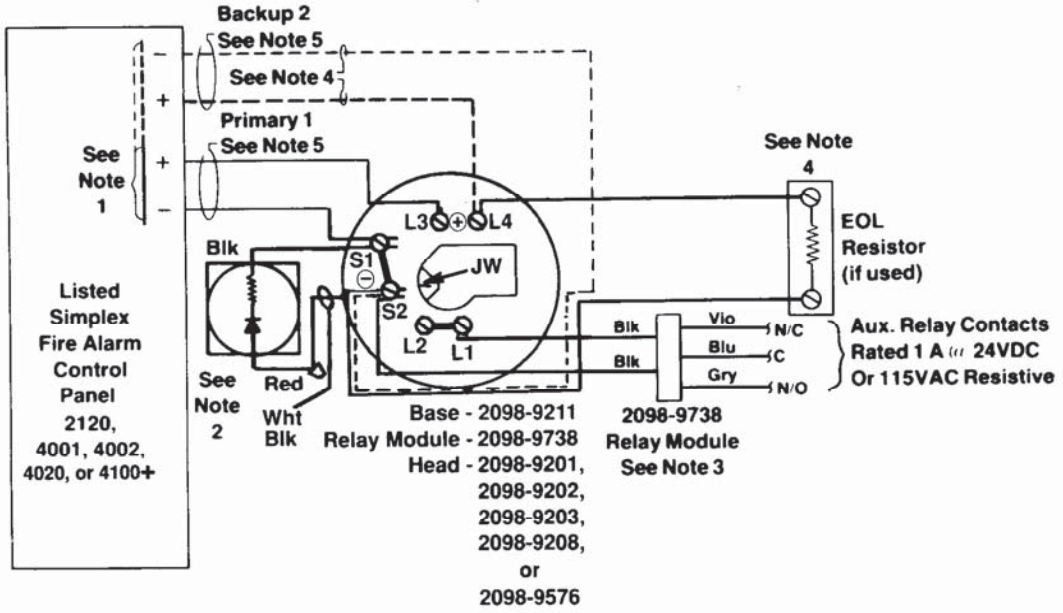
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. Refer to wiring diagrams provided with system panel for proper end-of-line resistor value.

2098-9637 BASE CONNECTIONS FOR STYLE B (FORMERLY CLASS B) INITIATE CIRCUIT



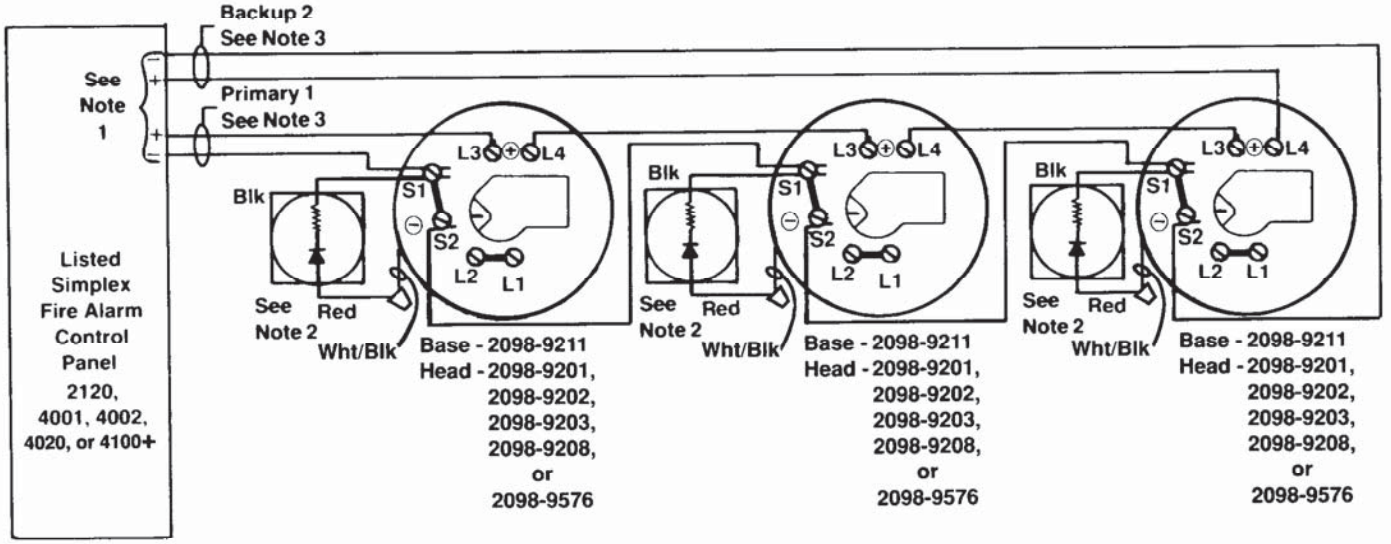
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. When wiring relay to base, remove resistor (black wire) from base terminal S3. Wire only one base/relay per initiate circuit.
4. For Style D (formerly Class A) initiate circuit, wire per dotted lines and do not use EOL resistor. If Style B (formerly Class B) initiate circuit, refer to wiring diagrams provided with system panel for proper EOL resistor value.
5. For Style D (formerly Class A) wiring, it is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9637 WITH 2098-9738
BASE AND RELAY CONNECTIONS FOR STYLE B (FORMERLY CLASS B) OR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT



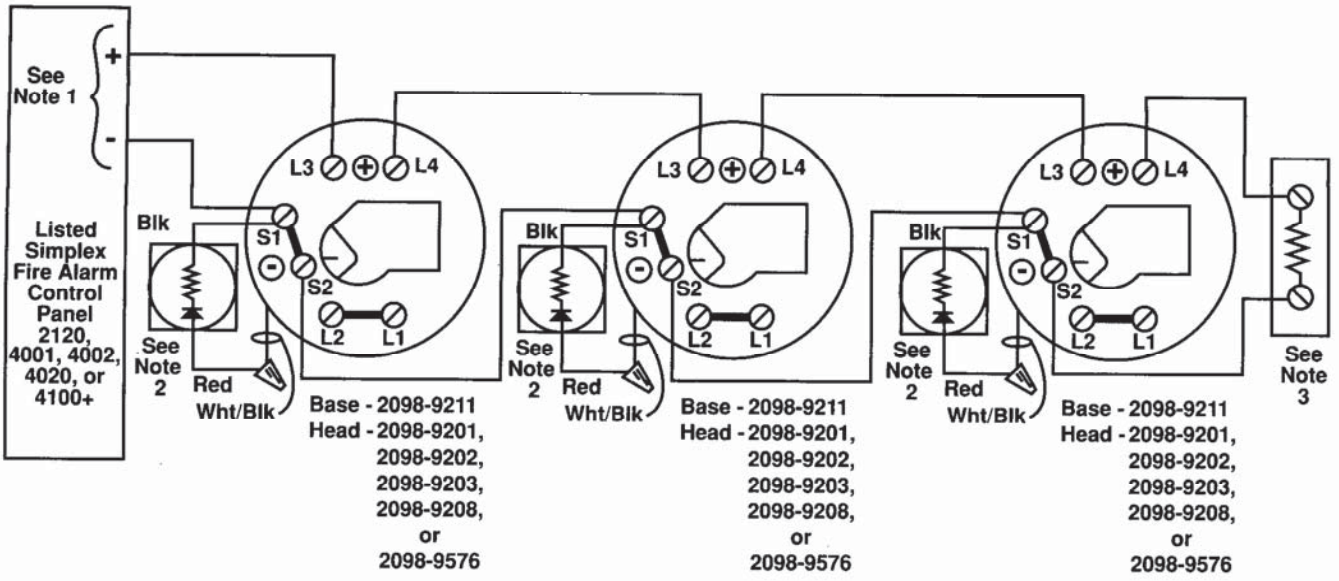
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. When wiring relay to base, cut JW. Wire only one base/relay per initiate circuit.
4. For Style D (formerly Class A) initiate circuit, wire per dotted lines and do not use EOL resistor. If Style B (formerly Class B) initiate circuit, refer to wiring diagrams provided with system panel for proper EOL resistor value.
5. For Style D (formerly Class A) wiring, it is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9211 WITH 2098-9738
BASE AND RELAY CONNECTIONS FOR STYLE B (FORMERLY CLASS B) OR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT



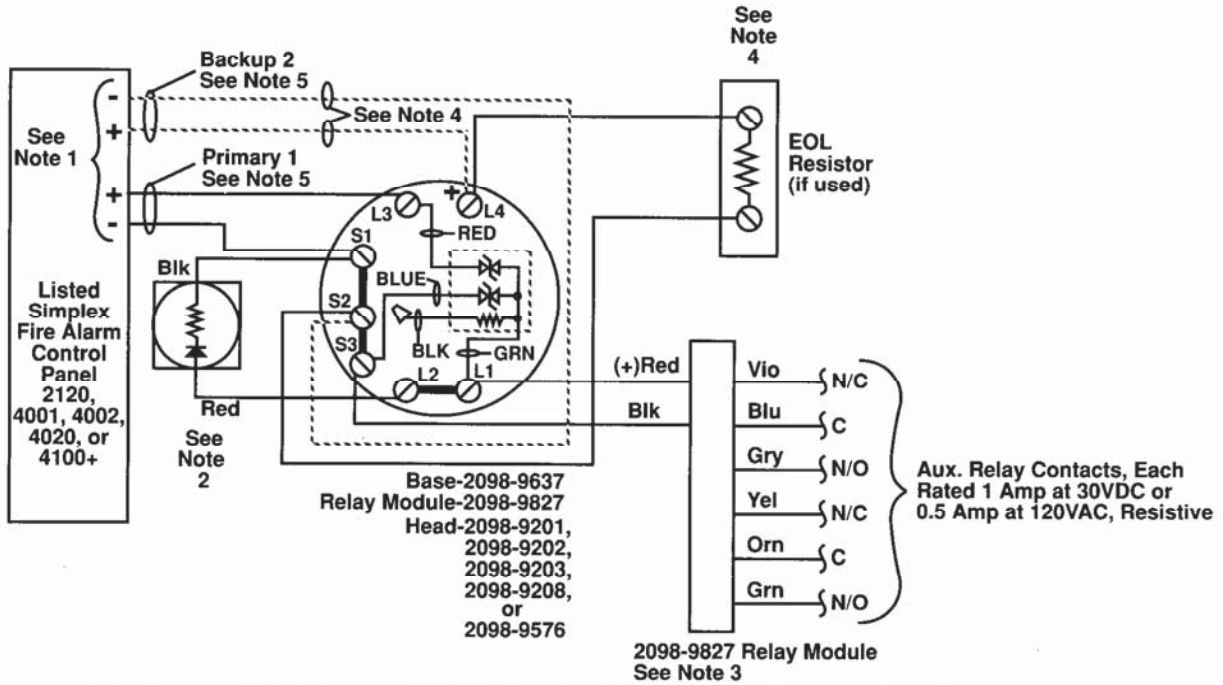
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. It is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9211 BASE CONNECTIONS FOR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT



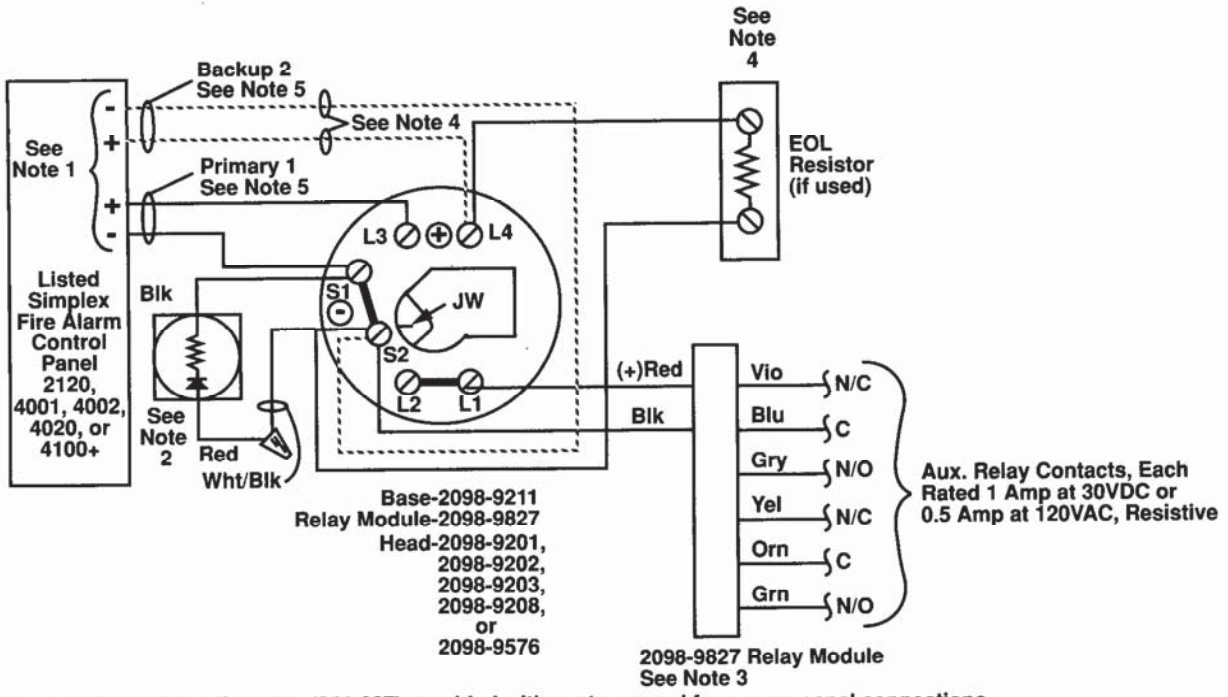
Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. Refer to wiring diagrams provided with system panel for proper end-of-line resistor value.

2098-9211 BASE CONNECTIONS FOR STYLE B (FORMERLY CLASS B) INITIATE CIRCUIT



Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. When wiring relay to base, remove resistor (black wire) from base terminal S3. Wire only one base/relay per initiate circuit.
4. For Style D (formerly Class A) initiate circuit. wire per dotted lines and do not use EOL resistor. If Style B (formerly Class B) initiate circuit, refer to wiring diagrams provided with system panel for proper EOL resistor value.
5. For Style D (formerly Class A) wiring, it is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9637 with 2098-9827
BASE AND RELAY CONNECTIONS FOR STYLE B (FORMERLY CLASS B) OR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT



Notes: 1. Refer to wiring diagrams (841-687) provided with system panel for proper panel connections.
2. If used, remote LED (2098-9808) is polarized; observe color-coded wiring.
3. When wiring relay to base, cut JW. Wire only one base/relay per initiate circuit.
4. For Style D (formerly Class A) initiate circuit. wire per dotted lines and do not use EOL resistor. If Style B (formerly Class B) initiate circuit, refer to wiring diagrams provided with system panel for proper EOL resistor value.
5. For Style D (formerly Class A) wiring, it is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.

2098-9211 WITH 2098-9827
BASE AND RELAY CONNECTIONS FOR STYLE B (FORMERLY CLASS B) OR STYLE D (FORMERLY CLASS A) INITIATE CIRCUIT

LIMITATIONS OF SMOKE DETECTORS

The smoke detectors used with these bases are designed to activate and initiate emergency action, but will do so only when used in conjunction with other equipment. They are designed for installation in accordance with NFPA standards 72-1990 and 72E.

Smoke detectors will not work without power. AC or DC powered smoke detectors will not work if the power supply is cut off for any reason.

Smoke detectors will not sense fires which start when smoke does not reach the detectors. Smoke from fires in chimneys, in walls, on roofs or on the other side of closed doors may not reach the smoke detector and alarm it.

A detector may not detect a fire developing on another level of a building. For this reason, detectors should be located on every level of a building.

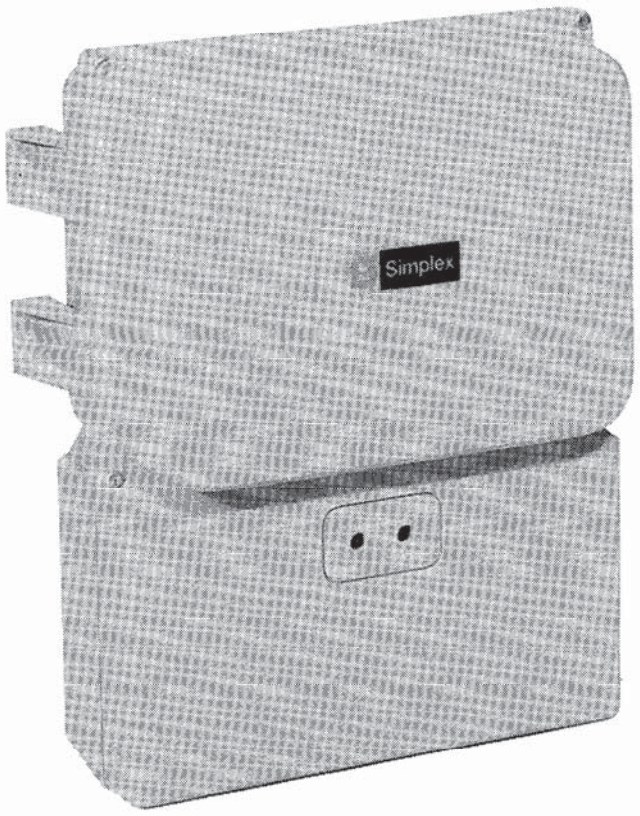
Smoke detectors have sensing limitations, too. Ionization detectors are better at detecting fast, flaming fires than slow, smoldering fires. Photoelectric detectors sense smoldering fires better than flaming fires. Because fires develop in different ways, and are often unpredictable in their growth, neither type of detector is always best, and a given detector may not always provide warning of a fire. In general, detectors cannot be expected to provide warning for fires resulting from inadequate fire protection practices, violent explosions, escaping gases, improper storage of flammable liquids like cleaning solvents, other safety hazards, or arson.

Smoke detectors cannot last forever. Smoke detectors contain electronic parts. Even though detectors are made to last for many years, any of these parts could fail at any time. Therefore, test your smoke detector system per NFPA 72E & 72H at least semi-annually. Clean and take care of your smoke detectors regularly.

Simplex

2098-9645, -9649 Duct Housings

Installation Instructions



PER-21-010 (574-652)
Ed 7 95

NOTICE

THIS DEVICE IS A DUCT SMOKE HOUSING. WHEN PROVIDED WITH DETECTOR, IT IS DESIGNED TO SAMPLE THE AIR FLOW PASSING BY IT IN THE AIR DUCT TO DETERMINE WHETHER IT CONTAINS UNACCEPTABLE LEVELS OF SMOKE.

THE EFFECTIVENESS OF A DUCT SMOKE DETECTOR IS HIGHLY DEPENDENT UPON:

- THE DESIGN AND OPERATING CONDITIONS OF THE AIR HANDLING SYSTEM IN WHICH IT IS INSTALLED;
- VARIABLES SUCH AS SMOKE DILUTION AND STRATIFICATION OVER WHICH EVEN THE BEST DESIGNED SYSTEMS HAVE NO CONTROL; AND,
- PROPER PLACEMENT AND POSITIONING OF THE DUCT SMOKE DETECTOR, WHICH IS OFTEN COMPROMISED FOR PRACTICAL REASONS.

FOR THE REASONS STATED ABOVE, THE EFFECTIVENESS OF THIS DUCT SMOKE DETECTOR CANNOT BE WARRANTED OR GUARANTEED. UNDER NO CIRCUMSTANCES SHOULD THIS DUCT SMOKE DETECTOR BE USED AS OR REGARDED TO BE A SUBSTITUTE FOR THE BUILDING'S REGULAR FIRE ALARM AND DETECTION SYSTEM, TO WHICH THIS DEVICE IS ATTACHED AS A SECONDARY DETECTION DEVICE.

TABLE OF CONTENTS

Page

GENERAL DESCRIPTION 1
ADDRESSABLE DUCT HOUSING – 2098-9645 (MAPNET II®)
SETTING THE DUCT DETECTOR'S ADDRESS 1
  Address Setting for the 2120 CDT System 1
  Address Setting for the 4020, 4100+, or 4120 System 2
ELECTRICAL SPECIFICATIONS
  Addressable Duct Housing – 2098-9645 5
  Two-Wire MAPNET II Operation 5
  Four-Wire MAPNET II Operation 5
  AC MAPNET II Operation for Supplementary Signaling Only 5
  Non-Addressable Duct Housing – 2098-9649 8
  Two-Wire DC Operation 8
  Four-Wire DC Operation 8
  Four-Wire AC Operation for Supplementary Signaling Only 8
ACCESSORIES 12
INSTALLATION
PRE-INSTALLATION ROUTINES
  Rules to Follow 13
APPLICATION NOTES 14
INSTALLATION PROCEDURES
  Inlet Tube Selection 15
  Housing Installation 16
  Inlet Tube Installation 16
  Exhaust Tube Installation 16
  Wiring Procedures 16
  Accessory Installation 17
  Detector and Duct Housing Testing 17
MAINTENANCE 18

ILLUSTRATIONS

Figure
1 ..... System Point Summaries with MAPNET II Addresses 2
2 ..... MAPNET II Address Chart 3
3 ..... MAPNET II Address Label 3
4 ..... Two-Wire MAPNET II Operation 4
5 ..... Four-Wire MAPNET II Operation 6
6 ..... AC MAPNET II Operation (Supplementary Signaling Only) 7
7 ..... Two-Wire DC Operation 9
8 ..... Four-Wire DC Operation 10
9 ..... Four-Wire AC Operation (Supplementary Signaling Only) 11
10,11,12 ..... Duct Housing Placement ..... 13 & 14
13 ..... Template Positioning 15
14 ..... Inlet Tube Orientation 15
15 ..... Inlet Tube Installation 15
16 ..... Accessory Installation 17
17 ..... Baffle Installation 18
18 ..... Template ..... Tear-Out Sheet

Suffix "C" following an 8-digit Product ID number denotes ULC-listed product.
MAPNET II Communication Net is protected by U.S. Patent No. 4,796,025.

GENERAL DESCRIPTION

The 2098-9645 and 2098-9649 air duct detector housings are designed to sample air and detect smoke in air ducts. Auxiliary contacts exist for alarm, supervisory, and control functions.

The housings use the 2098-9201 photoelectric smoke detector or the 2098-9544, -9576 ionization smoke detectors. The housing *must* have a baffle installed. Use the 2098-9810 baffle with the 2098-9544 detector, the 2098-9811 baffle with the 2098-9201 detector, or the 2098-9817 baffle with the 2098-9576 detector.

Air is sampled via sampling tubes which extend into the duct. The housing may be used with ducts from 8 inches to 95 inches wide. The housing may also be used on round ducts with diameters of 24 inches or greater.

Each housing has an "Alarm" and/or "Power On" LED.

Note: "Power On" LED does not operate for two-wire circuits.

For detailed information on using smoke detectors in air distribution systems, see NFPA 90A.

ADDRESSABLE DUCT HOUSING — 2098-9645 (MAPNET II)

The procedures that follow are used to install the 2098-9645 addressable duct housing. The instructions provided show how to set the address at each housing and also how to make electrical connections. Addressable smoke duct detectors are connected to a 2120 Multiplex Communicating Device Transponder (CDT), 4020 Fire Alarm Panel, 4100+ Fire Alarm Panel or 4120 Fire Alarm Panel by a single wire pair (MAPNET II).

SETTING THE DUCT DETECTOR'S ADDRESS

Duct detector addressing is critical since the 2120 CDT and the 4020, 4100, or 4120 System report alarms and troubles per duct detector rather than per zone of duct detectors. Each duct detector has a unique address. This address is associated with a custom label which identifies its physical location within a building. The duct detector's address and location must match up with the address listed in the specification sheets of the 2120 CMS File, or the Programmer's Report for the 4020, 4100+, or 4120 System. You should have the appropriate specification sheets with you during this part of the installation.

Address Setting for the 2120 CDT System

1. Using the 2120 CMS File, find the entry for the duct detector you are about to install. The CUSTOM LABEL column provides the location while the DEVICE ADDRESS column provides the switch setting data.

2. Using the switch setting data for the duct detector you're installing, set the duct detector's address. Locate the DIP switches on the duct detector's PC board (see Figure 4, 5, or 6). Use a small screwdriver or pen to set the switches.

   For the switch setting data in the DEVICE ADDRESS column, "0" is switch "ON" while "1" is switch "OFF."

3. Recheck the location of the detector and its address before electrical installation.

Address Setting for the 4020, 4100+, or 4120 System

1. Using the 4020, 4100+, or 4120 Programmer's Report, find the entry for the duct detector you are about to install. The DEVICE ADDRESS and CUSTOM LABEL are located in the SYSTEM POINT SUMMARY under "M."

   For example, Address M1-7 (for the 4100 system) is circled in Figure 1. M1 is the addressable channel while -7 is the device address on the channel. For a duct detector with Address M1-7, Address 7 must be set on the duct detector's DIP switches. Address 7 is circled in Figure 2.

Note: For Address 4-7 circled in Figure 1, the "4" identifies the MAPNET card address.

2. Using the example given in Step 1 as a guideline, set the duct detector's address using Figure 2. Locate the DIP switches on the duct detector's PC board (see Figure 4, 5, or 6). Use a small screwdriver or pen to set the switches.

3. Mark an address label with the appropriate address for your duct detector by shading a label box for each detector DIP switch in the ON position. (Address label marked Address 7 is shown in Figure 3.) Then apply the label to the detector near the detector's DIP switches.

4. Recheck the location of the detector and its address before electrical installation.

4020 System

DOCUMENTATION SYSTEM POINT SUMMARY Page 4
9304100A node:1 rev:1 10:50:20, WED, 14-JUN-95

System Point Summary (ascending by zone name): POINT SUMMARY ZONE

Zone Name	Custom Label	Device Type	Point Type	PNIS Code
IO1	MULTI IO CARD 1 POINT IO1	PULL	MONA	
IO2	MULTI IO CARD 1 POINT IO2	PULL	MONA	
IO3	MULTI IO CARD 1 POINT IO3	SSIGNAL	SIGA	
IO4	MULTI IO CARD 1 POINT IO4	SSIGNAL	SIGA	
M1-1	**COMPUTER LAB BLDG 21**	**VSMOKE**	**ION**	
M1-2	**3RD FLOOR EAST WING ROOM 18**	**SMOKE**	**GENIAM**	
M2-1	**2ND FLOOR WEST WING ROOM 12**	**SMOKE**	**ADRDET**	
IO9	BASEMENT EAST WING ROOM 3 IO9	SFPUMP	MONA	

DEVICE ADDRESS

4100+ or 4120 System

DOCUMENTATION SYSTEM POINT SUMMARY Page 2
9304100A node:1 rev:1 16:32:47, WED, 14-JUN-95

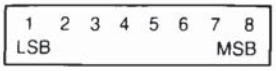
System Point Summary (ascending by zone name): POINT SUMMARY ZONE

Zone Name	Custom Label		Device Type	Point Type	PNIS Code
M1-1	FIRST FLOOR MICROWAVE ROOM	M1-1	ADRPUL	PULL	
M1-2	FIRST FLOOR DINING ROOM	M1-2	ADRPUL	PULL	
M1-3	FIRST FLOOR LOBBY	M1-3	ADRPUL	PULL	
M1-4	FIRST FLOOR MECHANICAL ROOM 2	M1-4	ADRPUL	PULL	
M1-5	FIRST FLOOR LOADING DOCK	M1-5	ADRPUL	PULL	
M1-6	1ST FLR MECH RM 1	M1-6	PHOTO	VSMOKE	
M1-7	**1ST FLR MECH RM 1**	**M1-7**	**DUCT**	**ADRDE**	

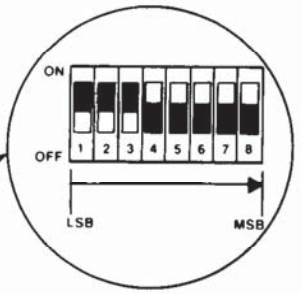
DEVICE ADDRESS

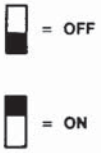
System Point Summaries with MAPNET II Addresses
FIGURE 1

4020, 4100+, OR 4120 USE ONLY



SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8	
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	= ADDRESS 1
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	= ADDRESS 2
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	= ADDRESS 3
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	= ADDRESS 4
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	= ADDRESS 5
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	= ADDRESS 6
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	= ADDRESS 7
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	= ADDRESS 8
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	= ADDRESS 9
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	= ADDRESS 10
ON	ON	OFF	ON	OFF	OFF	OFF	OFF	= ADDRESS 11
OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	= ADDRESS 12
ON	OFF	ON	ON	OFF	OFF	OFF	OFF	= ADDRESS 13
OFF	ON	ON	ON	OFF	OFF	OFF	OFF	= ADDRESS 14
ON	ON	ON	ON	OFF	OFF	OFF	OFF	= ADDRESS 15
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	= ADDRESS 16
ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	= ADDRESS 17
OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	= ADDRESS 18
ON	ON	OFF	OFF	ON	OFF	OFF	OFF	= ADDRESS 19
OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	= ADDRESS 20
ON	OFF	ON	OFF	ON	OFF	OFF	OFF	= ADDRESS 21
OFF	ON	ON	OFF	ON	OFF	OFF	OFF	= ADDRESS 22
ON	ON	ON	OFF	ON	OFF	OFF	OFF	= ADDRESS 23
OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	= ADDRESS 24
ON	OFF	OFF	ON	ON	OFF	OFF	OFF	= ADDRESS 25
OFF	ON	OFF	ON	ON	OFF	OFF	OFF	= ADDRESS 26
ON	ON	OFF	ON	ON	OFF	OFF	OFF	= ADDRESS 27
OFF	OFF	ON	ON	ON	OFF	OFF	OFF	= ADDRESS 28
ON	OFF	ON	ON	ON	OFF	OFF	OFF	= ADDRESS 29
OFF	ON	ON	ON	ON	OFF	OFF	OFF	= ADDRESS 30
ON	ON	ON	ON	ON	OFF	OFF	OFF	= ADDRESS 31
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	= ADDRESS 32
ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	= ADDRESS 33
OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	= ADDRESS 34
ON	ON	OFF	OFF	OFF	ON	OFF	OFF	= ADDRESS 35
OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	= ADDRESS 36
ON	OFF	ON	OFF	OFF	ON	OFF	OFF	= ADDRESS 37
OFF	ON	ON	OFF	OFF	ON	OFF	OFF	= ADDRESS 38
ON	ON	ON	OFF	OFF	ON	OFF	OFF	= ADDRESS 39
OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	= ADDRESS 40
ON	OFF	OFF	ON	OFF	ON	OFF	OFF	= ADDRESS 41
OFF	ON	OFF	ON	OFF	ON	OFF	OFF	= ADDRESS 42
ON	ON	OFF	ON	OFF	ON	OFF	OFF	= ADDRESS 43
OFF	OFF	ON	ON	OFF	ON	OFF	OFF	= ADDRESS 44
ON	OFF	ON	ON	OFF	ON	OFF	OFF	= ADDRESS 45
OFF	ON	ON	ON	OFF	ON	OFF	OFF	= ADDRESS 46
ON	ON	ON	ON	OFF	ON	OFF	OFF	= ADDRESS 47
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	= ADDRESS 48
ON	OFF	OFF	OFF	ON	ON	OFF	OFF	= ADDRESS 49
OFF	ON	OFF	OFF	ON	ON	OFF	OFF	= ADDRESS 50
ON	ON	OFF	OFF	ON	ON	OFF	OFF	= ADDRESS 51
OFF	OFF	ON	OFF	ON	ON	OFF	OFF	= ADDRESS 52
ON	OFF	ON	OFF	ON	ON	OFF	OFF	= ADDRESS 53
OFF	ON	ON	OFF	ON	ON	OFF	OFF	= ADDRESS 54
ON	ON	ON	OFF	ON	ON	OFF	OFF	= ADDRESS 55
OFF	OFF	OFF	ON	ON	ON	OFF	OFF	= ADDRESS 56
ON	OFF	OFF	ON	ON	ON	OFF	OFF	= ADDRESS 57
OFF	ON	OFF	ON	ON	ON	OFF	OFF	= ADDRESS 58
ON	ON	OFF	ON	ON	ON	OFF	OFF	= ADDRESS 59
OFF	OFF	ON	ON	ON	ON	OFF	OFF	= ADDRESS 60
ON	OFF	ON	ON	ON	ON	OFF	OFF	= ADDRESS 61
OFF	ON	ON	ON	ON	ON	OFF	OFF	= ADDRESS 62
ON	ON	ON	ON	ON	ON	OFF	OFF	= ADDRESS 63
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	= ADDRESS 64
ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	= ADDRESS 65
OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	= ADDRESS 66
ON	ON	OFF	OFF	OFF	OFF	ON	OFF	= ADDRESS 67
OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	= ADDRESS 68
ON	OFF	ON	OFF	OFF	OFF	ON	OFF	= ADDRESS 69
OFF	ON	ON	OFF	OFF	OFF	ON	OFF	= ADDRESS 70

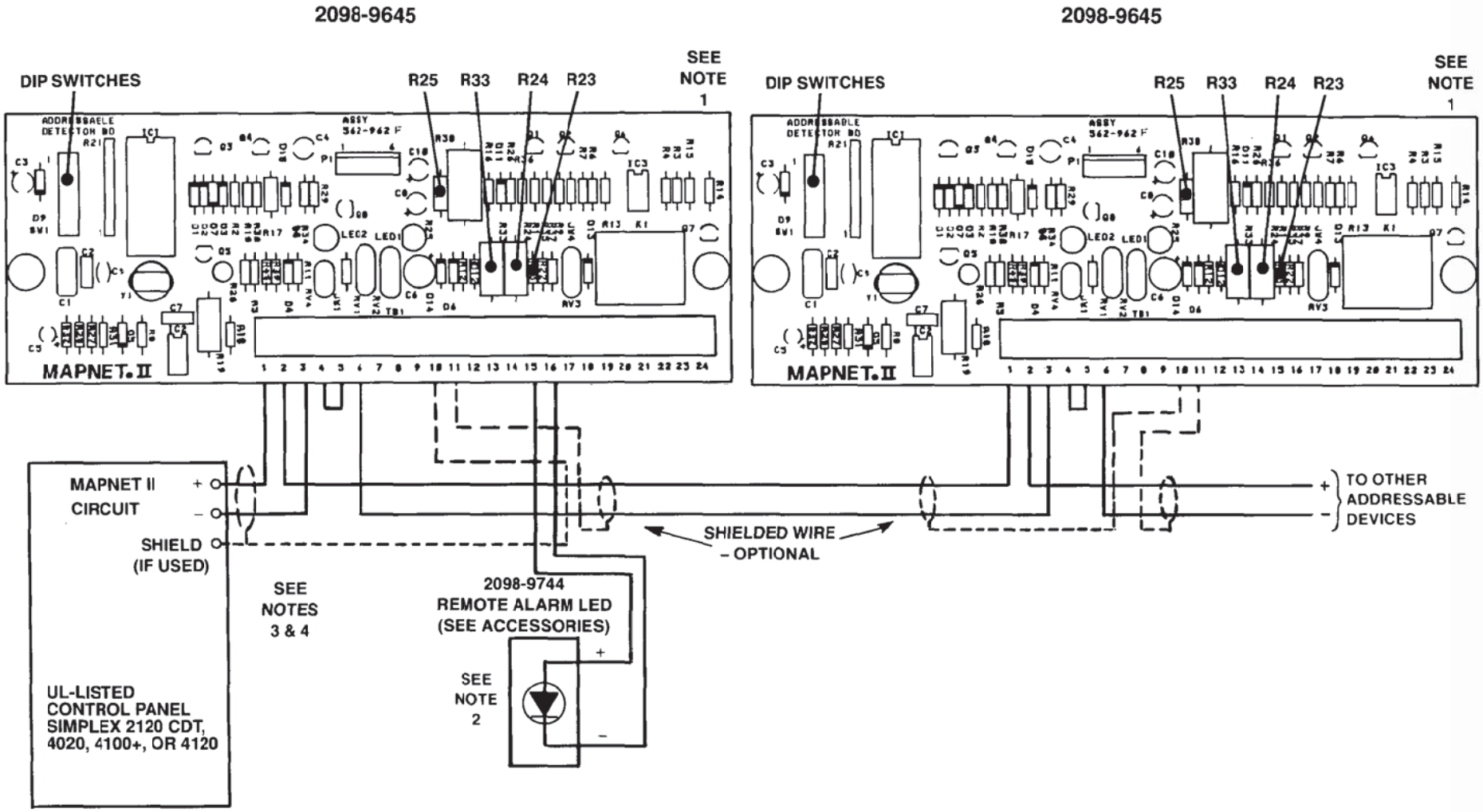




SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8	
ON	ON	ON	OFF	OFF	OFF	ON	OFF	= ADDRESS 71
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	= ADDRESS 72
ON	OFF	OFF	ON	OFF	OFF	ON	OFF	= ADDRESS 73
OFF	ON	OFF	ON	OFF	OFF	ON	OFF	= ADDRESS 74
ON	ON	OFF	ON	OFF	OFF	ON	OFF	= ADDRESS 75
OFF	OFF	ON	ON	OFF	OFF	ON	OFF	= ADDRESS 76
ON	OFF	ON	ON	OFF	OFF	ON	OFF	= ADDRESS 77
OFF	ON	ON	ON	OFF	OFF	ON	OFF	= ADDRESS 78
ON	ON	ON	ON	OFF	OFF	ON	OFF	= ADDRESS 79
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	= ADDRESS 80
ON	OFF	OFF	OFF	ON	OFF	ON	OFF	= ADDRESS 81
OFF	ON	OFF	OFF	ON	OFF	ON	OFF	= ADDRESS 82
ON	ON	OFF	OFF	ON	OFF	ON	OFF	= ADDRESS 83
OFF	OFF	ON	OFF	ON	OFF	ON	OFF	= ADDRESS 84
ON	OFF	ON	OFF	ON	OFF	ON	OFF	= ADDRESS 85
OFF	ON	ON	OFF	ON	OFF	ON	OFF	= ADDRESS 86
ON	ON	ON	OFF	ON	OFF	ON	OFF	= ADDRESS 87
OFF	OFF	OFF	ON	ON	OFF	ON	OFF	= ADDRESS 88
ON	OFF	OFF	ON	ON	OFF	ON	OFF	= ADDRESS 89
OFF	ON	OFF	ON	ON	OFF	ON	OFF	= ADDRESS 90
ON	ON	OFF	ON	ON	OFF	ON	OFF	= ADDRESS 91
OFF	OFF	ON	ON	ON	OFF	ON	OFF	= ADDRESS 92
ON	OFF	ON	ON	ON	OFF	ON	OFF	= ADDRESS 93
OFF	ON	ON	ON	ON	OFF	ON	OFF	= ADDRESS 94
ON	ON	ON	ON	ON	OFF	ON	OFF	= ADDRESS 95
OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	= ADDRESS 96
ON	OFF	OFF	OFF	OFF	ON	ON	OFF	= ADDRESS 97
OFF	ON	OFF	OFF	OFF	ON	ON	OFF	= ADDRESS 98
ON	ON	OFF	OFF	OFF	ON	ON	OFF	= ADDRESS 99
OFF	OFF	ON	OFF	OFF	ON	ON	OFF	= ADDRESS 100
ON	OFF	ON	OFF	OFF	ON	ON	OFF	= ADDRESS 101
OFF	ON	ON	OFF	OFF	ON	ON	OFF	= ADDRESS 102
ON	ON	ON	OFF	OFF	ON	ON	OFF	= ADDRESS 103
OFF	OFF	OFF	ON	OFF	ON	ON	OFF	= ADDRESS 104
ON	OFF	OFF	ON	OFF	ON	ON	OFF	= ADDRESS 105
OFF	ON	OFF	ON	OFF	ON	ON	OFF	= ADDRESS 106
ON	ON	OFF	ON	OFF	ON	ON	OFF	= ADDRESS 107
OFF	OFF	ON	ON	OFF	ON	ON	OFF	= ADDRESS 108
ON	OFF	ON	ON	OFF	ON	ON	OFF	= ADDRESS 109
OFF	ON	ON	ON	OFF	ON	ON	OFF	= ADDRESS 110
ON	ON	ON	ON	OFF	ON	ON	OFF	= ADDRESS 111
OFF	OFF	OFF	OFF	ON	ON	ON	OFF	= ADDRESS 112
ON	OFF	OFF	OFF	ON	ON	ON	OFF	= ADDRESS 113
OFF	ON	OFF	OFF	ON	ON	ON	OFF	= ADDRESS 114
ON	ON	OFF	OFF	ON	ON	ON	OFF	= ADDRESS 115
OFF	OFF	ON	OFF	ON	ON	ON	OFF	= ADDRESS 116
ON	OFF	ON	OFF	ON	ON	ON	OFF	= ADDRESS 117
OFF	ON	ON	OFF	ON	ON	ON	OFF	= ADDRESS 118
ON	ON	ON	OFF	ON	ON	ON	OFF	= ADDRESS 119
OFF	OFF	OFF	ON	ON	ON	ON	OFF	= ADDRESS 120
ON	OFF	OFF	ON	ON	ON	ON	OFF	= ADDRESS 121
OFF	ON	OFF	ON	ON	ON	ON	OFF	= ADDRESS 122
ON	ON	OFF	ON	ON	ON	ON	OFF	= ADDRESS 123
OFF	OFF	ON	ON	ON	ON	ON	OFF	= ADDRESS 124
ON	OFF	ON	ON	ON	ON	ON	OFF	= ADDRESS 125
OFF	ON	ON	ON	ON	ON	ON	OFF	= ADDRESS 126
ON	ON	ON	ON	ON	ON	ON	OFF	= ADDRESS 127

MAPNET II Address Chart
FIGURE 2

MAPNET II Address Label
FIGURE 3



NOTES:

1. REMOVE R24, R25, and R33 ON ALL 562-962 DETECTOR BOARDS (REV. F AND LATER) FOR TWO-WIRE MAPNET II OPERATION. (FOR ALL 562-962 DETECTOR BOARDS THAT ARE REV. E OR EARLIER, REMOVE R24, R25, AND R44 FOR TWO-WIRE MAPNET II OPERATION.)
2. REMOVE R23 WHEN USING THE 2098-9744 REMOTE ALARM LED.
3. GREEN POWER ON LED IS OFF IN TWO-WIRE OPERATION.
4. FOR ADDITIONAL WIRING INFORMATION, REFER TO THE M-2120-CDT DRAWINGS OR MAPNET II DEVICES (841-804).

Two-Wire MAPNET II Operation
FIGURE 4

ELECTRICAL SPECIFICATIONS

Addressable Duct Housing – 2098-9645

The 2098-9645 can be set up for any of the electrical configurations listed below. An addressable duct housing is connected to a 2120 Multiplex Communication Device Transponder (CDT), 4020 Fire Alarm system, 4100+ Fire Alarm system, or 4120 Fire Alarm by twisted pair-wire (MAPNET II). The duct detector obtains both power and data over this pair. (Shielded, twisted pair-wire for the MAPNET II circuit is optional.) For four-wire operation, a separate 24VDC source of power is required in addition to the MAPNET II line.

Note: All relay contacts rated 2A @ 120VAC or 28VDC resistive.

Two-Wire MAPNET II Operation (Figure 4)

- *Input voltage* — 16.5 to 36VDC
- *Ripple tolerance* — 20% maximum
- *Standby Current* — 1 mA
- *Alarm Current* — 1 mA. Add 1 mA for remote alarm LED 2098-9744.

Note: Remove R24, R25, and R33 for two-wire MAPNET II operation. See Figure 4 for wiring diagram.

Four-Wire MAPNET II Operation (Figure 5)

The 2098-9645 has a self-contained relay, K1, for alarm-initiating or control functions.

- *Input Voltage* — 18 to 32VDC, polarized
- *Ripple Tolerance* — 20% maximum
- *Standby Current* — 10mA at 24VDC. Add 20 mA for remote power-on LED.
- *Alarm Current* — 24 mA at 24VDC. Add 2.8 mA for remote alarm LED.
- *Control Contacts* — Alarm relay — K1A N.O. (TB1-23, -24); C (TB1-21, -22); N.C. (TB1-17)
  — K1B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).

Note: Remove R37, D14, and JW4 for four-wire MAPNET II operation. See Figure 5 for wiring diagram.

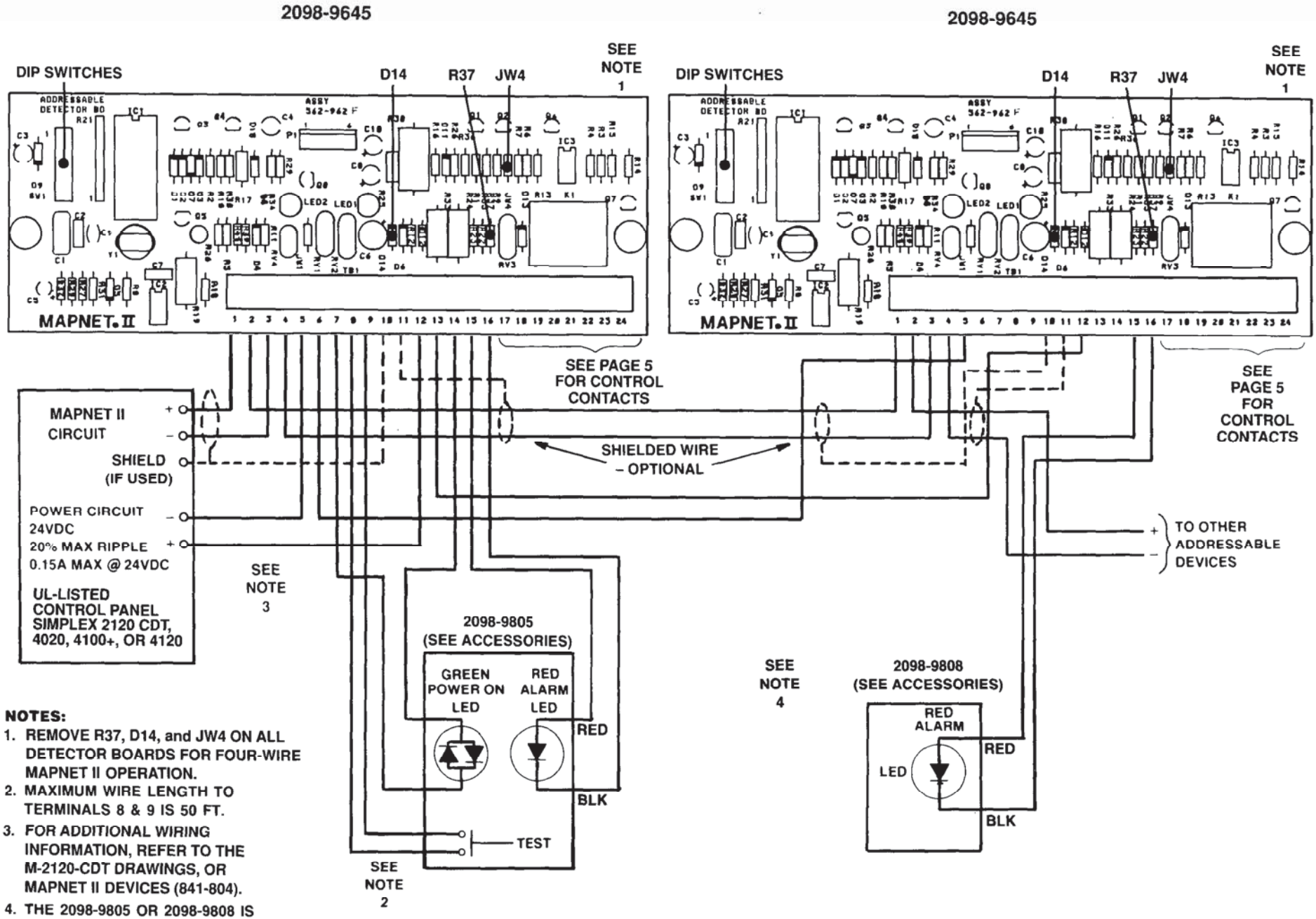
AC MAPNET II Operation for Supplementary Signaling Only (Figure 6)

AC operation requires a self-contained transformer, Simplex No. 2098-9747. See Accessory Installation section.

The 2098-9645 has a self-contained relay, K1, for alarm-initiating or control functions.

- *Input voltage* — 120VAC, 60 Hz, 3VA maximum
- *Control Contacts* — Alarm relay — K1A N.O. (TB1-23, -24); C (TB1-21, -22); N.C. (TB1-17)
  — K1B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).

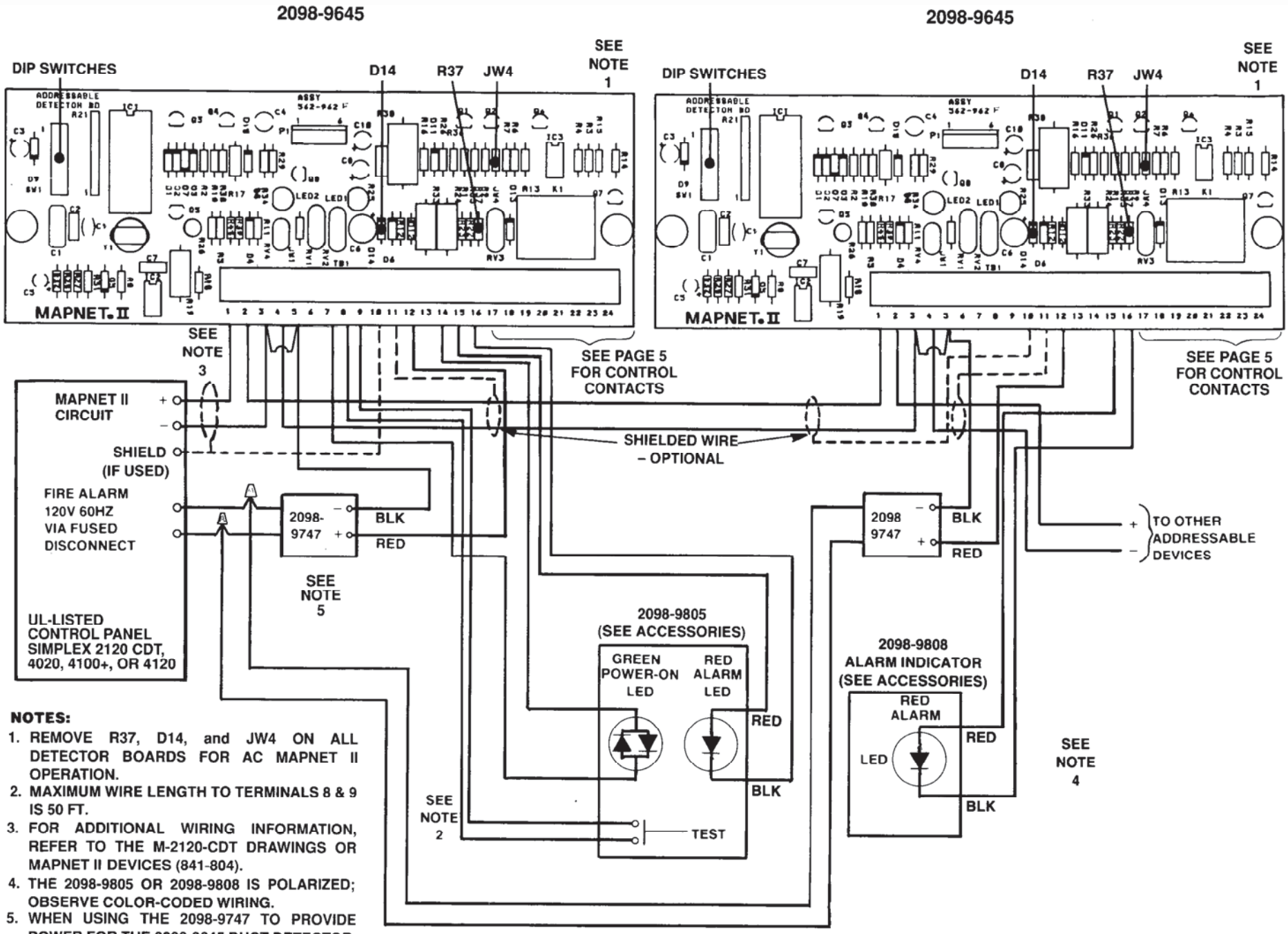
Note: Remove R37, D14, and JW4 for AC MAPNET II operation. See Figure 6 for wiring diagram.



NOTES:

1. REMOVE R37, D14, and JW4 ON ALL DETECTOR BOARDS FOR FOUR-WIRE MAPNET II OPERATION.
2. MAXIMUM WIRE LENGTH TO TERMINALS 8 & 9 IS 50 FT.
3. FOR ADDITIONAL WIRING INFORMATION, REFER TO THE M-2120-CDT DRAWINGS, OR MAPNET II DEVICES (841-804).
4. THE 2098-9805 OR 2098-9808 IS POLARIZED; OBSERVE COLOR-CODED WIRING.

Four-Wire MAPNET II Operation
FIGURE 5



NOTES:

1. REMOVE R37, D14, and JW4 ON ALL DETECTOR BOARDS FOR AC MAPNET II OPERATION.
2. MAXIMUM WIRE LENGTH TO TERMINALS 8 & 9 IS 50 FT.
3. FOR ADDITIONAL WIRING INFORMATION, REFER TO THE M-2120-CDT DRAWINGS OR MAPNET II DEVICES (841-804).
4. THE 2098-9805 OR 2098-9808 IS POLARIZED; OBSERVE COLOR-CODED WIRING.
5. WHEN USING THE 2098-9747 TO PROVIDE POWER FOR THE 2098-9645 DUCT DETECTOR, USE THE DUCT DETECTOR FOR SUPPLEMENTARY SIGNALING ONLY.

AC MAPNET II Operation (Supplementary Signaling Only)
FIGURE 6

Non-Addressable Duct Housing – 2098-9649

The 2098-9649 can be set up for any of the electrical configurations listed below.

Two-Wire DC Operation (Figure 7)

Relay contacts transfer upon alarm for alarm-initiating and control functions. All relay contacts are rated 2A at 120VAC or 28VDC resistive.

- *Input voltage* — 15 to 32VDC, polarized
- *Ripple tolerance* — 20% maximum
- *Standby Current* — 40 uA maximum at 24VDC
- *Alarm Impedance* — 300 ohms (with remote alarm LED)
- *Alarm Current* — 50mA at 24VDC maximum
- *Control Contacts* — **WITHOUT REMOTE ALARM LED**
  — Alarm relay — K2A N.O. (TB1-23, -24); C (TB1-21, -22); N.C. (TB1-17) — K2B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).
  — **WITH REMOTE ALARM LED**
  — Alarm relay — K2A N.O. (TB1-23, -24); C (TB1-21, -22); N.C. (TB1-17).

Note: Remove JW2 and diode D1 for two-wire operation. See Figure 7 for wiring diagram.

Caution: Connect only one duct detector to a two-wire circuit if the alarm relay is being used for control.

Four-Wire DC Operation (Figure 8)

The 2098-9649 has a self-contained relay, K1, for power supervision. Relay contacts in K2 transfer upon alarm and are available for alarm-initiating or control functions.

- *Input Voltage* — 18 to 32VDC, polarized
- *Ripple Tolerance* — 20% maximum
- *Standby Current* — 24 mA at 24VDC. Add 20 mA for remote power-on indicator.
- *Alarm Current* — 50 mA at 24VDC. Add 2.8 mA for remote alarm indicator.
- *Control Contacts* — Alarm relay K2B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).

Notes: 1. Removing detector from housing or failure of 24VDC supply power will de-energize the K1 relay and transfer relay trouble contacts to open initiating circuit.

2. Remove JW3 and JW4 for four-wire operation. See Figure 8 for wiring diagram.

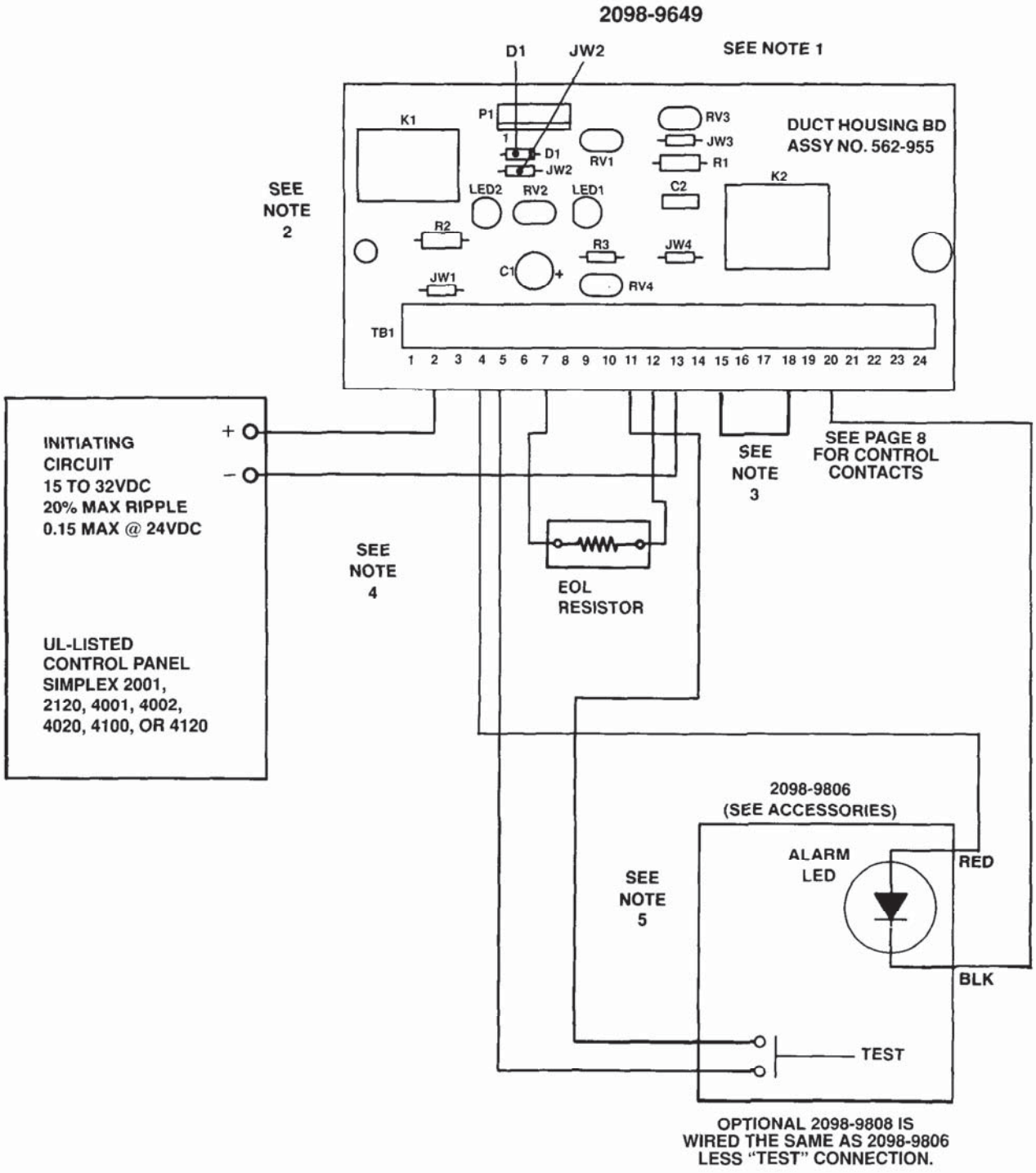
Four-Wire AC Operation for Supplementary Signaling Only (Figure 9)

AC operation requires a self-contained transformer, Simplex No. 2098-9747. See Accessory Installation section.

- *Input voltage* — 120VAC, 60 Hz, 3VA maximum
- *Control Contacts* — Alarm relay — K2B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).

Notes: 1. Removing detector from housing or failure of AC input voltage will de-energize K1 relay and transfer relay trouble contacts to open initiating circuit.

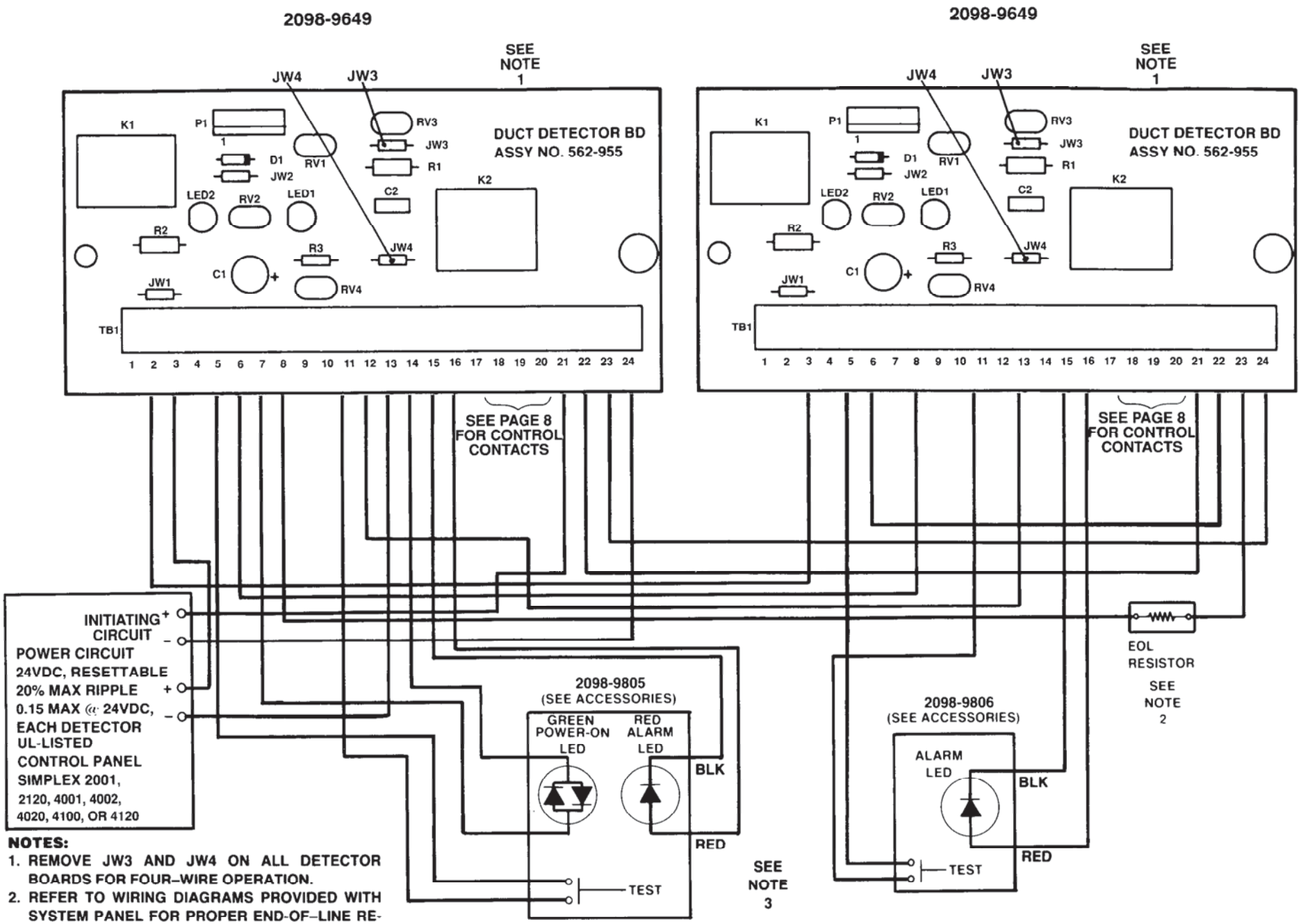
2. Remove JW3 and JW4 for AC operation. See Figure 9 for wiring diagram.



NOTES:

1. REMOVE JW2 AND DIODE D1 FOR 2-WIRE OPERATION.
2. GREEN POWER-ON LED IS OFF IN TWO-WIRE OPERATION.
3. JUMPER TERMINALS 15 AND 18 WHEN 2098-9806 OR 2098-9808 IS USED.
4. FOR ADDITIONAL WIRING INFORMATION, REFER TO WIRING DIAGRAMS PROVIDED WITH THE SYSTEM PANEL.
5. THE 2098-9806 OR 2098-9808 IS POLARIZED; OBSERVE COLOR-CODED WIRING.

Two-Wire DC Operation
FIGURE 7

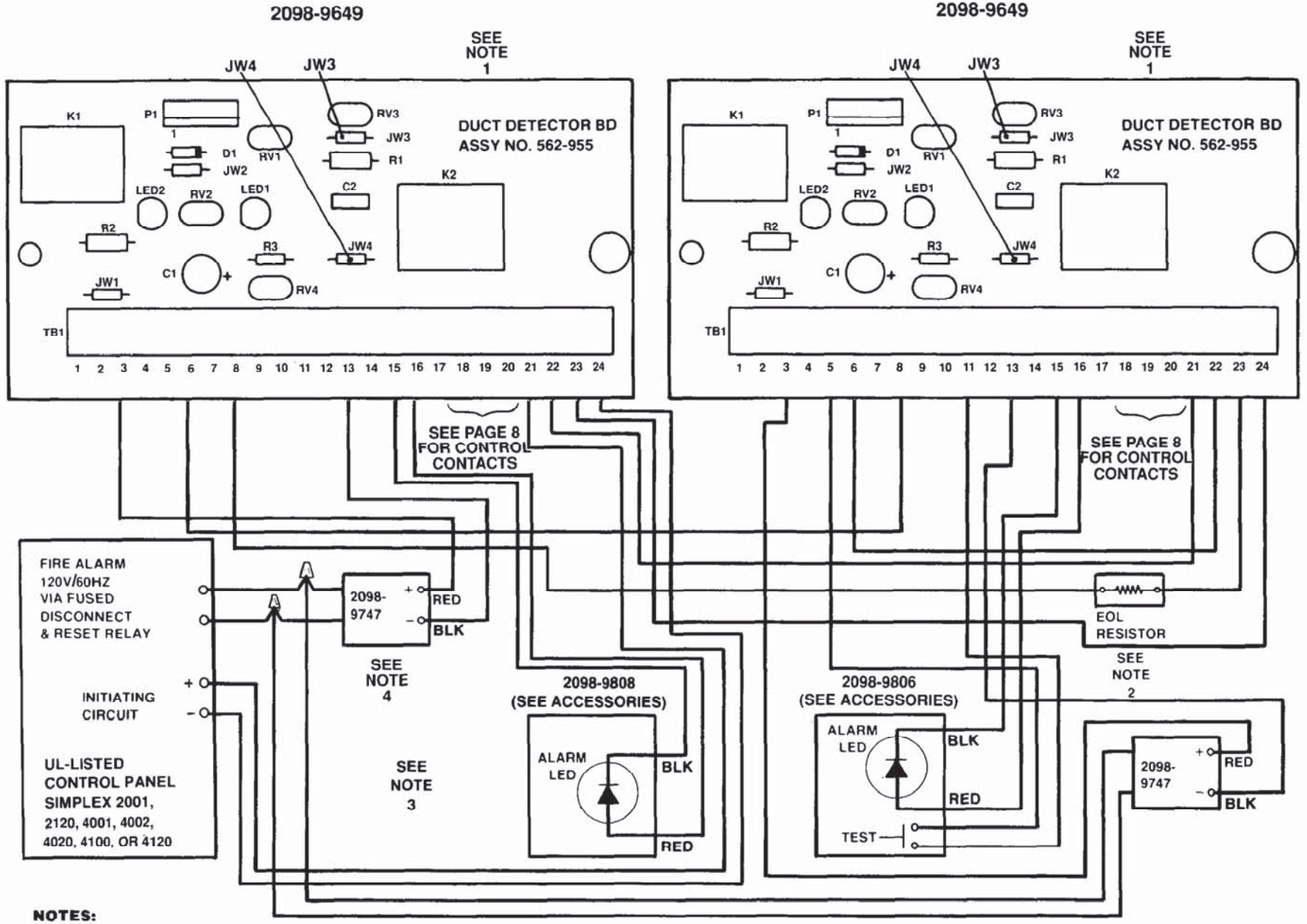


NOTES:

1. REMOVE JW3 AND JW4 ON ALL DETECTOR BOARDS FOR FOUR-WIRE OPERATION.
2. REFER TO WIRING DIAGRAMS PROVIDED WITH SYSTEM PANEL FOR PROPER END-OF-LINE RESISTOR VALUE.
3. THE 2098-9805 OR 2098-9806 IS POLARIZED; OBSERVE COLOR-CODED WIRING.

Four-Wire DC Operation

FIGURE 8



NOTES:

1. REMOVE JW3 AND JW4 ON ALL DETECTOR BOARDS FOR AC OPERATION.
2. REFER TO WIRING DIAGRAMS PROVIDED WITH SYSTEM PANEL FOR PROPER END-OF–LINE RESISTOR VALUE.
3. THE 2098-9806 OR 2098-9808 IS POLARIZED; OBSERVE COLOR-CODED WIRING.
4. WHEN USING THE 2098-9747 TO PROVIDE POWER FOR THE 2098-9649 DUCT DETECTOR, USE THE DUCT DETECTOR FOR SUPPLEMENTARY SIGNALING ONLY.

Four-Wire AC Operation (Supplementary Signaling Only)

FIGURE 9

ACCESSORIES

Accessory installation instructions are provided on Page 17 of this publication.

REMOTE ALARM INDICATOR — MODEL 2098-9744 (Use with 2098-9645 – two-wire MAPNET II)

- Red LED indicator ON when detector is in alarm.
- *Alarm Current* — 2 mA total (1 mA for LED) at 5 VDC nominal.

REMOTE ALARM INDICATOR — MODEL 2098-9808 (Use with 2098-9649 or four-wire 2098-9645)

- Red LED indicator ON when detector is in alarm.
- *Alarm Current* — 2.8 mA at 24VDC nominal.

REMOTE ALARM INDICATOR/KEY SWITCH — MODEL 2098-9806 (Use with 2098-9649 or four-wire 2098-9645)

- Red LED indicator ON when detector is in alarm. Key switch activates alarm relay and remote LED.
- *Alarm Current* — 2.8 mA at 24VDC nominal.

REMOTE POWER/ALARM INDICATOR/KEY SWITCH — MODEL 2098-9805 (Use with four-wire 2098-9649 or 2098-9645)

- Green LED indicator glows with power ON.
- Red LED indicator ON when detector is in alarm.
- Key switch activates alarm relay and remote LED.
- Can be used in four-wire DC or AC configurations only (Figure 8 or 9).
- *Standby Current* — 20 mA (green LED) at 24VDC nominal.
- *Alarm Current* – 2.8 mA (red LED) at 24 VDC nominal.

AC WIRING KIT — MODEL 2098-9747

The 120VAC transformer assembly allows the duct housing to be adapted to AC-powered operation. Installs inside the 2098-9645 or 2098-9649 housing.

NOTE: USE OF THE DUCT DETECTOR WITH THE 2098-9747 IS *FOR SUPPLEMENTARY SIGNALING ONLY.*

IMPORTANT
BAFFLE IS REQUIRED AND MUST BE ORDERED SEPARATELY (SEE FIGURE 17).

PRE-INSTALLATION ROUTINES

The 2098-9645 and 2098-9649 duct housings should be installed in a location of relatively non-turbulent air flow and within the intended operating velocity range of 400 to 4000 feet per minute (122 to 1220 M/min.).

Simplex recommends measurement of air flow and examination of engineering specifications that define expected duct air velocities under all conditions to determine if a location is suitable for duct detector operation. An Alnor Instrument Co. (Chicago) Model 6000P Velometer or equivalent may be used to check the duct air velocity.

WARNING: READ BELOW BEFORE INSTALLING SENSOR TO ITS BASE.

The sensor comes with a **dust cover** to protect it from contamination during completion of building construction.

To properly install the sensor to its base:

A. Remove dust cover from sensor.

B. Install sensor by inserting sensor into its base opening, rotating sensor counterclockwise until it drops into the seated position, and then rotating sensor clockwise to latch the contacts.

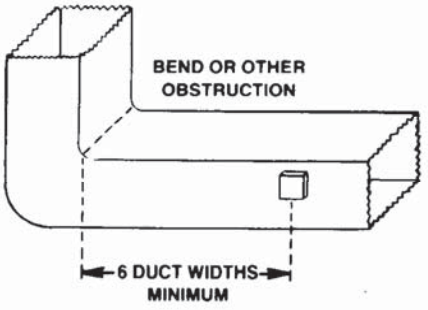
IMPORTANT: An audible "snap" indicates proper contact engagement.

WARNING: System will not operate with dust cover in place.

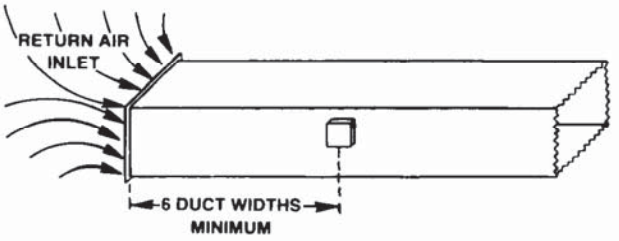
Rules to Follow

1. Whenever possible, locate detectors a minimum of six duct widths downstream from bends or inlets. Such locations ensure that air flow will be non-turbulent and that smoke will be properly mixed with air in the duct for maximum detector efficiency. See Figures 10 and 11.

Note: Installation of duct housing to a round duct is the same as shown below as long as round duct is not less than 24 inches (610mm) in diameter.

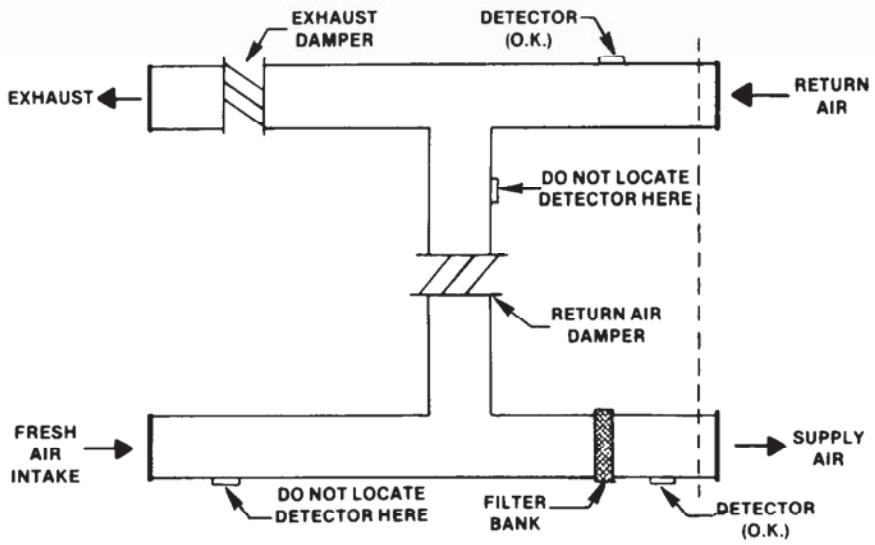


Duct Housing Placement
FIGURE 10



Duct Housing Placement
FIGURE 11

2. Locate duct detector so that dampers do not restrict air flow at the detector location. See Figure 12.



Duct Housing Placement

FIGURE 12

3. Locate air duct detectors on the return duct of the equipment's air handling system. However, detectors should NOT be installed in the return air damper branch. See Figure 12.

4. Locate detectors on branch lines if close identification of the alarm source is required.

5. Locate detectors on the *downstream side* of filters. However, should the filters block, sufficient air flow may not be available for proper detector operation. See Figure 12.

6. Whenever possible, locate detectors where they can be conveniently observed and readily serviced.

7. Locate detectors in return air ducts *ahead* of mixing areas.

8. Do not locate detectors next to outside air inlets unless you want to monitor smoke entry to the handling system from an adjacent area.

9. Locate detectors upstream of air humidifiers and cooling coils. See Figure 12.

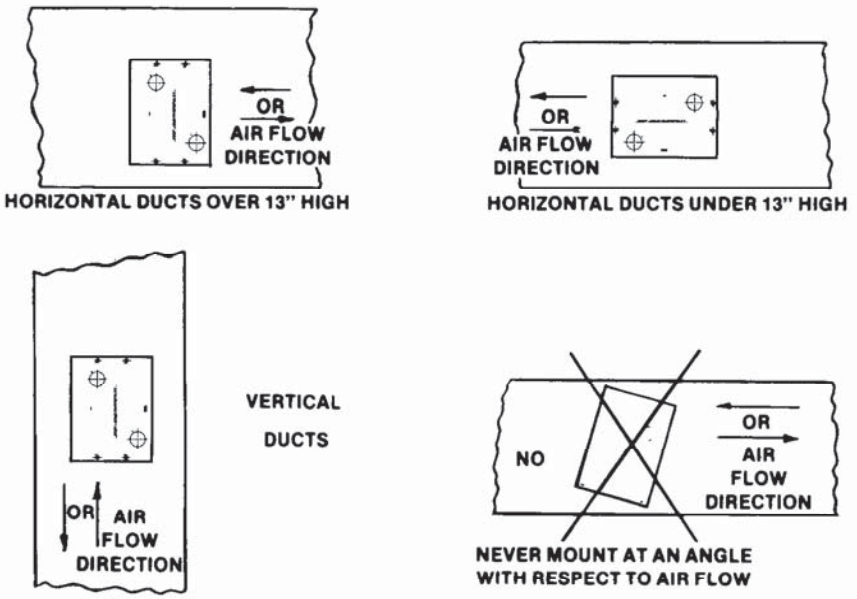
APPLICATION NOTES

The NFPA states that *duct smoke detectors must not be used as substitutes for open area protection.* The 2098-9645 and the 2098-9649 are intended for use in the control of air handling equipment for the purposes of closing dampers or shutting down air handling units.

INSTALLATION PROCEDURES

1. Tape the template (Figure 18) on the duct surface as shown in Figure 13. DO NOT POSITION the TEMPLATE WITH EDGES ANGLED WITH RESPECT TO AIR FLOW DIRECTION.

2. Drill four holes (marked "A" in Figure 18 and determined by metal thickness of duct) and two 1.625 inch (41.3 mm) holes (marked "B" in Figure 18) as located by the template.



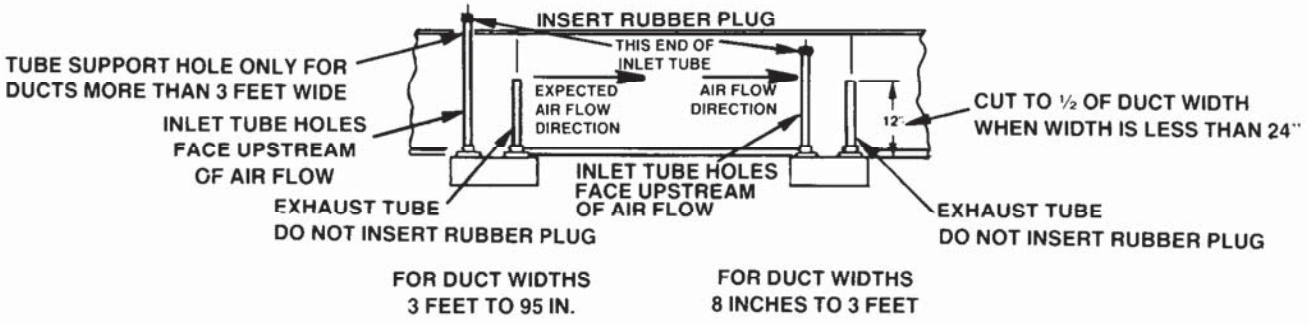
Template Positioning
FIGURE 13

3. If the duct is more than 3 feet (0.9 m) wide, then punch a 1-inch (25.4 mm) hole in the duct wall directly opposite the upstream 1.625 inch (41.3 mm) hole. See Figure 14. This hole is used to support the inlet tube.

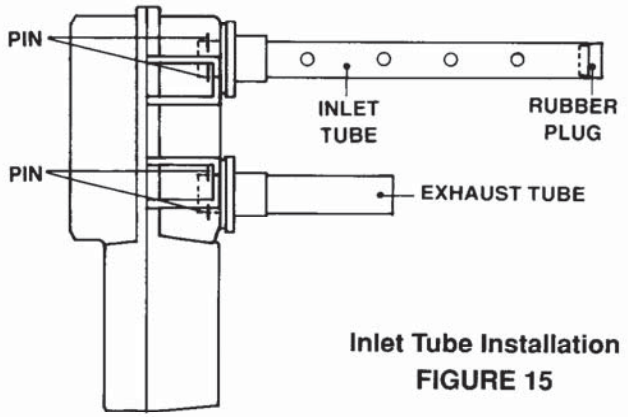
Inlet Tube Selection

4. Inlet tubes should be selected and cut to length as specified in Table A (page 16).

   After trimming the inlet tube opposite the pin, tap rubber plug (supplied) into the trimmed end. See Figure 15.



Inlet Tube Orientation
FIGURE 14



Inlet Tube Installation
FIGURE 15

TABLE A

OVERALL DUCT WIDTH	TUBE REQUIRED	TUBE TYPE	SUGGESTED CUT LENGTH
12 in. (0.3m)	2098-9796	Hole	1 inch (2.54 cm) less than duct width
13 in. (0.33m) to 24 in. (0.6m)	2098-9804	Hole	1 inch (2.54 cm) less than duct width
24 in. (0.6m) to 46 in. (1.16m)	2098-9797	Hole	1/2 inch (1.3 cm) longer than duct width
46 in. (1.16m) to 71 in. (1.8m)	2098-9798	Hole	1/2 inch (1.3 cm) longer than duct width
71 in. (1.8m) to 95 in. (2.4m)	2098-9799	Hole	1/2 inch (1.3 cm) longer than duct width

Housing Installation (See Figure 14)

5. Insert the inlet and exhaust tube receptors into the two holes previously cut in the duct.

6. Using the four #10 sheet metal screws provided in the accessory kit, secure the housing to the duct.

Inlet Tube Installation (See Figure 14)

7. Install the inlet tube by inserting the rubber plug end of the tube into the upstream tubing receptor located in the rear of the duct housing. Seat the pin into the appropriate slots so that the holes in the inlet tube face upstream to the air flow.

Note: If a support hole is being used, be sure to insert the inlet tube through the hole on the far side of the duct.

8. Install the tube retainer (supplied) using two #8 machine screws.

Notes

A. Be sure to securely tighten the #8 machine screws to prevent accidental turning of the tube within the receptor.

B. If the inlet protrudes through the far side of the duct, seal the opening around the tube (on the outside of the duct) with duct sealant.

Exhaust Tube Installation (See Figure 14)

9. Install the exhaust tube into the downstream tube receptor. Seat the pin into the slots so that the tube cannot turn.

10. Install the tube retainer (supplied) using two #8 machine screws.

Note: Be sure to securely tighten the #8 machine screws.

11. **Wiring Procedures**

A. If conduit is required, route conduit to the most convenient knockout and secure to assembly using suitable fittings.

B. Connect wires to the appropriate terminals within the duct housing in accordance with the system wiring diagram and the appropriate typical installation diagram.

C. Perform all wiring in accordance with the requirements of the National Electrical Code, local codes, and applicable specific system drawings.

D. Connect the optional accessory as specified in Step 12 and the associated installation and wiring diagrams. **Only one indicator may be connected to each 2098-9645 or 2098-9649.**

12. **Accessory Installation**

A. The 2098-9744, -9805, -9806, and -9808 accessories are intended for installation to a standard 2 in. x 3 in. outlet box having a depth of at least two inches. See Figure 16 for details. Make wiring connections in accordance with the installation wiring diagram prior to attaching accessory to the box.

B. If AC operation (supplementary signaling only) is desired, install the transformer kit supplied with the 2098-9747 AC wiring kit.

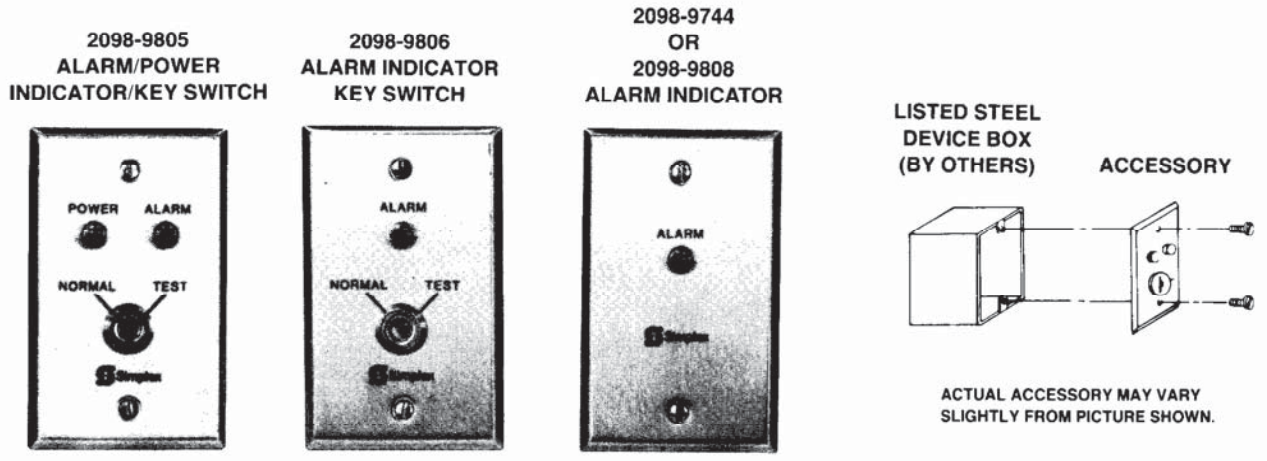
1. Secure the transformer below the terminal strip using the two screws supplied with the kit.

2. Connect the brown and white transformer primary leads to a 120VAC source.

3. Connect the building ground wire to the green ground screw.

4. Connect the transformer secondary leads to the terminal strip as follows:

- 2098-9645 – The red wire goes to terminal TB1-12; the black wire goes to terminal TB1-5.
- 2098-9649 – The red wire goes to terminal TB1-3; the black wire goes to terminal TB1-13.



Accessory Installation
FIGURE 16

Detector and Duct Housing Testing

13. AC or DC Operation Detector Testing

A. *Basic Unit* — With air handling unit OFF and power applied to the detector, introduce smoke into the detector or activate the built-in test feature as described in the detector head operating instructions. Observe alarm LED operation. Restore normal operation to detector by momentarily removing AC power or by removing and replacing the detector head after smoke has been cleared from its chamber.

B. *Basic Unit with 2098-9744 or 2098-9808 Option* — Perform Step A above and observe both alarm LED operation of detector and remote alarm indicator. Restore detector as in Step A.

C. *Basic Unit with 2098-9806 Option* — Perform Step A above and observe both alarm LED operation of detector and remote alarm indicator. Restore detector as in Step A.

Alternate test method — Insert key into lock and turn key clockwise to test. Observe alarm LED operation of detector and remote alarm indicator. Remove key and restore detector as in Step A.

D. *Basic Unit with 2098-9805 Option* — Perform Step A above. Green LED indicator glows when power in ON. Use in four-wire DC or AC configuration only.

Alternate test method — Insert key into lock and turn key clockwise to test. Observe alarm LED operation of detector and remote alarm indicator. Remove key and restore detector as in Step A.

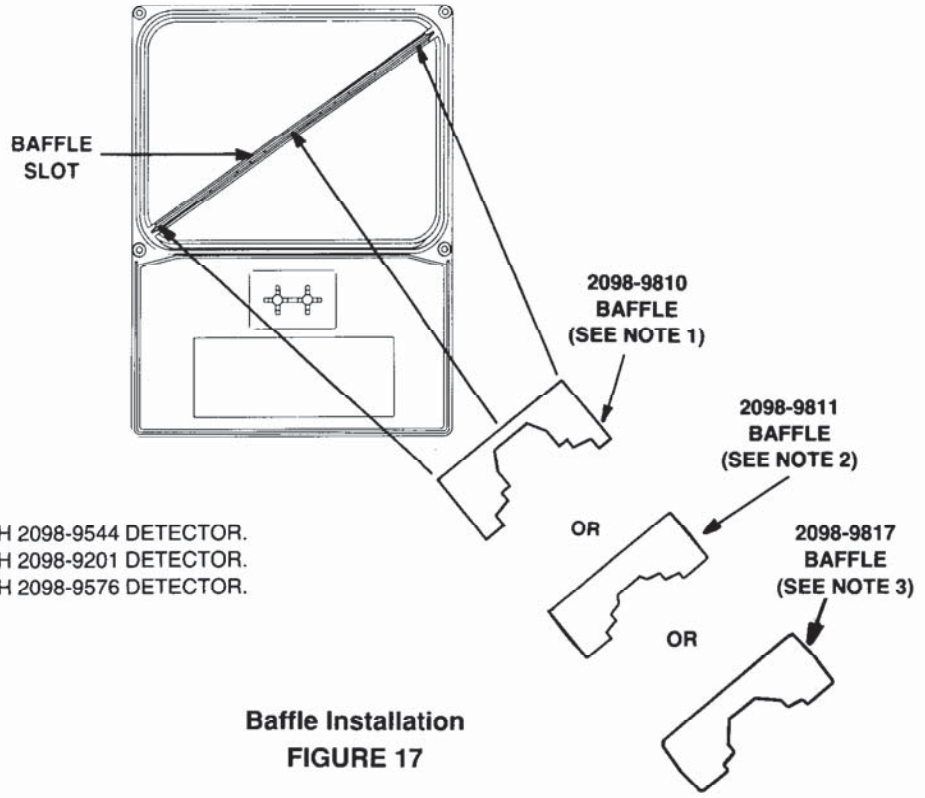
14. Air Differential Pressure Test

With the air handling unit turned on and all filters and dampers in place, measure the air differential pressure using a Dwyer Instrument Co. (Michigan City, Ind.) No. 20026 0 to 2" H_20 (or equivalent) differential pressure gauge.

Take measurements from inside of the detector housing before the cover is installed. Measure the difference in pressure between the intake tube and the exhaust tube. The pressure differential for all duct velocities between 400 and 4000 feet per minute shall not be less than 0.015 inches of water nor greater than 1.55 inches of water.

15. After testing is completed, attach the cover **(with appropriate baffle)** to the duct housing. (Be sure that baffle is snapped into place inside baffle slot. The baffle must be installed into the duct housing to ensure detector operation. Each baffle is marked with a detector number(s). The detector numbers indicate which detector is compatible with the baffle. See Figure 17 for proper location of baffle.) Secure cover in place using the four screws provided. To provide an airtight seal, tighten securely **(BUT DO NOT OVERTIGHTEN)** to seat the cover firmly against the gasket.

- Correct baffle (2098-9810, 2098-9811, or 2098-9817 **must** be installed in baffle slot. See Figure 17.



NOTES:
1. USE 2098-9810 BAFFLE WITH 2098-9544 DETECTOR.
2. USE 2098-9811 BAFFLE WITH 2098-9201 DETECTOR.
3. USE 2098-9817 BAFFLE WITH 2098-9576 DETECTOR.

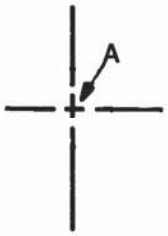
Baffle Installation
FIGURE 17

MAINTENANCE

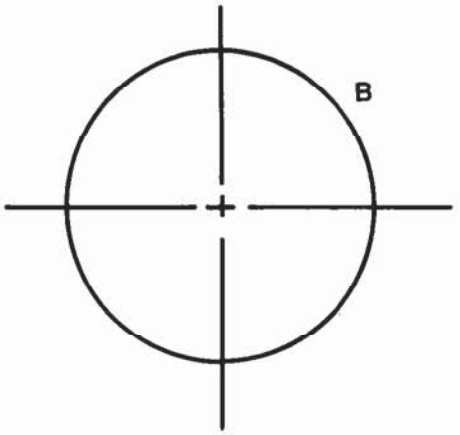
The duct detector sampling tube holes should be checked periodically for cleanliness, thus assuring easy air entry. Any dust or debris should be removed from tube or tube holes.

The maintenance program of the particular detector used should be carried out in accordance with the detector's installation instructions. Vacuuming the detector's air entry areas should be performed on a six-month basis, or as required.

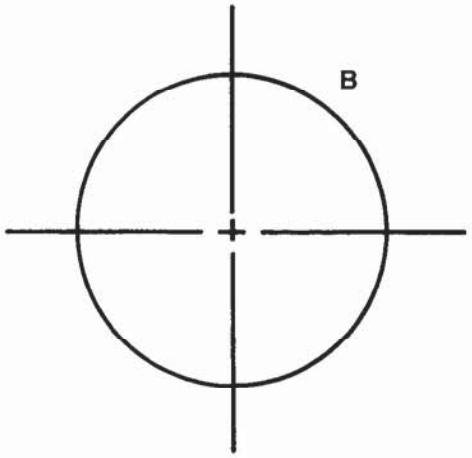
↑ BE CAREFUL WHEN TEARING OUT TEMPLATE AT PERFORATION. ↑



TOP



DRILL POINTS MARKED "A" ARE FOR SHEET METAL SCREWS.
HOLES ARE DETERMINED BY TABLE BELOW.
HOLES MARKED "B" ARE FOR SAMPLING AND EXHAUST TUBES. HOLES ARE 1.625" DIA.



METAL THICKNESS OF DUCT	"A" HOLE DIAMETER	DRILL BIT SIZE
.030" (.76mm)	.144" (3.7mm)	27
.062" (1.6mm)	.152" (3.8mm)	24
.093" (2.4mm)	.173" (4.4mm)	17

Template
FIGURE 18

Fire Alarm Station Operation

Single Action Stations 2099-9101, -9102, -9754, -9755 – Figure 1

Pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of an alarm and the actuation of annunciator contacts (if provided). The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the rod as shown in mounting drawing (see Figure 7).

Single Action Station with Pre-signal Alarm 2099-9107 – Figure 1

Pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of a pre-signal alarm, actuates the annunciator contacts (if provided), and exposes the general alarm key switch. Insert and turn the proper key to sound a general alarm. The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the rod as shown in mounting drawing (see Figure 7).

Signal Action Station with Institutional Cover 2099-9762 – Figure 2

Unlocking and opening the station causes the sounding of a general alarm. The station must be closed and locked before the fire alarm system can be returned to normal.

Double Action Stations (Break Glass) 2099-9103, -9104, -9105 – Figure 3

Breaking the glass with the hammer and pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of an alarm and the actuation of annunciator contacts (if provided). The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the glass plate as shown in the replacement drawing (see Figure 5) and replace the rod as shown in the mounting drawing (see Figure 7).

Double Action Station with Pre-signal Alarm (Break Glass) 2099-9108 – Figure 3

Breaking the glass with the hammer and pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of a pre-signal alarm, actuates the annunciator contacts (if provided), and exposes the general alarm key switch. Insert and turn the proper key to sound a general alarm. The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the glass plate (see Figure 5) as shown in the replacement drawing and replace the rod as shown in the mounting drawing (see Figure 7).

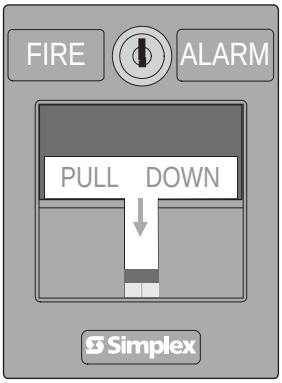
Double Action Station (Push Type) 2099-9756, -9757, -9758 – Figure 4

Pushing on the push bar and then pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of an alarm and the actuation of annunciator contacts (if provided). The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the rod as shown in mounting drawing (see Figure 7).

Double Action Station with Pre-signal Alarm (Push Type) 2099-9759 – Figure 4

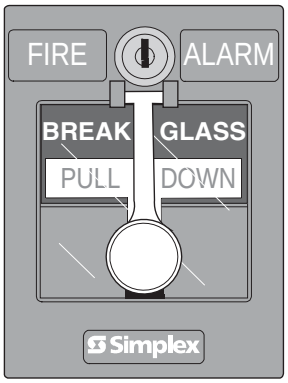
Pushing on the push bar and then pulling the handle down firmly to break the rod (visible below the handle) causes the sounding of a pre-signal alarm, actuates the annunciator contacts (if provided), and exposes the general alarm key switch. Insert and turn the proper key to sound a general alarm. The front of the station must be unlocked and opened to reset the handle before the fire alarm system can be returned to normal. Replace the rod as shown in mounting drawing (see Figure 7).

Note: (On all 2099 Stations)
Once installed, unlocking and opening the front of the station causes an alarm.

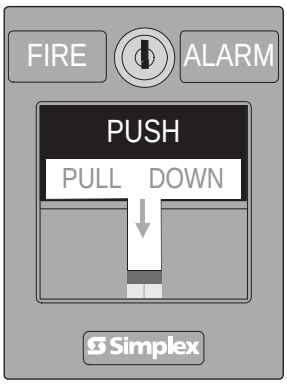


Single Action Station
Figure 1.

Single Action Station with Institutional Cover
Figure 2.



Double Action Station
Break Glass
Figure 3.



Double Action Station
Push Type
Figure 4.

Testing

Notify local authorities and operate station as in an actual alarm station. After testing, replace rod (and glass plate on glass double action units), reset the station, and restore the control panel.

Replacement of Glass on Double Action Break Glass Type – Figure 5

1. Swing Hammer (A) away from front of pull station.
2. Fit glass retainer (B) onto bottom of glass plate (C). Then fit top of glass plate behind tab.
3. Slide glass retainer (B) into station until it snaps into place.
4. Gently return hammer (A) to its normal position.

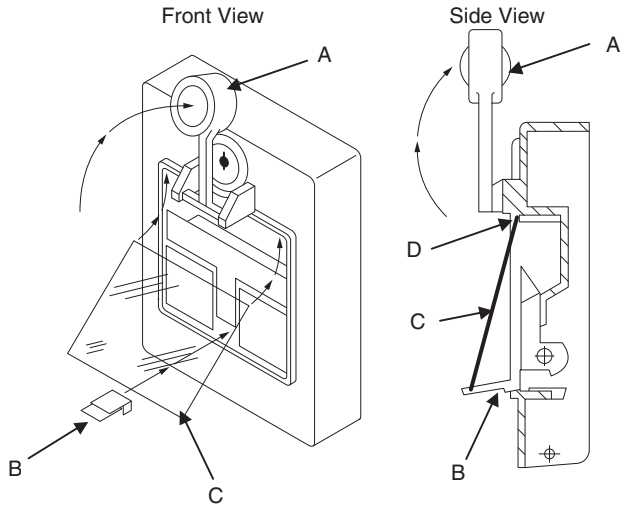


Figure 5. Double Action Station Glass Plate Replacement

Application

The National Fire Protection Association (NFPA), Bulletin number 72, gives specific minimum requirements on this subject. When manual station coverage appears limited in any way, additional units should be installed. Stations should be mounted with the bottom of the station not less than 3-1/2 ft. (1.07M) or more than 5 feet (1.52M) from the floor. Usually stations are mounted at the 4-1/2 ft. (1.4M) level.

In order to make building and facilities accessible to, and usable by the physically handicapped, some specifications may require that the station be installed not more than 3-1/2 ft. (1.07M) from the floor.

Stations should be located in the normal path of exit, and distributed in the protected area so that they are unobstructed and readily accessible.

Stations should be provided on each floor to obtain a travel distance of not more than 200 feet (60.96M) to the nearest station from any point in the building. One station should be provided for each floor where the maximum floor area is 10,000 square feet (929 sq. meters) or more. One station should be provided on the first floor and on each succeeding alternate floor if the areas to be protected are smaller than the limits as described above.

Mounting

For semi-flush mounting (Figures 6 and 8), use a standard 4” (10.16cm) square outlet box with a minimum depth of 2-1/8” (5.39cm) fitted with a 3/4” (1.9cm) deep single gang switch cover set flush (DO NOT RECESS) or protruding 1/16” (.16cm) from the wall surface.

Exception: The 2099-9103, -9754, -9755, -9756, or -9762 can be semi-flush mounted by using a standard single gang switch box 3” x 2” (7.62cm x 5.08cm) with a minimum depth of 2-1/2” (3.65cm) with conduit KO’s, set flush (DO NOT RECESS) or protruding 1/16” (.16cm) from the wall surface.

For surface mounting (Figures 7 and 8), use a 2975-9178 red steel back box or a 2975-9022 aluminum back box. Do not substitute a box with a depth less than 2-3/16” (5.55cm).

Exception: The 2099-9103, -9754, -9755, -9756, or -9762 can be surface mounted by using a wiremold box no. B-3 (formerly A-3).

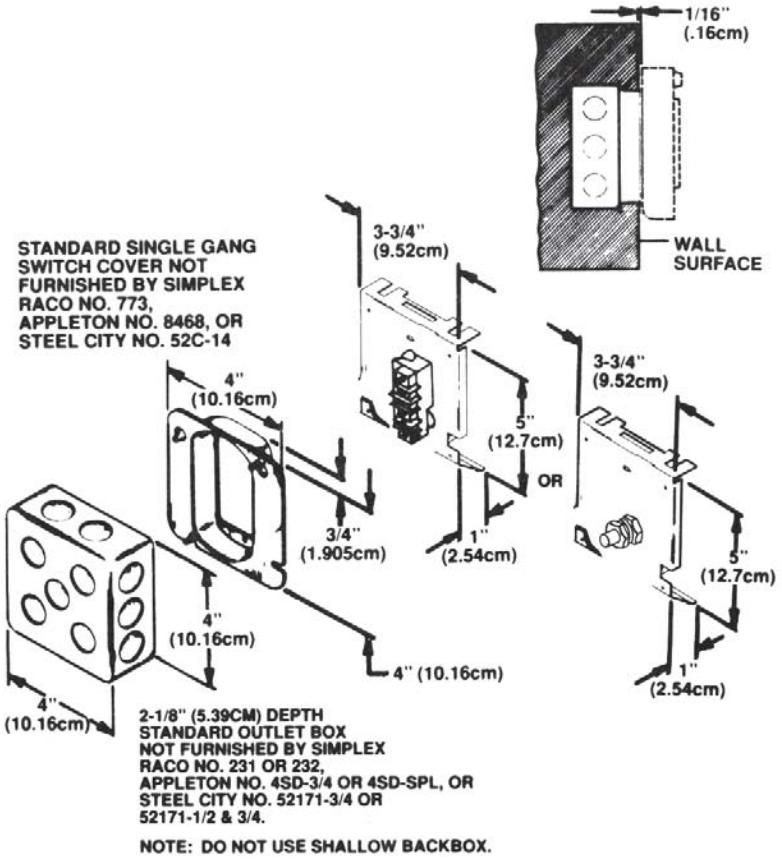


Figure 6. Semi-Flush Station Mounting

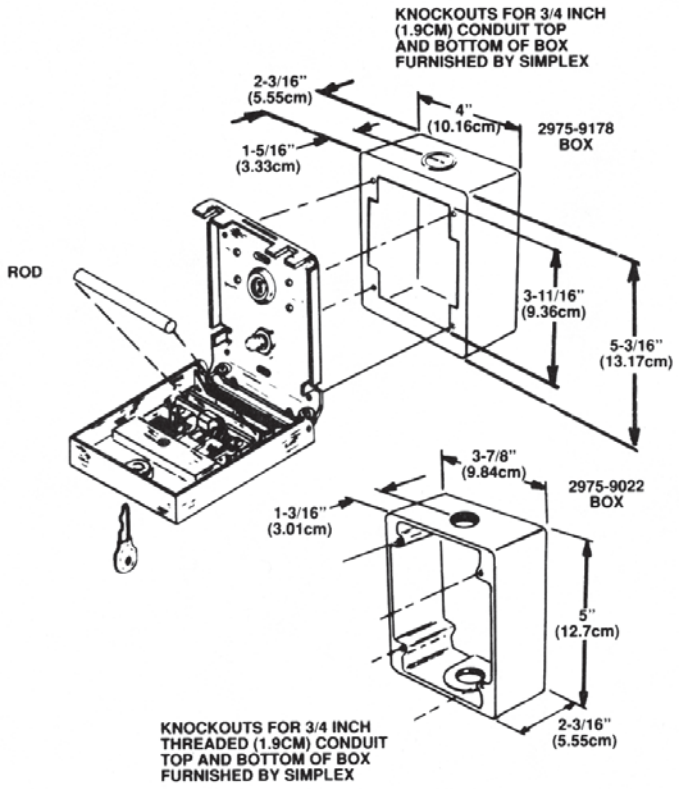


Figure 7. Surface Station Mounting

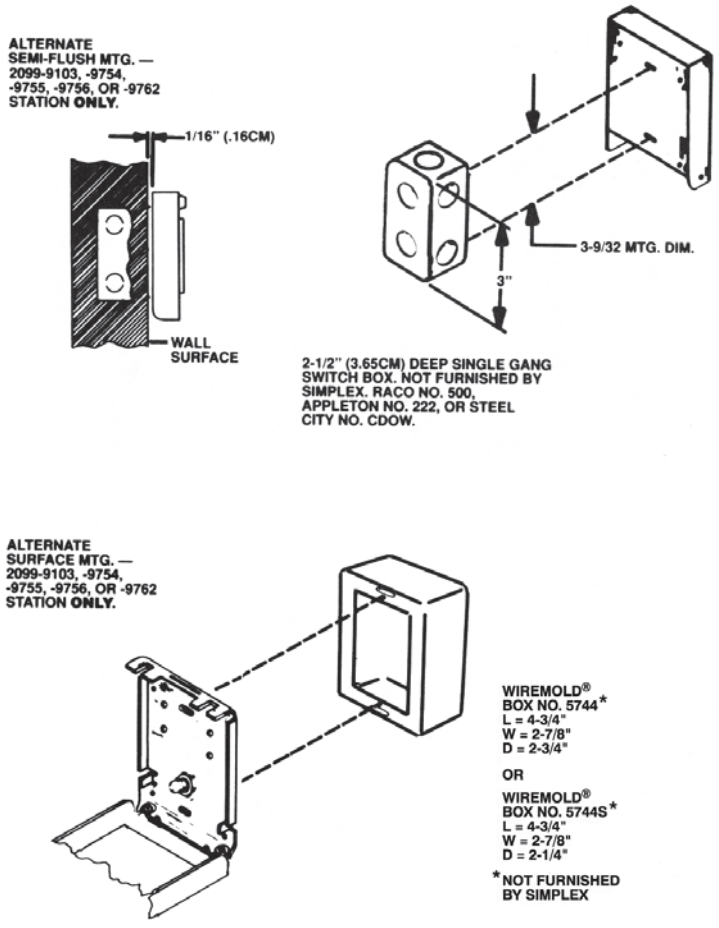
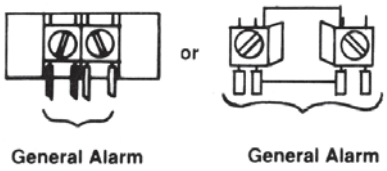
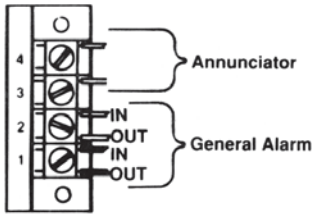
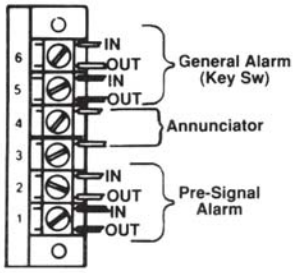


Figure 8. Alternate Semi-Flush and Surface Station Mounting

Wiring

Use No. 18 AWG minimum, No. 14 AWG maximum (Terminal Specification).

Caution: For System supervision, do not use looped wire under terminals. Break wire run to provide supervision of connections.

Station Type	Terminal Connections
2099-9103 2099-9754 2099-9755 2099-9756 2099-9762	
2099-9101 2099-9102 2099-9104 2099-9105 2099-9757 2099-9758	
2099-9107 2099-9108 2099-9759	

Features and Contact Arrangements

PRODUCT ID	SINGLE ACTION	GLASS DOUBLE ACTION	PUSH DOUBLE ACTION	PRE-SIGNAL	GEN. ALARM	ANUNN	LOCAL COVER Ⓐ	INST. COVER Ⓑ
2099-9101	X				NO	NO		
2099-9102	X				NO	NC		
2099-9103		X			NO			
2099-9104		X			NO	NO		
2099-9105		X			NO	NC		
2099-9107	X			NO	NO	NO		
2099-9108		X		NO	NO	NO		
2099-9754	X				NO			
2099-9755	X				NO		X	
2099-9756			X		NO			
2099-9757			X		NO	NO		
2099-9758			X		NO	NC		
2099-9759			X	NO	NO	NO		
2099-9762	X				NO			X

English Version Units

NO = Normally open contact (closed on Alarm)

NC = Normally closed contact (open on Alarm)

Ⓐ = Cover marking "Local"

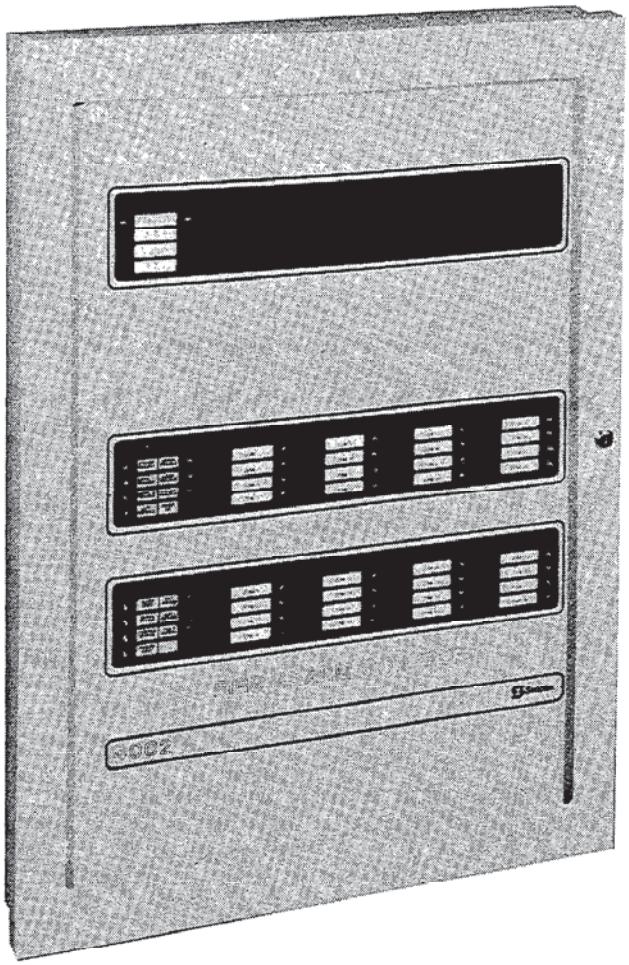
Ⓑ = Institutional cover marking "Key Operated only"

9388

Simplex

4002 Fire Alarm

Installation and Operating Instructions



FA4-21-151 (574-009)
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TABLE OF CONTENTS

PAGE

SECTION 1
- System Operation Description 3
  - Pushbuttons 4
  - Toggle Switches 4
  - Indicators 4
- Panel Displays
  - Normal Condition 6
  - Trouble Condition 6
  - Alarm Condition 6
- Operating 4002 Optional Equipment 6
- Control Panel Operating Instructions
  - Alarm Conditions 7
  - Trouble Conditions 7
  - Sprinkler Activation 8
- System Test Procedures
  - Battery Test 9
  - Walk Test™ 9
  - LED and Trouble Buzzer Test 10
  - Manual Evacuation Test (Drill) 10
- Graphic Representation Of Audible Zone Codes 11
- What To Do In Case Of Trouble 12
  - System Troubleshooting Chart 12

SECTION 2
- Installation
  - Introduction 16
  - General Notes 16
  - Installation Checklist 17
- Back Box Installation 18
- General Requirements For Fire Alarm Wiring 19
  - Plastic Pipe, Raceway, Cable 19
- System Wiring Specifications 19
  - Initiating Device Wiring 19
  - Notification Appliance Wiring 20
  - Control Circuits 20
  - Incoming Power 21
  - Earth Detection (Ground) 21
- Mounting and Wiring Peripheral Devices 21
  - Style B 21
  - Style D 22
- Checking System Wiring 22
  - Style B Initiating Device 22
  - Style D Initiating Device 22
  - Sprinkler Tamper Switch Circuit 22
  - Style Y Notification Appliance 22
  - Style Z Notification Appliance 23
- Re-Mounting Electronic Components in Back Box 23
- Terminations Of System Wiring 24
  - Initiating Device Circuit 24
  - Notification Appliance Circuit 24
  - Control Relay Circuit 24
  - Annunciator Output Circuit 24
  - City Relay 24
  - Special Zone Inputs 24
  - Connect Power to System 24
  - 2120 Connection 25
  - SCU/RCU Wiring 25
  - Fan Control Module 25

Setting DIP Switches, SW1, SW2 And SW3 25
Definitions Of System Functions 27
Normal Operation 27
Alarm Verification 27
Coded Input On Zone 1 28
Waterflow On Zone 7 28
Sprinkler Supervision On Zone 8 28
Signal Cutoff After 10 Minutes 28
Signal Silence Inhibit 29
2120 Connection Present In System 29
Walk Test™ Mode 29
Manual Evacuation Switch Enabled/Disabled 29
Signal Coding 29
Selective Signal Circuit Operation 30
ESP Program Mode 30
Walk Test™ 31
Re-Mounting Retainer and Door 31
Customer Information 31
Glossary of 4002 Fire Alarm System Terms 32

APPENDIX A — Expanded Simplex Programming Option 33
Selective Signal Circuit Operation 33
Selective Relay Control Operation 33
Selective Fan/Damper Control Relay Operation 33
Selective Door Holder Relay Control 34
Selective Bypass Control Switch Operation 34
Selective Switch Operation 34
Multiple Tamper Zones 34
Stage 1/Stage 2 Operation or Pre-Signal Operation 34
Cross Zoning 34
Timing Functions 34
Master Code 34
Non-Alarm Monitor Point Operation 34
Non-Latching Monitor Point Operation 34
Piezo Signal Operation 34
AC Power Fail (Control) 34
2120 Non-Default Operation 34
RCU Switch Non-Default Operation 35
SCU Point Matrix (Zone Grouping) 35
Elevator Recall with Alternate Floor 35
System Reset (Special Operation) 35
Point Sensing 35
PNIS Zone Coding 35

APPENDIX B — Fan Control Module
Features 36
Panel Connections 36
Field Connections 36
Switches 36
DIP Switch SW1 36
Switch SW2 37
Switch SW3 38
DIP Switch SW4 38
DIP Switch SW3 on CPU Module 38
Interconnection Diagram 39
Wire Length Chart in Feet 40

APPENDIX C — Battery Testing Information 41

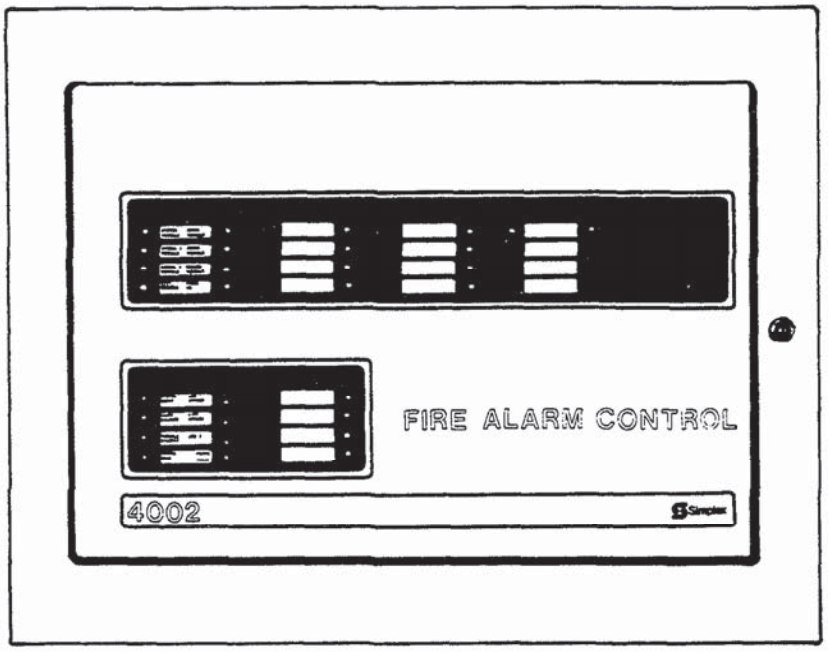


Figure 1 – 4002 Fire Alarm System

SYSTEM OPERATION DESCRIPTION

The 4002 is a battery-backed, U.L. listed, power-limited, electrically-supervised fire alarm system that, depending on its size, can operate up to six notification appliance (signal) circuits and monitor up to 32 zones of initiating device circuits. In addition, a 4002 can automatically control equipment such as fire doors, smoke dampers, fans and elevators during a fire condition.

The 4002 provides audible and visual indications during trouble or alarm (fire) conditions. Should either of the above occur, the system sounds the applicable notification device(s) and flashes the applicable LED (one of the yellow LEDs for trouble, one of the red LEDs for alarm). The indications continue until someone appropriately acknowledges the condition (presses the TROUBLE SILENCE or the ALARM SILENCE push button).

- Acknowledging the condition silences the notification device(s), causes the flashing LED to illuminate steadily and, in the case of an alarm, illuminates the ALARM SILENCED LED.

Note 1: If, following a trouble or alarm acknowledgement, another circuit or zone goes into trouble or alarm, the applicable LED flashes and, in the case of an alarm, the alarm notification device(s) resound.

Note 2: Once in alarm, the system remains in alarm until (1) the device that initiated the alarm is restored to normal and (2) the panel is reset.

The user interface with the system consists of controls and indicators which are mounted in the control panel. The purposes of these controls and indicators are as follows, and are shown on Figure 2.

4002 CONTROL PANEL
OPERATOR SWITCHES AND INDICATORS

a. **PUSH BUTTONS**

1. **SYSTEM RESET** – Used to reset the system following an alarm condition.

2. **ALARM SILENCE** – Used to stop alarm signal operation during an alarm condition.

3. **TROUBLE SILENCE** – Used to stop the panel trouble signal from sounding during trouble conditions.

4. **MANUAL EVAC** – Causes the alarm signals to operate. (Does not activate control relays or city disconnect). This pushbutton must be held in for 3 seconds to activate indicating appliances.

b. **TOGGLE SWITCHES**

1. **CITY BYPASS** – In the "UP" position, prevents the system from reporting an alarm condition to the municipal fire department and causes both the "system trouble" and "city trouble" LEDs along with the trouble signal to activate.

2. **AUX 1 BYPASS** – **A.** The UP position, prevents alarm relay #1 from energizing during an alarm condition and causes the "SYSTEM TROUBLE" LED and trouble signal to activate.

   B. Becomes inoperative if jumper JW12 is removed. The Aux 1 relay will operate like the piezo during a trouble condition. The "System Trouble" LED will illuminate when a trouble condition exists. Outputs of Aux 1 relay are silenced with the Trouble Silence push button.

3. **AUX 2 BYPASS** – The "UP" position, prevents alarm relay #2 from energizing during an alarm condition and causes the "system trouble" LED and the trouble signal to activate.

c. **INDICATORS** (amber LED's)

1. **SYSTEM TROUBLE** – Used to indicate abnormal conditions in the system.

2. **SIGNAL 1 TROUBLE** – Indicates a wiring fault (open or short) or a defective device in signal circuit #1.

3. **SIGNAL 2 TROUBLE** – Indicates a wiring fault (open or short) or a defective device in signal circuit #2.

4. **CITY TROUBLE** – Indicates either the "City Bypass" toggle switch in the bypass position or a wiring fault (open) between the panel and the municipal fire reporting system.

5. **ANNUN TROUBLE** – Indicates a problem within the annunciator or a wiring fault (open) between the panel and the annunciator.

6. **POWER TROUBLE** – Indicates either total or partial loss of AC power (brown out conditions) or battery is disconnected.

7. **GROUND TROUBLE** – Indicates a ground fault in the system.

8. **POWER ON** – Indicates AC power is applied to system. This is a **green** LED.

9. **ALARM SILENCED**– Indicates Alarm Evacuation Signals have been silenced.

10. **ZONE** – From 8 to 32 **red "ALARM"** LEDs and an equal number of **amber "TROUBLE"** LEDs.

- Each "ZONE ALARM" LED indicates an alarm condition (fire) in its zone; each "ZONE TROUBLE" LED indicates a trouble in its zone.

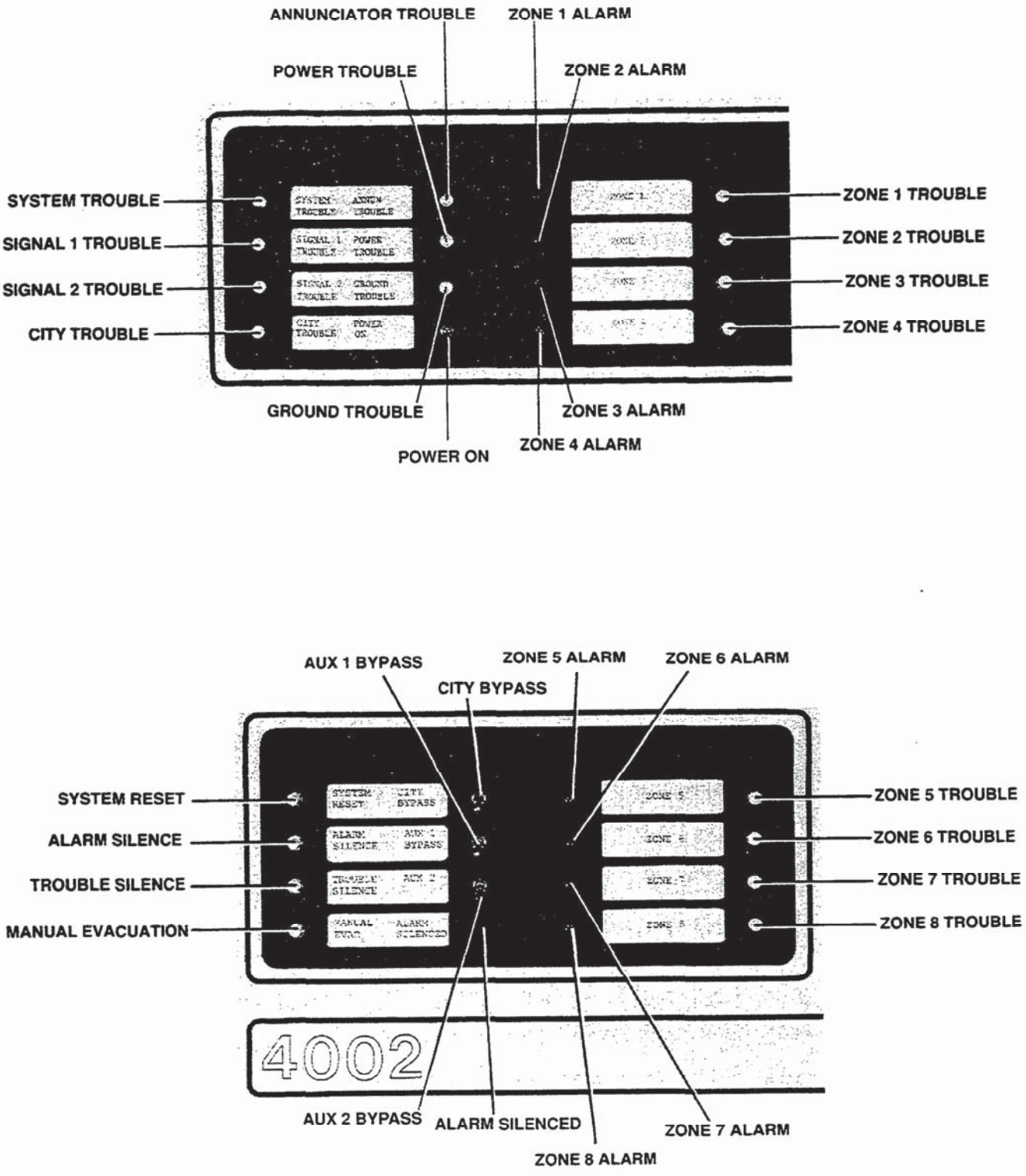


Figure 2 – 4002 Operator Switches And Indicators

4002 PANEL DISPLAYS
NORMAL, TROUBLE AND ALARM CONDITIONS

- **Normal Condition**
  - Green "POWER ON" LED on.
  - All other panel indicators off.
- **Trouble Condition**
  - System Trouble buzzer sounds continually.
  - One or more amber "TROUBLE" LEDs on.
- **Alarm Condition (Non-ESP)**
  - All signals sound.
  - AUX and city relays activate.
  - One or more "ALARM" LEDs flash.
  - System trouble buzzer sounds at a march time cadence (120 pulses per minute).

Note: The following Software functions will affect the ALARM SILENCE operation.

a. *Selective coded station input* – Indicating appliances cannot be silenced when zone 1 is in alarm. The indicating appliances will be silenced automatically when coding is complete. The flashing zone LED will change to a steady state when the code is completed.

b. *Waterflow Sprinkler On Zone 7* – Indicating appliances cannot be silenced if water is flowing in the sprinkler system.

c. *Alarm Silence Inhibit* – Programmed for 1, 3, or 5 minutes.

d. *Signal Cutoff* - After 10 minutes of continuous operation, signals silence automatically.

- Signals can be manually silenced at any time.

OPERATING 4002 OPTIONAL EQUIPMENT

- **ESP Programming Option (See Appendix A)**
  - System programmed to meet customer requirements.
  - Provides 23 additional functions.
- **Fan Control Module (See Appendix B)**
  - Provides hand/OFF/automatic (HOA) operations for climate and smoke control.

4002 FIRE ALARM SYSTEM OPERATING INSTRUCTIONS FOLLOWING AN ALARM/TROUBLE CONDITION

YOUR SAFETY AND THE SAFETY OF THOSE AROUND YOU ALWAYS COMES FIRST!
Actions taken during a fire depend upon local practices. Be sure you know what to do.

HOW TO OPERATE THE PANEL DURING AN ALARM SITUATION:

- Identify the zone in alarm via the control panel indicators. Follow Local Procedure to investigate that zone to determine the cause of the alarm. (Pull station activated, smoke detector activated etc.)
- After all occupants are evacuated, unlock and open the panel door.
- To silence signals, press the alarm silence push button.
  - Audible signals are silenced, alarm silenced LED illuminates, and any red zone indicator that was flashing comes on steady. If another alarm is reported from another zone, the alarm signals sound again, the alarm silenced LED turns OFF, and the red indicator representing the zone in alarm flashes until the audible signals are again silenced.

HOW TO RESET THE FIRE ALARM SYSTEM FOLLOWING AN ALARM CONDITION:

- When the alarm situation has been cleared, restore or replace all affected alarm-initiating devices (pull stations and detectors) in accordance with the instructions provided with each device.
- Press and hold the SYSTEM RESET switch until LEDs illuminate (see Note below).
  - The trouble buzzer sounds for 2 seconds and LEDs illuminate for approximately 5 seconds.

WHAT TO DO IN CASE OF TROUBLE:

- Notify appropriate personnel.

NAME _____ **ADDRESS** _____ **PHONE NUMBER** _____

- Unlock and open panel door.
- If tone device is sounding, press the trouble silence push button.
- Refer to the 4002 Customer Instructions manual for additional instructions or call a local Simplex Branch Office for assistance.

Note: The following options affect the system as follows:

- Waterflow/Sprinkler – you cannot silence an alarm or reset the system if water is flowing in the sprinkler system.
- Coded Input On Zone 1 – the signals cannot be silenced while a code is being transmitted.
- ESP (Expanded Simplex Programming)
- Silence Inhibit – you cannot silence an alarm or reset the system until the specified time period has elapsed.
- Custom Project Specific Software Programming

THESE INSTRUCTIONS ARE INTENDED TO BE FRAMED AND MOUNTED ADJACENT TO THE CONTROL PANEL FOR READY REFERENCE.

Refer to the Customer's Instructions for a detailed description of system operation.

HOW TO OPERATE THE PANEL 4002 CONTROL PANEL DURING AND AFTER SPRINKLER SYSTEM ACTIVATION

The panel, when programmed in software for this function, indicates one or more sprinkler water flow devices connected to zone 7 are in alarm by:

a. Flashing zone 7 red "ALARM" LED.

b. Sounding the "sprinkler alarm" (general alarm signals) and designated signal circuit 2.

c. Piezo sounds "FAST MARCH TIME" signal.

Note: The designated sprinkler alarm signal(s) on signal circuit #2 cannot be silenced while the sprinkler system is active.

Actions to take:

a. Investigate the cause of the sprinkler system alarm. It could be a fire. **If NO FIRE or WHEN THE FIRE IS OUT, continue.**

b. Turn off the water supply valve for the sprinkler system.

c. Zone 8 "ALARM" LED flashes.

d. Press the "ALARM SILENCE" push button to silence signals.

- "ALARM SILENCED" LED illuminates
- The general alarm signals and piezo are silenced.
- Zone 7 red "ALARM" LED goes on steady.
- Zone 8 red "ALARM" LED goes on steady until someone turns the sprinkler system water supply valve back on, then it will automatically go off.

e. Restore or replace sprinkler heads in accordance with the instructions provided with the devices.

f. Recharge the sprinkler system in accordance with the directions provided with the sprinkler system.

- During the recharging period, zone 7 "ALARM" LED glows steady.

g. When the sprinkler system is fully charged, press the "SYSTEM RESET" push button.

- The "ALARM" LEDs go off.

Note: Until the sprinkler system is fully charged, waterflow may be **detected by the panel and the fire alarm system may go into alarm again. You may have to repeat this procedure several times while recharging the sprinkler system.**

4002 FIRE ALARM SYSTEM
TEST PROCEDURE

Note: This procedure should be followed when the system is installed during periodic tests required by code. Check with local codes to determine how frequently your system should be tested. Inform appropriate personnel that you will be testing the fire alarm system. Then unlock and open the panel door. Remove the panel retainer plate (two "squeeze clips" hold it in place).

BATTERY TEST

a. Check battery power as follows:

1. Remove AC power from panel by disconnecting the main power feed.
2. Silence the trouble signals by pressing the "TROUBLE SILENCE" push button.
3. Wait five minutes.
4. Activates the "MANUAL EVAC" switch. Allow the system to sound for 2 minutes.
5. Using a meter, read across the pins of P5 (found on the bottom-left of the CPU board [see Figure 4, page 15]).
   - Voltage must exceed 20VDC (if less than 20VDC, call your local Simplex Branch office).
6. Apply AC power to the panel.

Note: See Appendix C for additional battery testing information.

WALK TEST™

a. Put the panel in its *Walk Test™* mode as follows:

1. (See Figure 3) Transfer program DIP switch SW2-1 to OFF.
   - For location of SW2, see Figure 4 (page 15).
2. Press the SYSTEM RESET push button. The panel's LEDs will all light (except POWER and GROUND TROUBLE) then the panel will indicate SYSTEM TROUBLE and CITY TROUBLE. The city circuit is disabled during the walk test.

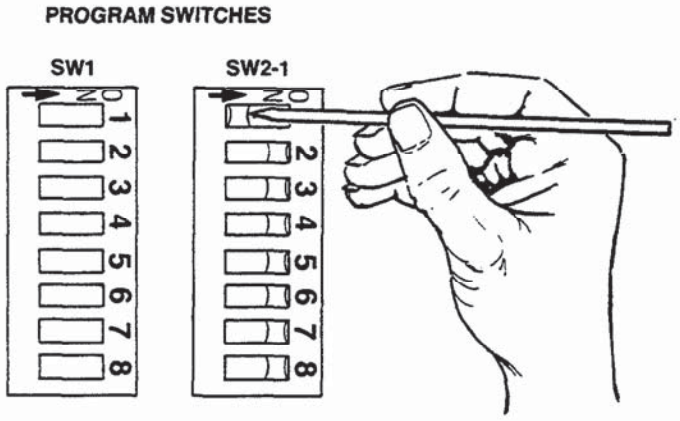


Figure 3 – DIP Switch SW2 Position 1

3. Activate each of the system's alarm initiating devices (pull stations, smoke detectors, heat detectors etc.).
   - The signals will sound a "zone identification" code following the activation of any alarm initiating device (See CODE CHART ON PAGE 11).
   - After the code, the system resets itself in approximately 5 seconds.

Note: Smoke detector and rate-of-rise heat detectors may require more than five seconds to clear, and hence may cause the system to reissue the previous code.

4. Test for electrical supervision of wiring to each device as follows:

    1. Disconnect a wire from each device (in the case of a smoke detector, remote it from its base).

    2. Reconnect the wire or reinstall the smoke detector head.

        - The signals should sound for four seconds each time a wire is disconnected or a smoke detector head is removed.

    Note: Failure of the signals to sound indicates an improperly wired zone circuit, signal circuit or smoke detector base.

IMPORTANT: *Upon completing the system Walk Test™:*

- Return DIP switch SW2-1 to its ON position.
- Install the panel frontplate.
- Press the SYSTEM RESET push button.
- Notify appropriate personnel that the test has been completed.

LED AND TROUBLE BUZZER TEST

Press the SYSTEM RESET push button for approximately two seconds.

- The trouble buzzer will sound for approximately 2 seconds.
- Except for the "POWER TROUBLE," "GROUND TROUBLE," and those for signal circuits 3 and above, all panel LEDs must light for about 5 seconds.

MANUAL EVACUATION TEST (DRILL)

a. Perform "Manual Evacuation Test" as follows:

    1. Inform appropriate personnel that you will be testing the fire alarm system.

    2. Unlock and open the fire alarm panel door.

    3. Press and hold the "MANUAL EVAC" push button IN for 3 seconds.

    The notification appliances will sound to alert personnel within the building. The notification appliance will continue to sound until silenced by pressing the "ALARM SILENCE" or the "SYSTEM RESET" push button.

    Note: Manual evacuation tests do not activate the auxiliary relays or the municipal fire department city connections.

        • Should a valid alarm initiation occur during a manual evacuation test, the auxiliary relays and the city circuit connections activate.

GRAPHIC REPRESENTATION OF AUDIBLE ZONE CODES

a. If "*simple coding*" is programmed in your system to identify the zone where a fire condition exists, a zone code repeats on the alarm signals until the alarm is silenced.

b. If a *Walk Test™* is being performed, a zone code sounds once on the alarm signals before the panel automatically resets itself.

c. Each long dash (—) represents a half-second-long signal pulse.

d. Each short dash (–) represents a quarter-second-long signal pulse.

Zone No.	Zone Identification Code	Description
1 =	—	1 long
2 =	— —	2 long
3 =	— — —	3 long
4 =	— — — —	4 long
5 =	— — — — —	5 long
6 =	— — — — — —	6 long
7 =	— — — — — — —	7 long
8 =	— — — — — — — —	8 long
9 =	— — — — — — — — —	9 long
10 =	— – –	1 long, pause, 2 short
11 =	— —	1 long, pause, 1 long
12 =	— — —	1 long, pause, 2 long
13 =	— — — —	1 long, pause, 3 long
14 =	— — — — —	1 long, pause, 4 long
15 =	— — — — — —	1 long, pause, 5 long
16 =	— — — — — — —	1 long, pause, 6 long
17 =	— — — — — — — —	1 long, pause, 7 long
18 =	— — — — — — — — —	1 long, pause, 8 long
19 =	— — — — — — — — — —	1 long, pause, 9 long
20 =	— — – –	2 long, pause, 2 short
21 =	— — —	2 long, pause, 1 long
22 =	— — — —	2 long, pause, 2 long
23 =	— — — — —	2 long, pause, 3 long
24 =	— — — — — —	2 long, pause, 4 long
25 =	— — — — — — —	2 long, pause, 5 long
26 =	— — — — — — — —	2 long, pause, 6 long
27 =	— — — — — — — — —	2 long, pause, 7 long
28 =	— — — — — — — — — —	2 long, pause, 8 long
29 =	— — — — — — — — — — —	2 long, pause, 9 long
30 =	— — — – –	3 long, pause, 2 short
31 =	— — — —	3 long, pause, 1 long
32 =	— — — — —	3 long, pause, 2 long

WHAT TO DO IN CASE OF TROUBLE

a. Notify appropriate personnel that the system is in trouble.

b. Unlock and open the panel door. Then press the TROUBLE SILENCE push button.

c. Check to see what the panel's symptoms are. Then perform the action which applies to those symptoms as described in the SYSTEM TROUBLESHOOTING CHART. See Figure 4 (page 15) for location of components identified on the troubleshooting chart. The troubleshooting chart is located on pages 12 through 14.

SYSTEM TROUBLESHOOTING CHART

IMPORTANT

Corrective actions which follow asterisks should be performed only by a Simplex technician or a qualified electrician.

Symptom	Probable Cause	Corrective Action
# 1. Zone "ALARM" LED is on, and system cannot be reset	• Pull station activated	Restore pull station.
	• Smoke detector alarm indicator on steady	Reset or replace smoke detector.
	• Duct smoke detector alarm indicator on steady	Reset or replace duct detector.
	• Heat detector activated	Restore or replace heat detector.
	• Waterflow device activated	Restore waterflow device.
	• Zone circuit shorted	* Clear shorted line condition. (The E.O.L. resistor's 3.3K ohms should be read between the zone terminals.)
# 2. Both "SYSTEM TROUBLE" and one or more "ZONE" Trouble LEDs are on.	• Alarm initiating device (smoke det, pull station) removed from zone	Replace alarm initiating device.
	• Open connection in zone wiring	* Repair the open line condition. (The E.O.L. resistor's 3.3K ohms should be read between the zone terminals.)
	• Defective module in fire alarm panel	Call Simplex
# 3. "POWER ON" LED is off	• Fire alarm 120VAC circuit breaker tripped	Reset breaker.
	• Fuse F2 in panel open	Replace fuse F2 (8 Amp) (see page 15, Figure 4).
	• Low AC voltage or "brownout" condition (brown-out voltage is 102 VAC or less)	* Check power distribution in building.

Symptom	Probable Cause	Corrective Action
# 4. "SYSTEM TROUBLE" LED in on (all other trouble LEDs are off)	• Manual switch(es) are not in the normal position.	Restore switch(es) to normal position.
	• A remote annunciator's RESET or SILENCE switch not in the normal position	Restore to normal position.
	• Transformer connection P4 not connected	Connect the transformer cable to P4.
	• Open card supervisory loop	Ensure all interconnecting harnesses are connected.
# 5. Both "SYSTEM TROUBLE" and "POWER TROUBLE" LEDs are on	• Battery fuse F3 open	Replace F3 (8 amp) fuse.
	• Battery connections are not connected	Check battery connection at batteries and connector P5.
# 6. Both "SYSTEM TROUBLE" and one or more "SIGNAL" Trouble LEDs are on	• Alarm notification device removed from circuit (bell, horn, A/V unit)	Replace alarm notification device.
	• Open connection on signal circuit	* Repair the open line condition. (The E.O.L. resistor's 10K ohms should be read between the signal terminals).
	• Electrical short in signal circuit	* Repair the short circuit condition. (The E.O.L. resistor's 10K ohms should be read between the signal terminals).
	• Defective fuse F7	Replace Fuse F7 (3 amp).
# 7. Both "SYSTEM TROUBLE" and CITY TROUBLE LEDs are on	• CITY BYPASS switch not in its normal position	Restore to normal position.
	• Configuration jumpers incorrectly set	Set jumper correctly.
	• Open in city circuit field wiring	* Repair the open line condition.
# 8. Both "SYSTEM TROUBLE" and "GROUND TROUBLE" LEDs are on	One or more conductors are shorted to ground	* Remove field wiring from connectors one pair at a time until ground fault clears.
# 9. Both "SYSTEM TROUBLE" and "ANNUN TROUBLE" LED's are on	• Burned out LED in annunciator	* Depress SYSTEM RESET to check annunciator LEDs.
	• Open connection between panel and annunciator	* Repair open line condition.
	• Serial annunciator not installed in system	Set SW3 to all closed positions.
	• DIP switch SW3 settings incorrect	Set SW3 to indicate correct number of serial annunciators in system.
	• DIP switch SW11 settings incorrect	Set SW11 to indicate correct number of supervised annunciators. See Wire Diagrams.
	• Defective annunciator	Call Simplex
	• Defective module in fire alarm panel	Call Simplex

Symptom	Probable Cause	Corrective Action
#10. System fails to go into alarm	• Defective alarm initiating device	Replace device.
	• Zone circuit incorrectly wired (electrical open between panel and initiating device)	* Correct wiring fault in zone circuit.
	• Defective module in fire alarm panel	Call Simplex
#11. No output to devices connected to AUX relay(s) on TB4	• Defective device	Repair or replace device.
	• N.O. or N.C. wiring incorrect	Correct wiring.
	• Defective fuse(s)	Replace Fuse F4 or F5 (3 amps).
	• Incorrectly programmed.	* Program correctly.
#12. "SYSTEM TROUBLE" and several "Zone trouble" LEDs are flashing	• Defective 24 volt power supply	Call Simplex
	• Fuse F9 defective	Replace fuse F9 (3 amps).
#13. "SYSTEM TROUBLE" and "Signal 2 Trouble" LEDs are flashing and the Piezo is sounding.	• Defective notification appliance	* Repair or replace defective device.
	• Fuse F6 defective	Replace fuse F6 (3 amps).

NEED HELP?

CALL YOUR LOCAL SIMPLEX BRANCH OFFICE, WHICH IS LISTED IN THE YELLOW PAGES, FOR ALL MALFUNCTIONS NOT LISTED IN THE ABOVE TROUBLESHOOTING CHART, OR IF YOU WOULD LIKE A QUALIFIED SIMPLEX TECHNICIAN TO ASSIST YOU WITH INSTALLATION, TESTING, AND TROUBLESHOOTING THE SYSTEM.

4002 MAIN C.P.U.

COMPONENT LOCATIONS

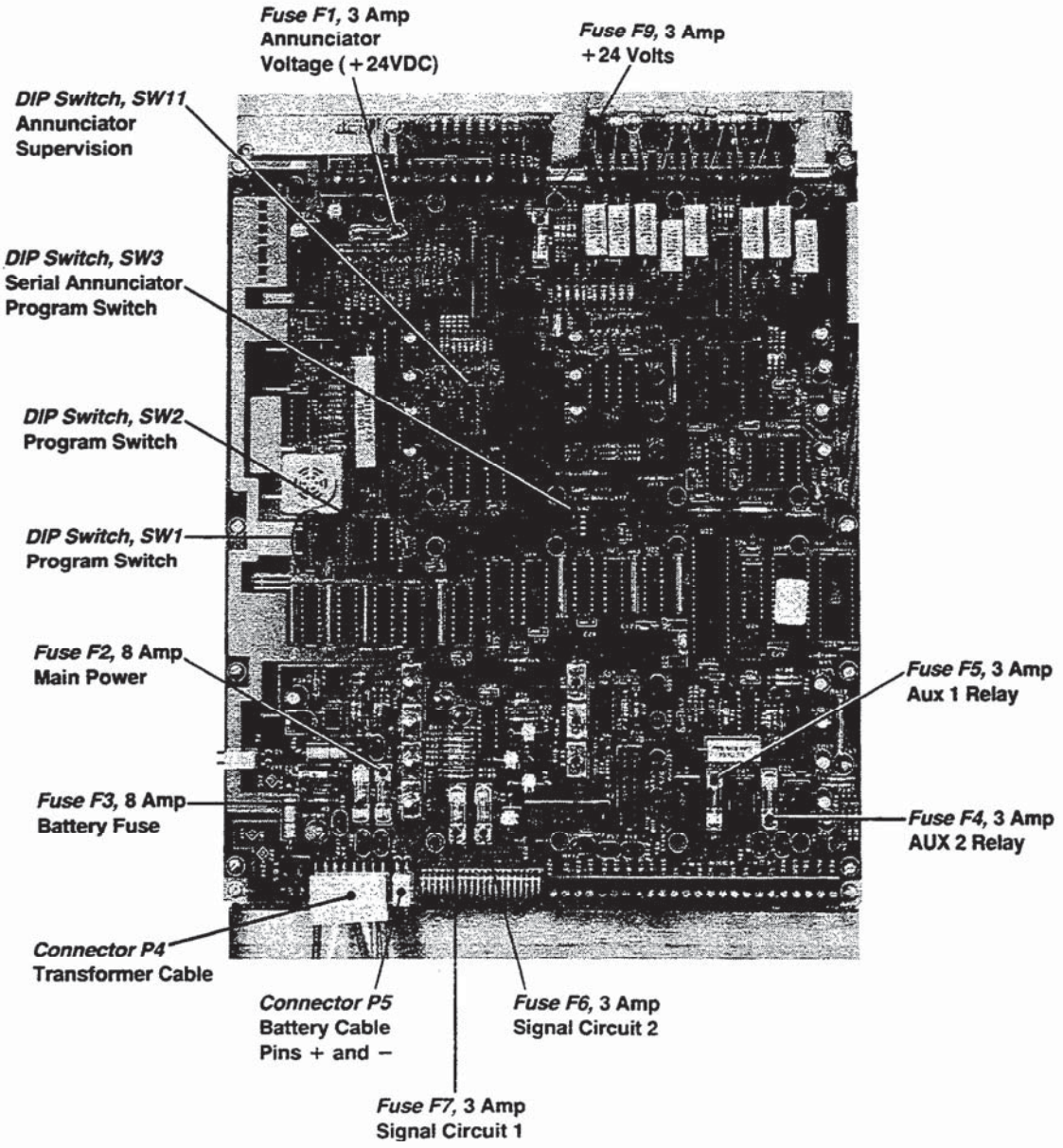


Figure 4 – Component Locations

CAUTION

NEVER REMOVE OR REPLACE CABLES OR WIRES WITH POWER APPLIED TO THE SYSTEM

To power down the system:	To power up the system:
1. Disconnect either of the battery's terminals.	1. Turn on system power at the AC breaker.
2 Turn off system power at the AC breaker.	2 Apply battery power.

INSTALLATION INSTRUCTIONS

INTRODUCTION

This section provides both information and instructions on the 4002 fire alarm system wiring. It is important that you read this section and utilize the 4002 field wiring diagrams 841-669 and 841-687 which accompany the control panel to install your fire alarm system.

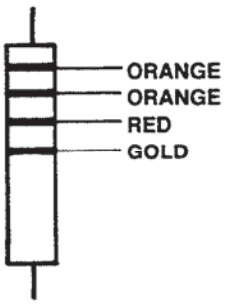
- To help you in the installation of this and other Simplex fire alarm systems, the following publication has been made available for general reference: **How to Wire a Building for a Fire Alarm System** (Simplex Publication No. FA2-91-001).

General Notes

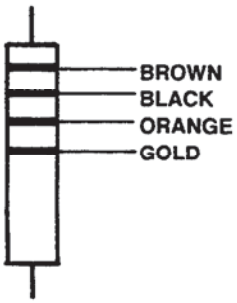
a. When running wires to the control panel, identify and tag all wires appropriately: 120 VAC or 220/240 VAC power; signal circuit 1; zone 1, zone 5 etc.; and identify all "+" and "-" wires by color code or numerical sequence.

b. The panel's terminal strips are labeled with a terminal strip number (TB1, TB2, etc.), and each terminal is designated by a terminal number (1, 2, 3, etc.). Therefore, TB1-1 is terminal 1 on terminal strip 1, TB3-2 is terminal 2 on terminal strip 3, etc. In addition, each terminal is identified by an abbreviation of the circuit function to be connected. For example, zone 1 = ZN1+, ZN1−, signal circuit 2 = S2B+, S2B−; annunciator output from zone 5 = ANN 5−.

c. Use the color code shown in Figure 5 to determine E.O.L. resistor values. E.O.L. resistors are provided as part of the System Support Material when shipped. A 1,000 ohm (1k, 1 W) resistor is provided for the city relay termination, and should be installed when city connections are not required. Terminate all unused zone circuits with 3.3k ohm resistors. Terminate all unused signal circuits with 10K ohm resistors.



Zone Circuit E.O.L. Resistor
3,300 ohm (3.3k, 1 W)



Signal Circuit E.O.L. Resistor
10,000 ohm (10k, 1/2 W)

Figure 5 – E.O.L. Resistors

d. All wiring should be done in accordance with local codes and the National Electrical Code, Article 760.

e. **Remember:** A neatly wired panel helps assure accurate inspection of terminal connections and simplifies troubleshooting.

INSTALLATION CHECKLIST

- This section provides a systematic 10 step method for installing a 4002 fire alarm system.
- Use the field wiring diagram *#841-669* and *841-687* as reference.
- Upon completion of a step, check the appropriate box.
- Detailed instructions for each installation step can be referenced on the pages noted.
- Common hand tools and a volt/ohm meter are required to perform this installation.

STEP #	ACTION REQUIRED	FOR DETAIL, REFER TO PAGE NUMBER
☐ 1.	Mount Control Panel Back Box (Less internal electronic subassemblies)	18
☐ 2.	Install System Wiring throughout building for zone, signal, control and input power circuits (including system ground connection). Tag each wire at the control panel location.	19
☐ 3.	Install all peripheral devices (stations, detectors, horns, bells, etc.) and end-of-line resistors.	21
☐ 4.	Check all system wiring with a volt/ohm meter for shorts, opens, grounds or extraneous voltages.	22
☐ 5.	Re-mount electronic sub-assemblies in the control panel back box. Re-make all factory harness connections.	23
☐ 6.	Terminate all system wiring at the specified terminal locations.	24
☐ 7.	Program basic system functions via DIP switch SW1 and SW2.	25
☐ 8.	Perform a complete system test of all device using "walk-test" mode.	31
☐ 9.	Mount retainer panel and door on cabinet. Connect door ground wire to box.	31
☐ 10.	Instruct owner's representative on system operation.	31

STEP #1

BACK BOX INSTALLATION

4002 Back Boxes may be shipped with or without their electronic components, and come in three different sizes. The procedures listed below should be used when installing a back box with electronic components. Details for mounting a back box without electronic components are shipped with the empty back boxes.

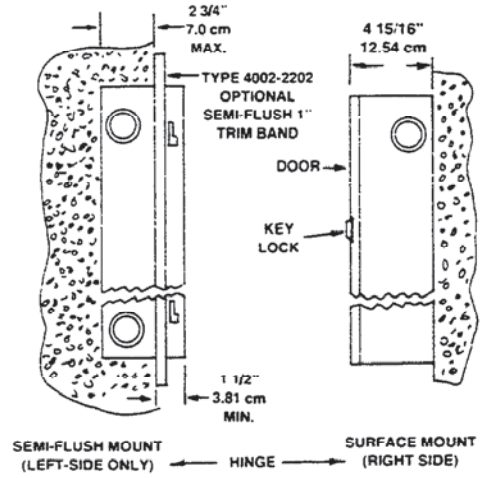
A. *Systems With Electronic Components*

1. Carefully open the shipping container.
2. Inventory the contents of the shipping container to ensure complete shipment of the required materials. (See packing list.)
3. Remove the panel door box from the shipping container.
4. Remove the back box from the shipping container and lay the unit on a flat surface.
5. Remove the retainer (internal door) by squeezing and pulling the two black plastic tabs located on the upper center of the retainer. Lift the retainer from the back box.
6. Carefully *mark* one end of each interconnection cable.
7. Remove *one end* of all interconnection cables from the electronic assemblies.
8. *Loosen* the screws holding the small upper and lower rack sets and remove them from the back box (none in #2 units). *Loosen* the screws holding the large rack set that contains the CPU module (located on the left side of the back box) and remove the large rack set from back box. The electronic assemblies and one end of the cables and wiring harness should remain mounted to these rack sets.

Note: The use of a grounded wrist strap is recommended when removing/replacing the rack sets.

9. Store the electronic assemblies in the shipping container.
10. Place the retainer in the shipping container.
11. Place the panel door box in the shipping container.
12. Store the shipping container in a safe, clean, and dry location until the back box installation and the system field wiring is completed, and you are ready to reassemble the control panel as instructed on page 23.
13. Mount the back box as shown in Figure 6.

Note: For semi-flush mounting, the back box must be extended 1 1/2 inches from the finished wall. Page 23 of this manual contains details for remounting the electronic components into the back box.



NOTE: USE TOP SMALL KNOCKOUTS FOR SEMI-FLUSH MOUNTING AND LEFT HAND HINGE ONLY.

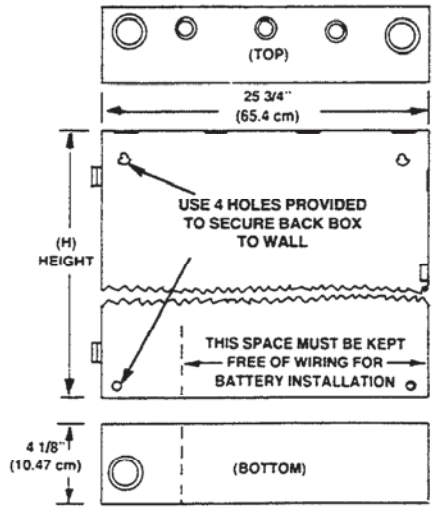


Figure 6 – Back Box Mounting Instructions

PRODUCT IDENTIFICATION NUMBER	DESCRIPTION		HEIGHT (H)
	SIZE	WEIGHT	
2975-9184 2975-9185	2 UNIT	55.50	20 3/4" (52.7 cm)
2975-9186 2975-9187	4 UNIT	78 50	36 1/4" (92.1 cm)
2975-9188 2975-9189	6 UNIT	106 50	52 1/8" (132.4 cm)

NOTE: WEIGHT IS IN POUNDS, AND DOES NOT INCLUDE BATTERIES.

STEP #2

GENERAL REQUIREMENTS FOR FIRE ALARM WIRING

Note: These wiring specifications are subject to local codes, and are not intended to circumvent any required codes, laws, or regulations.

- Only copper conductors may be used.
- All wiring, except ground connection wiring, must be free from shorts and have a minimum resistance of one megohm to ground.
- Metallic conduit, metallic raceway, plastic pipe, plastic raceway or approved fire alarm cable may be used.

Note: When using metallic conduit, and the continuity of the conduit is not maintained, a 12 AWG drain wire (ground) must be connected between the break in the conduit installation.

- Only fire alarm system wiring may be run in the same conduit, raceway or multiconductor cable.
- Each peripheral device (pull station, detector, horn, bell, etc.) must have its own enclosure (back box, outlet box, etc.) per instructions provided with each device.
- All wiring shall be terminated with U.L. listed devices (wire nuts, pressure connectors, etc.). Wiring terminated with only electrical tape is not permitted. All splicing (free ends of conductors) shall be covered with an insulation equivalent to that of the conductors.

REQUIREMENTS WHEN USING PLASTIC PIPE, PLASTIC RACEWAY, OR APPROVED FIRE ALARM CABLE

- When a system wire is adjacent and parallel to other building wire runs, a minimum of 6 in. shall be maintained between the different wire runs.
- When a system wire is to cross over other building wires, the system wires shall cross at a 90° angle and have a minimum of 6 in. separation.
- All fire alarm cables entering an electrical box must be provided with a connector that provides strain relief and protection for the cable.
- All fire alarm cables shall be separated by at least 3 ft. from every heat-radiating recessed fixture (for example, a high-hat fixture). Furthermore, cables shall not be installed in direct contact with lay-in fixture ballasts.
- Where fire alarm cables are exposed to the weather, the cables shall be shielded or run in metallic raceway with approved weatherproof or rain-tight fittings.

SYSTEM WIRING SPECIFICATIONS

Initiating Device Wiring (Zone Circuits) Use Field Wiring Diagrams #841-687 and 841-669.

Devices connected: Pull Stations, Heat Detectors, Smoke Detector, etc.

Wiring: – Up to 32 circuits with either two wires (for Style B operation) or four wires (for Style D operation) per circuit. Each Style B, 2 wire circuit terminates with a 3.3K ohm E.O.L. resistor at the last device.

Zone wire resistance must not exceed 50 ohms, and its total wire length must not exceed *5,000* ft. Style B or *2,500* ft. Style D.

STEP #2 cont.

Notification Appliance Wiring (Signal Circuits) Use Field Wiring Diagrams #841-687 and 841-669.

Examples: Horns, bells, visual units, etc.

The chart below should be used to determine the wire lengths in a 2-wire parallel DC signal circuit.

Note 1: Calculate the total current for all devices to be powered by a circuit. This is accomplished by adding current requirements for each device on a circuit. Then use the "TOTAL CURRENT IN CIRCUIT" column to determine wire length.

Note 2: Current draw of typical indicating appliances are:

Lamp – .075 A
Bell – .110 A
Horn – .035 A
Visual Devices – .070 A

NOTE 3.
Line distance was determined based on .11A per device and the devices spaced at equal distances. (For circuits where all devices are located at end of the circuit, contact your local Simplex Field Office)

NOTE 4.
Wiring distance is 1/2 distance for Style D, 4-wire notification appliance circuits.

TOTAL CURRENT	DISTANCE TO LAST DEVICE FROM THE PANEL IN FEET		
	18 AWG	16 AWG	14 AWG
0.11A	2349	3735	5940
0.22A	1566	2494	3960
0.33A	1198	1904	3029
0.44A	995	1518	2415
0.55A	783	1245	1980
0.66A	681	1083	1722
0.77A	602	958	1524
0.88A	526	836	1330
0.99A	479	761	1211
1.10A	438	697	1108
1.21A	400	636	1012
1.32A	374	595	945
1.43A	335	534	849
1.54A	314	500	795
1.65A	293	466	472
1.76A	281	448	712
1.87A	266	423	673
1.98A	253	403	641

CONTROL CIRCUITS

- ***AUXILIARY ALARM RELAYS*** (Activate on system alarm) Use Field Wiring Diagrams #841-687 and 841-669.

  Devices controlled: Lights, fans, door release, dampers, etc.

  Contacts: Form C dry contacts rated 2 amps @ 30 VDC/30 VAC or 0.5 amps @ 120 VAC resistive.*

  Wiring: From 14 to 18 AWG wire may be used.

- ***TROUBLE RELAY*** (Not Silenceable – Activates on system trouble) Use Field Wiring Diagrams #841-687 and 841-669.

  Devices controlled: Trouble horns, bells, lights, etc.

  Contacts: Form C dry contacts rated 2 amps @ 30 VDC/30 VAC or 0.5 amps @ 120 VAC resistive.*

  Wiring: From 14 to to 18 AWG wire may be used.

- ***TROUBLE RELAY*** (Silenceable – Activates on system trouble) Use Field Wiring Diagrams #841-687 and 841-669. Change AUX 1 alarm relay from alarm to trouble by removing Jumper JW12. When this jumper is removed, the trouble silence push button disconnects the relay.

CAUTION
Use of external power may void power limited U.L. Listing on that circuit.

- ***Incoming Power*** (See W.D. #841-669, [sheet 22 for 120 VAC; sheets 36, 37 and 38 for 220/240 VAC]

  Source: Dedicated fire alarm power circuit with a 10 amp fused disconnect or as required by local codes.

  Wiring: Use two 14 AWG wires or 14 AWG cable.

- ***Earth Detection*** (Ground) (See W.D. #841-669)

Source: Connection must be made to an approved dedicated earth ground per NEC Article 250 (NFPA 70).

IMPORTANT

Terminate ground wire on green ground lug screw inside fire control back box.

STEP #3

MOUNTING AND WIRING PERIPHERAL DEVICES

(Refer to Wiring Diagrams 841-687 and Instructions Provided with Each Device.)

- ***Style B***

Install all peripheral devices (detectors, horns, pull stations, etc.) and connect them to the appropriate wires. Connect a 3.3K ohm end-of-line resistor (EOLR) across the terminals of the last device in the initiating device circuits and mark the device accordingly (see Figure 7). Connect a 10k-ohm EOLR across the terminals of the last device in the notification appliance circuits and mark the device accordingly (see Figure 8).

Note: (X) = Zone Circuit #
(Y) = Signal Circuit #

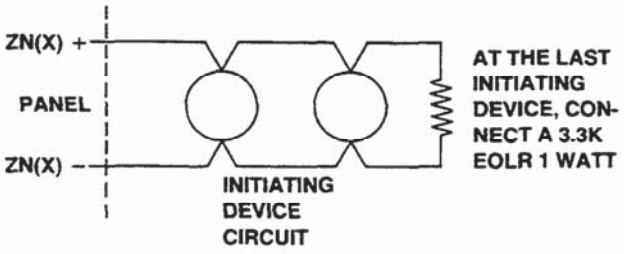


Figure 7

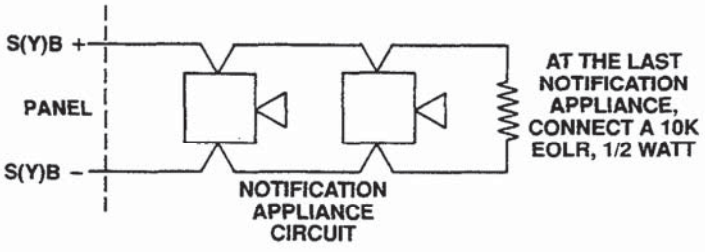
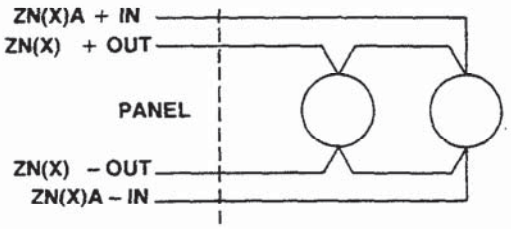


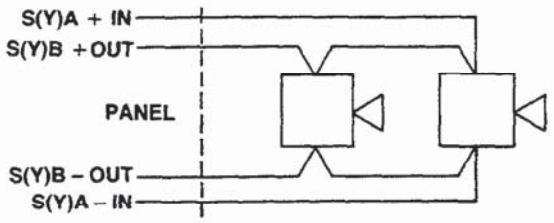
Figure 8

Style B Initiating Device Circuit – Style Y Notification Appliance Circuit

- ***Style D***

Same as class B, except both ends of every circuit terminate at the panel (see Figure 9 for typical initiating device circuit and Figure 10 for typical notification appliance circuit).





Style D Initiating Device Circuit – Style Z Notification Appliance Circuit

Figure 9 **Figure 10**

STEP #4

CHECKING SYSTEM WIRING

- At the control panel, use a volt/ohm meter to check each wiring circuit. Use the green grounding lug in the control panel for all measurements to station ground. Each measurement has a tolerance of + or – 10%.
- Each circuit must test free of grounds and extraneous voltages.
- Each of the following circuit types must have the following resistance readings.

Circuit Type	Meter Reading
Style B Initiating Device (Zone) Circuit	
From zone + to zone – (each zone)	3.3K ohms
From zone + to station ground	Infinity
From zone – to station ground	Infinity
Style D Initiating Device (Zone) Circuit	
From zone + to zone – (each zone)	Infinity
From zone + to station ground	Infinity
From zone – to station ground	Infinity
From zone + OUT to + IN	Less than 50 ohms
From – OUT to – IN	Less than 50 ohms
Sprinkler Tamper Switch Circuit (zone 8)	
From + to station ground	Infinity
From – to station ground	Infinity
From + to – across circuit	560 ohms
Style Y Notification Appliance Circuit (each signal circuit)	
From + to station ground	Infinity
From – to station ground	Infinity
Resistance across circuits	
In one direction	10K ohms
In opposite direction	Less than 200 ohms

Style Z Notification Appliance Circuit (each signal circuit)

From + to station ground	Infinity
From − to station ground	Infinity
From +OUT to +IN	Less than 50 ohms
From −OUT to −IN	Less than 50 ohms
Resistance across circuits	
In one direction	Infinity
In opposite direction	Less than 200 ohms

STEP #5

RE-MOUNTING ELECTRONIC COMPONENTS IN BACK BOX

Note: Care must be taken to avoid contact and potential static damage to the printed circuit boards during the following procedures. A grounding wrist strap is recommended.

- Make sure system ground wire is attached to the green lug screw in the back box.

Re-mount the transformer first.

- Re-mount electronic sub-assemblies complete with rails using screws provided in the same relative box position as they were shipped from the factory (see F.W. diagrams 841-669).

- Connect *ALL* cables and wiring harness in original locations as shipped from the factory and previously marked during back box installation.

STEP #6

TERMINATIONS OF SYSTEM WIRING AT THE 4002 CONTROL PANEL

Note: Terminate all system wiring as specified in the Field Wiring Diagrams (841-669). **Refer to sheets and figures listed below.**

	SHEET #	FIG. #
a. **Initiating device (zone) circuits**		
• Style B	6/ 7	N/A
• With zone disconnect/suppressor board	10	N/A
• Style D with 4-wire detectors.	8/ 9	N/A
• With zone disconnect/suppressor board.	11/12	N/A
• 2 unit, Class B suppression.	24	N/A
• 4 and 6 unit, Class B suppression.	25	N/A
b. **Notification appliance (signal) circuits**		
• Style Y	13/15	14
• Style Z	14	15
c. **Control relay circuits**		
• From AUX and TBL relay contacts (on CPU board).	16	16
• From AUX relay contacts (on AUX relay board).	16	17
• From relay contacts (on relay boards).	17	18
• 10 Amp relay module.	26	N/A
d. **Annunciator output circuits**		
• LED annunciators (with remote trouble, acknowledge or reset).	18	11
• LED annunciators (w/o remote trouble, acknowledge or reset).	18	11
• Incandescent lamp annunciators.	19	12
• A Auxiliary	32	N/A
• B Auxiliary	33	N/A
• D Auxiliary	34	N/A
e. **City circuit**		
• Connections, programming, Reverse polarity, Local energy, Shunt, Form C.	20	19
f. **Special zone inputs**		
• Coded input on zone 1.	21	8
• Waterflow switch on zone 7.	21	9
• Sprinkler tamper switch on zone 8.	21	9
g. **Connect Power to system**		
• AC Power.	22	20
• System Batteries.	22	21
• 4 unit Expansion Power Supply.	29	N/A
• 6 unit Expansion Power Supply.	30	N/A
• To silence signals press the TROUBLE and SYSTEM RESET push buttons.		
• Use the harnesses provided with the system.		

h. **2120 Connections**

• Transponder.	23	N/A
• Interface Module (set DIP switch SW1-8 OFF)	28	N/A
i. **SCU/RCU Wiring (See Note 3)**	27	N/A
j. **Fan Control Module (See Note 3)**	31	N/A

Notes: 1. Wire devices according to Field Wiring Diagrams 841-687.
2. If the system continues to display trouble, follow the troubleshooting procedures on page 12.
3. DIP Switch SW3 on the CPU module must be set in accordance with Table 2 on page 26. A wire length chart is found on page 40.

STEP #7

SETTING PROGRAM DIP SWITCH SW1, SW2, AND SW3

DIP Switch, SW1 and SW2 are used to select a variety of functions which are required for alarm operations. The locations of these switches are shown on Figure 4, page 15, or Field Wiring Diagrams 841-669, sheet 2.

Information on all basic programmable functions can be found on pages 25 through 30.

The installer must select the alarm operations/functions required for each system installation. Use a pointed, non-metallic object for selecting switches. See Figure 11 below for details of DIP Switches SW1 and SW2.

- Press SYSTEM RESET after making changes to SW1 and SW2 settings.

Use the information in Table 1, on next page, (also shown on sheet #2 of wiring diagrams) to determine exact DIP Switch settings required for this installation.

DIP switch SW3 is used for supervisory modules connected to the serial annunciator port on the CPU module (TB4 COM and REC). Use the information in Table 2, on next page, to determine required settings for this installation.

Note: When shipped, the system contains *NO* special programmed functions and normal operation is general alarm.

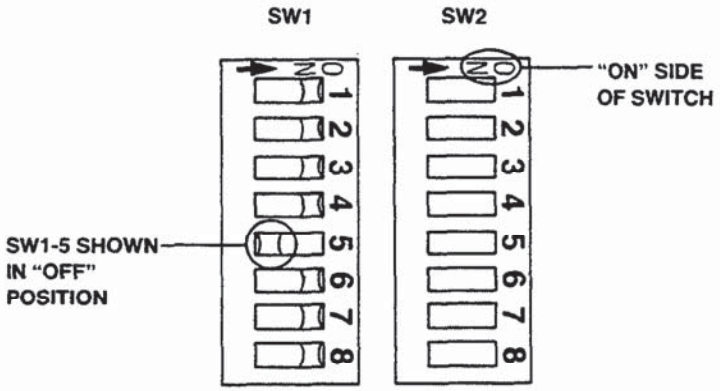


Figure 11 – DIP Switches, SW1 and SW2

Normal Operation: The following represents normal system operation when DIP Switch, SW1 and SW2 are set to the *ON* position.

a. The activation of any alarm initiating device on any zone immediately causes all signals throughout the system to operate continuously.

b. Pressing the "ALARM SILENCE" push button immediately stops all signal operations.

c. All push buttons and switches in the fire alarm panel are enabled.

STEP #7 cont.

PROGRAMMING BASIC SYSTEM FUNCTIONS VIA DIP SWITCH PACKAGES SW1 AND SW2

TABLE 1

DIP Switch SW1

SW1-1 = **Alarm Verification**
On.....Normal operation
Off.....Alarm Verification

SW1-2 = **Coded Input (Zone 1)**
On.....Normal operation
Off.....Coded input on Zone 1 (cut JW11)

SW1-3 = **Waterflow**
On.....Normal operation
Off.....Waterflow on Zone 7 (signal 2 not silencable)

SW1-4 = **Sprinkler Supervision** (Tamper)
On.....Normal operation
Off.....Sprinkler supervision on Zone 8

SW1-5 = **Time Limit Cut Off**
On.....Normal operation
Off.....Signal Cutout after 10 minutes

SW1-6	SW1-7 = **Silence Inhibit**
On	On.....Normal operation
Off	On.....One minute signal silence inhibit
On	Off.....Three minutes signal silence inhibit
Off	Off.....Five minutes signal silence inhibit

SW1-8 = **2120 Connection**
On.....Normal operation
Off.....2120 connection is present in system

DIP Switch SW2

SW2-1 = **System Test**
On.....Normal operation
Off.....Walk Test™ mode

SW2-2 = **Manual Evacuation**
On.....MANUAL EVAC switch enabled
Off.....MANUAL EVAC switch disabled

SW2-3	SW2-4	SW2-5 = **Signal Coding**
On	On	On.....Normal operation
Off	On	On.....March time
On	Off	On.....Slow march time
Off	Off	On.....Temporal coding
On	On	Off.....Simple coding
Off	On	Off.....California code (one minute)
On	Off	Off.....California code, three minutes
Off	Off	Off.....California code, (five minutes)

SW2-6	SW2-7 = **Selective Signalling**
On	On.....Normal operation
Off	On.....March time on signal circuit 1 until reset
On	Off.....Signal circuit 1 on steady until reset
Off	Off.....Signal circuits 1 and 2 on steady until reset

SW2-8 = **Expanded Simplex Programming (ESP)**
On.....Normal operation
Off.....ESP program mode

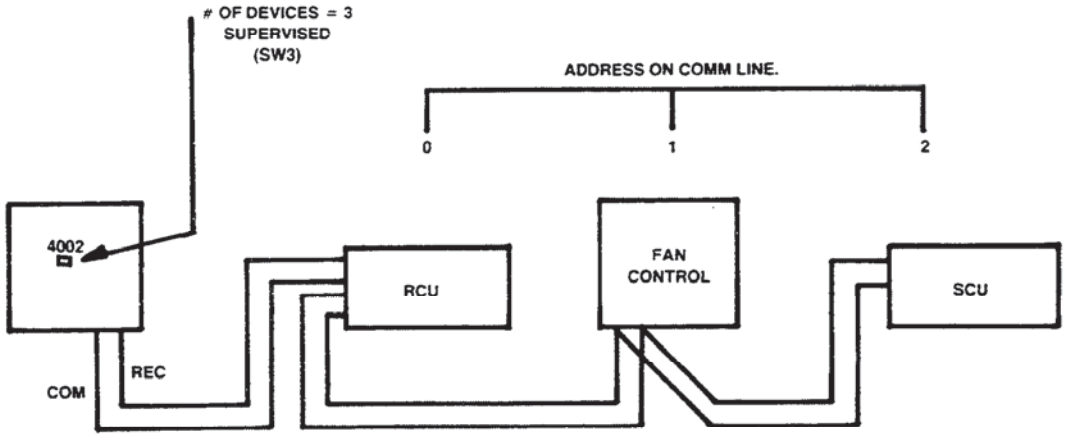
SETTING DIP SWITCH SW3 FOR SERIAL PORT SUPERVISION

TABLE 2

DIP SWITCH SW3

	Number of Modules in System															
Switch Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SW3-1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
SW3-2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW3-3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
SW3-4	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

STEP #7 cont.



Notes:

1. ***Normal Operation*** – Indicates that a special function is NOT selected and DIP Switches, SW1 and SW2 are in the ON position.
2. For a complete description of each system function, see pages 27 through 30.
3. The "SYSTEM RESET" switch must be pressed after DIP switches are set.
4. See page 15 for location of DIP Switches SW1, SW2 and SW3.

BASIC DEFINITIONS OF DIP SWITCH SELECTABLE SYSTEM FUNCTIONS

- ***Normal Operation:*** The following represents normal system operation and all DIP switches are set to the ON position.

  a. The activation of any alarm initiating device on any zone immediately causes all signals throughout the system to operate continuously.

  b. Pressing the ALARM SILENCE push button immediately stops all signal operation.

  c. All push buttons and toggle switches on the panel's front are enabled.

- ***Alarm Verification (DIP Switch SW1-1 OFF)***

  The alarm verification feature is used to reduce unwanted alarms in smoke detectors. It allows smoke detectors to be verified while residing in the same zone with heat detectors and manual stations that are not verified. Operation is as follows:

  a. If a smoke detector senses an alarm, the 4002 will start a 30 second timer and ignore the alarm.

  b. At the end of the 30 second timer, if no other zones or contact devices have alarmed, the zone is reset for 5 seconds.

  c. After power is restored to the detectors, the 4002 begins a 120 second confirmation period. If, during this time, the detector re-alarms (or another detector alarms), the signals are sounded and alarm functions occur as programmed.

STEP #7 cont.

d. If no alarms occur during the 120 second confirmation period, the 4002 returns automatically to the normal mode.

Note: If, any time during the alarm cycle, an alarm is sensed from another zone or contact device (heat detector or manual station), the 4002 alarms immediately.

- ***Coded Input on Zone 1 (DIP Switch SW1-2 OFF and JW11 Cut)***

The coded input operation is used for either coded stations or coded systems. When selected, this feature allows the 4002 to connect to devices that input a specific code for their location. These devices must be wired to zone 1. The coded input feature bypasses the normal latch circuit on zone 1 and allows the signals to follow the input code. All other alarm functions remain the same (e.g., auxiliary relays and city circuit operation). The coded input signal takes priority over other signals while the code device is pulsing. The 4002 will turn priority over to the other alarm functions after 30 seconds of silence from the coded input device.

- ***Waterflow on Zone 7 (DIP Switch SW1-3 OFF)***

Zone 7 may be used for connecting to the waterflow contacts on a sprinkler system. When selected, zone 7 will monitor normally-open waterflow contacts for closure to indicate an alarm. Notification appliance circuit 2 will turn on and cannot be silenced as long as the waterflow contacts are closed. When the flow contacts are restored to normal, notification appliance circuit 2 can then be silenced by the system reset push button.

- ***Sprinkler Tamper Switch Supervision on Zone 8 (DIP Switch SW1-4 OFF)***

By setting DIP Switch SW1-4 to off, Zone 8 may be used for monitoring the position of sprinkler gate valves. It can be connected to normally-closed sprinkler-tamper contacts. The 4002 allows up to five normally-closed contacts, and the circuit is supervised for opens and shorts. When a contact opens, the following sequence occurs.

1. Zone 8 Alarm LED flashes.
2. The Auxiliary Trouble Relay and Piezo activates until silenced.
3. Activating the ALARM SILENCE push button silences the trouble circuit.
4. Restoring the valve to the normal position causes the zone LED to extinguish.

Notes:

1. The 4002 can be reset while a supervisory circuit is still open (not normal). If the circuit is still open when reset, the sequence will again start at step 1 above.
2. ESP must be provided if operation of an Auxiliary Alarm Relay from Zone 8 is required.

- ***Signal Cutoff Time Limit After 10 Minutes (DIP Switch SW1-5 OFF)***

The signal cutoff feature provides an automatic signal silence function. When an alarm occurs, the signals will sound for 10 minutes and then be silenced.

Note: If the signal silence inhibit feature (see below) is selected in conjunction with this option, the signals will automatically silence 10 minutes after the conclusion of the signal silence inhibit time.

STEP #7 cont.

- ***Signal Silence Inhibit (DIP Switches SW1-6 and SW1-7 OFF)***

The signal silence inhibit feature prevents the operator from silencing the signals until the inhibit duration expires. Available inhibit durations are:

No delay (normal operation)
1 Minute delay
3 Minutes delay
5 Minutes delay

- ***2120 Connection is Present in System (DIP Switch SW1-8 OFF)***

An option that, when selected, allows the Control Panel to communicate with a Simplex 2120 Multiplex System via the 2120 Communication Module.

- ***Walk Test™ Mode (DIP Switch SW2-1 OFF)***

When selected, the following occurs:

a. The system Trouble LED illuminates.

b. The city alarm relay is bypassed.

c. The auxiliary alarm relays are bypassed.

Note: The auxiliary relays connected to the annunciator outputs still follow the zone alarm LEDs.

d. The system is ready for a Walk Test™ (see page 9)

IMPORTANT: The system **DOES NOT** provide fire protection when in the Walk Test™ mode.

- ***MANUAL EVAC Switch Enabled or Disabled (DIP Switch SW2-2)***

The "manual evacuation" switch is standard on all systems.

When enabled, (SW2-2 ON) activating the switch will turn on all indicating appliance circuits while leaving the auxiliary alarm relays and city circuit in their normal position. The manual evacuation signal is terminated by pressing either the signal silence or system reset switch.

When disabled, (SW2-2 OFF) the switch has no effect on the system whatsoever.

- ***Signal Coding (DIP Switches SW2-3, SW2-4 and SW2-5)***

The signal coding option uses three DIP switch positions to allow 8 different selections. Only one code selection can be used. This feature is common to the operation of all indicating appliances in the system. The coding choices are:

a. *Normal operation* – When selected, the signals will sound continuously.

b. *March time* – When selected, the signals will sound a march time code of 120 beats a minute.

c. *Slow march time* – When selected, the signals will sound a march time code of 20 beats a minute.

STEP #7 cont.

d. *Temporal code* – When selected, the signals will repeat a code pattern consisting of 0.5 sec on, 0.5 sec off, 0.5 sec on, 0.5 sec off, 0.5 sec on, 2.5 sec off.

e. *Simple coding* – When selected, the signals will sound a code that represents the area in alarm.

f. *California code (one minute)* – When selected, the signals will sound a special code used in L.A. county for one minute and then stop.

g. *California code (three minutes)* – When selected, the signals will sound the above code for three minutes and then stop.

h. *California code (five minutes)* – When selected, the signals will sound the above code for five minutes and then stop.

- ***Selective Signal Circuit Operation (DIP Switches SW-6 and SW2-7)***

The selective signal circuit feature provides one of four operating modes for notification appliance circuits 1 and 2 as follows:

a. *Normal operation* – Both signal circuit 1 and signal circuit 2 silence when the alarm silence switch is activated.

b. *March time on signal circuit 1 until reset* – Causes notification appliance circuit 1 to code a march time signal while the other notification appliance circuits follow the coding selection DIP switch settings. Notification appliance circuit 1 remains on until the system is reset while all other appliance circuits can be silenced by the alarm silence switch. This mode of operation can be used to flash incandescent lamps after the audible signals have been reset.

c. *Signal circuit 1 on steady until reset* – Causes notification appliance circuit 1 to operate continuously while appliances in other circuits follow the coding selection DIP switch settings. Notification appliance circuit 1 remains on until the system is reset while all other appliance circuits can be silenced by the alarm silence switch. This mode of operation can be used to flash strobe lamps after the audible signals have been silenced.

d. *Signal zones 1 and 2 on steady until reset* – Same as the above, except that it also applies to signal circuit 2.

- ***ESP Program Mode (DIP Switch SW2-8)***

The ESP program mode allows qualified Simplex personnel to custom-program the system by entering ESP (Expanded Simplex Programming) equations into system memory.

IMPORTANT

DIP switch SW2-8 must *never* be left in its OFF (Program) position (except when performing ESP Programming procedures).

- When DIP switch SW2-8 is in its On (Normal) position, the panel functions as a fire control unit — a device which provides fire protection; when DIP switch SW2-8 is in its Off (Program) position, the panel functions as a program entry device — a device which provides *no* fire protection.

STEP #8

WALK TEST™

Perform a complete Walk Test™ to ensure proper system operations. These procedures are located on page 9 in this manual.

STEP #9

RE-MOUNTING RETAINER AND DOOR

a. Mount the lock bracket to the back box.

b. Insert the lip located on the lower portion of the retainer (interior door) over the lip at the bottom of the back box.

c. Squeeze the two black plastic locking tabs at the top of the retainer, then insert them into the two slots at the top of the back box. This will secure the retainer to the back box.

d. Place the door on the two back box hinges. The door should open freely to allow access to operator controls.

IMPORTANT

e. Ground the door by attaching the green ground wire and the ground screw lugs to both the door and the back box.

STEP 10.

CUSTOMER INFORMATION

Provide the owner with a complete system orientation to include operating instructions. These procedures start on page 3 in this manual. Leave all documentation with the customer including electrical drawings of the system and 4002 Field Wiring Diagrams.

GLOSSARY OF 4002 FIRE ALARM SYSTEM TERMS

Alarm Verification Option: A field-programmed option that causes the CPU to verify (double-check) all alarm initiations originated by smoke detectors before sounding the signals.

Annunciator: A remotely-located, electrically-powered display, separate from the control panel, containing LEDs or lamps to indicate the status of the fire alarm system.

Auxiliary (AUX) Relays: Control relays that normally energize during alarm conditions, and that are used to either apply power to or remove power from other equipment during an alarm condition. An auxiliary relay can also be programmed for activation during a trouble condition rather than an alarm condition.

City Remote Station Connection Circuit: Circuitry contained on the CPU board, which allows the 4002 fire alarm system to be tied either indirectly (via leased telephone lines) or directly (via a shunt or local energy master box) to a municipal fire station.

Class A Circuit: An initiating device (Style D) or notification appliance circuit (Style Z) within which all components remain fully functional even though a single open or ground exists in the circuit.

Class B Circuit: An initiating device (Style B) or notification appliance circuit (Style Y) within which some or all components may be disabled when a single open or ground exists in the circuit.

CPU (Central Processing Unit): That portion of the fire alarm panel which processes alarm and trouble information received from throughout the system, and acts on that information in an appropriate manner.

CPU Board: A panel-mounted module consisting of (among other things) the CPU itself, eight zone [circuit] monitors, two signal [circuit] monitors and two AUX relays.

End-of-Line (E.O.L.) Resistor: A resistor installed at the electrically farthermost point in a signal or zone circuit.

Fan Control Module: A panel-mounted module that consists of manual switches which allow fan or damper control circuits to be turned on, turned off, or operated automatically.

Fire Alarm Control Panel: The portion of the fire alarm system which provides the power and contains the circuitry needed for system operation.

Notification Appliance (Signal) Circuit: A circuit consisting of one or more notification appliances.

Notification Appliance (Signaling Device): A device which produces an audible and/or visual signal in response to a fire condition.

- Horn, bell, chime, flashing light, etc.

Initiating Device: A manual or automatic device which, when activated, initiates an alarm.

- Pull station, heat or smoke detector, waterflow switch, etc.

Initiating Device (Zone) Circuit: A circuit consisting of one or more initiating devices.

Local Energy Master Box: A municipal fire department connection box, mounted external to the panel, that uses electrical energy from the fire alarm panel to energize its (the master box's) electromagnetic tripping mechanism.

Power Supply Module: That portion of the fire alarm panel which provides the power needed to operate all panel modules, as well as that needed to operate all electrically-powered initiating devices and all notification appliances.

Shunt Master Box: A municipal fire department connection box, mounted external to the panel, that uses electrical energy from the municipal fire alarm system to energize its (the master box's) electromagnetic tripping mechanism.

Signal Module: A panel-mounted module which supervises two notification appliance (signal) circuits.

Silence Inhibit Option: A field-programmed option which, when entered, prevents all alarm-notification appliances from being silenced, and the system from being reset, until the delay's duration expires.

Supervision: The continuous electrical checking of fire alarm circuits and components for troubles (opens and, in some cases, shorts).

- For example, 4002 signal circuits are supervised for both opens and shorts, while 4002 zone circuits are supervised for opens only (a zone circuit short causes an alarm condition).

Zone Module: A panel-mounted module containing the circuitry needed to supervise either four or eight zone circuits for both trouble and alarm conditions.

APPENDIX A

ESP Programming Option

Normally the 4002 is used as a general alarm system. Activation of any monitor point will energize all signal circuits, relays (to include the city relay), and the piezo. A number of DIP switch selectable functions may also be used to enhance the general alarm operation.

When more sophisticated project specific operations are required, Expanded Simplex Programming (ESP) Option must be installed. This option allows the operation of the system to be tailored to meet your specific requirements and perform up to 23 additional special operations. These special operations are defined by the user and may be modified at any time by qualified SIMPLEX personnel. ESP programs are defined for each desired operation, then programmed at the local SIMPLEX branch office. SIMPLEX personnel must install the ESP option, then test each ESP programmed operation.

Once programmed, the system will handle its ESP controlled inputs and outputs differently, while the rest of the system will operate general alarm. SIMPLEX personnel will demonstrate the operation and provide detailed instructions on each ESP programmed function. These tailored instructions are not included in any reference manual and must be used as required.

a. **Selective Signal Circuit Operation**

   One or more selected monitor point inputs will act upon one or more signal output circuits.

   Selective signal operations may be used for various applications.

   Three specific selective signal operations are as follows:

   1. Selective signals by floor — Evacuation signals sound on the floor of the alarm initiation; other signals may sound on other floors.

   2. Selective signals by zone — Evacuation signals sound in the zone or area of the alarm initiation; other signals may sound on other areas.

   3. Floor above and floor below — Evacuation signals sound on the floor of the alarm initiation, and on the floor above and the floor below the floor of the alarm initiation; other signals may sound on other floors.

b. **Selective Relay Control Operation**

   One or more selected monitor point inputs will act upon one or more general purpose output relay control circuits.

c. **Selective Fan/Damper Control Relay Operation**

   One or more selected monitor point inputs will act upon one or more relay circuits which control fan/damper circuits.

d. **Selective Door Holder Relay Control**

One or more selected monitor point inputs will act upon one or more relay circuits which control door holder circuits.

e. **Selective Bypass Control Switch Operation**

One or more selected inputs (monitor or control) will selectively bypass control circuits.

f. **Selective Switch Operation**

One or more selected switch inputs will selectively control output circuits.

g. **Multiple Tamper Zones**

One or more selected monitor point inputs (connected to sprinkler gate valves, N/O or N/C) which activate specific tamper signals.

h. **Stage 1/Stage 2 Operation or Presignal Operation**

Stage 1/Stage 2 — Zone activation alerts in-house personnel and starts a delay timer. If the timer is not reset before the delay expires, evacuation signals sound automatically.

Presignal — Zone activation alerts in-house personnel. A second (manual) action is required before evacuation signals sound.

i. **Cross Zoning**

A method of operation by which two or more monitor points must be activated before an output action can occur.

j. **Timing Functions**

One or more selected monitor point inputs may cause a selected output to activate *for* a predetermined time period or *after* a time period elapses.

k. **Master Code**

One or more selected monitor point inputs will cause a selected coded pulse pattern to be outputted to selected control outputs. (Usually the notification appliance circuits or city circuit).

l. **Non-Alarm Monitor Point Operation**

A method of removing one or more selected monitor points from the 4002 general alarm program. The monitor point alarm LED will flash when activated, but no control outputs will occur unless specified in an E.S.P. equation.

m. **Non-latching Monitor Point Operation**

A method of allowing one or more selected monitor point to "track" a peripheral device contact closing or opening.

- Only non-alarm contacts should be non-latching.

n. **Piezo Signal Operation**

The ability to control the Piezo selectively using any function statement in E.S.P.

o. **AC Power Fail (Control)**

The ability to control any output during an AC power loss or brownout condition at the 4002 panel.

p. **2120 Non-Default Operation**

The 2120 communicator module has a standard operation consisting of:

1. Zone alarm and trouble reporting to the 2120 CPU.
2. The ability for the 2120 to initiate 4002 system reset, alarm silence, trouble silence and manual evacuation.

Should an operation other than the default program be required, an ESP equation must be written and the data base may have to be changed.

q. **RCU Switch Non-Default Operation**

The 4602 Serial Annunciator RCU switches have a standard default operation consisting of:

1. System Reset
2. Alarm Silence
3. Trouble Silence
4. Manual evacuation

Should an operation other than the default program be required, an ESP equation must be written and the data base must be changed.

r. **SCU Point Matrix (Zone Grouping)**

A method by which zones may be grouped in ESP memory points and assigned to a specified 4602 Serial Annunciator LED.

s. **Elevator Recall w/Alternate Floor**

A method that alters the recall of the elevator to ground level during an alarm situation. If the alarm is initiated from ground level the elevator may be recalled to an alternate floor.

t. **System Reset (Special Operation)**

A method of changing the state of an output circuit when the system is reset.

u. **Point Sensing**

A method of changing an initiating device circuit (zones) to detect inputs other than normally open contact devices. (i.e., current limited and normally closed devices).

v. **PNIS Zone Coding**

A specified pulsed signal is sounded by the indicating appliances to audibly indicate where the alarm was initiated. ESP Data Base and ESP Equations are used to define the type of codes and their use.

APPENDIX B

FAN CONTROL MODULE (Figures 12 and 13)

A. *Features*

A 4002 system may include up to four fan control modules, each of which consists of two fan control circuits.

Each fan control module includes:

- Two 3-position maintained toggle switches (SW2 and SW3).
- Two DIP switch packages (SW1 and SW4).
- Two P connectors (P1 and P2).
- Two red LEDs (fan OFF).
- Two green LEDs (fan ON).
- Two yellow LEDs (fan circuit TBL).
- One terminal block (TB1).

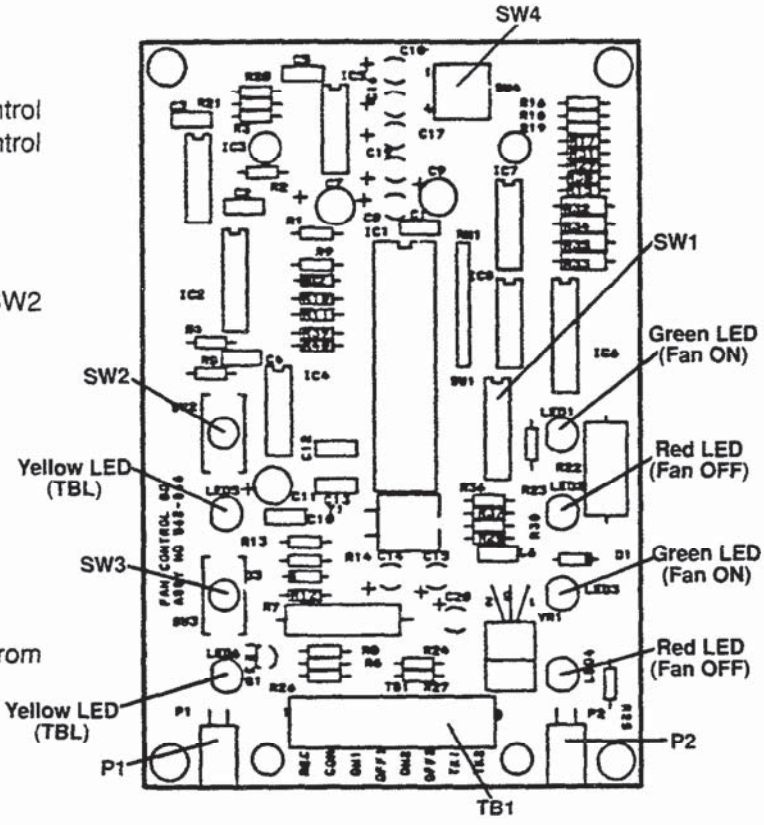


Figure 12

B. *Panel Connections*

P1 = 24VDC input power (2-wire harness) from any of the following:

P6 on CPU module
P2 of another fan control module
P3 of a signal expansion module
P2 on a 2120 interface module

P2 = 24VDC output power

TB1-1 = REC (from TB4-20 [REC] on the CPU [or from TB1-1 on another fan control module]).
TB1-2 = COM (from TB4-21 [COM] on the CPU [or from TB1-2 on another fan control module]).

C. *Field Connections*

TB1-3 = ON1 (0V out to pick fan 1 ON relay).
TB1-4 = OFF1 (0V out to pick fan 1 OFF relay).
TB1-5 = ON2 (0V out to pick fan 2 ON relay).
TB1-6 = OFF2 (0V out to pick fan 2 OFF relay).
TB1-7 = TK1 (+24 [feedback] from 1st fan circuit via vane, sail or pressure differential switch in 1st air duct).
TB1-8 = TK2 (+24 [feedback] from 2nd fan circuit via vane, sail or pressure differential switch in 2nd air duct).

D. *Switches*

DIP Switch SW1

Switches SW1-1 and SW1-2 (Control the red and green LEDs.)

SW1-1 OFF = Green LED lit when +24 present on TB1-8.
Red LED lit when +24 absent from TB1-8.
SW1-1 ON = Green LED lit when SW2 in ON position.
Red LED ON when SW2 in OFF position.

SW1-2 OFF = Green LED lit when +24 present on TB1-7.
Red LED lit when +24 absent from TB1-7.
SW1-2 ON = Green LED lit when SW3 in ON position.
Red LED lit when SW3 in OFF position.

Switches SW1-3 and SW1-4 (Functions depend on whether or not the 4002 has ESP.)

If the panel *lacks* ESP, the module responds to the issuance of any alarm message as follows:

SW1-3	SW1-4		
ON	ON	=	Leaves fans in their current state.
ON	OFF	=	Turns both fan circuits OFF.
OFF	ON	=	Turns both fan circuits ON.
OFF	OFF	=	Turns fan circuit 1 ON, turns fan circuit 2 OFF.

If the panel *has* ESP, switches SW1-3 and SW1-4 identify the fans under the module's control as follows:

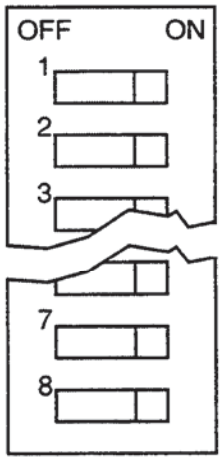
SW1-3	SW1-4		
ON	ON	=	Module controls fans 1 and 2.
ON	OFF	=	Module controls fans 3 and 4.
OFF	ON	=	Module controls fans 5 and 6.
OFF	OFF	=	Module controls fans 7 and 8.

Note: ESP allows the CPU to turn individual fans ON or OFF, depending on which of the system's zones is in alarm.

Switches SW1-5 thru SW1-8 (Set the fan control module's address.)

SW1-5	SW1-6	SW1-7	SW1-8	Address
ON	ON	ON	ON	0
ON	ON	ON	OFF	1
ON	ON	OFF	ON	2
ON	ON	OFF	OFF	3
ON	OFF	ON	ON	4
ON	OFF	ON	OFF	5
ON	OFF	OFF	ON	6
ON	OFF	OFF	OFF	7
OFF	ON	ON	ON	8
OFF	ON	ON	OFF	9
OFF	ON	OFF	ON	10
OFF	ON	OFF	OFF	11
OFF	OFF	ON	ON	12
OFF	OFF	ON	OFF	13
OFF	OFF	OFF	ON	14
OFF	OFF	OFF	OFF	Not valid

Layout,
Switch SW1



Switch SW2 (Position determines the presence or absence of 0V on terminals TB1-3 and TB1-4)

Up position = Applies 0V to TB1-3 (ON1), energizing fan control relay K1.
Center position = Presence or absence of 0V determined by the fan control module's microprocessor.
Down position = Applies 0V to TB1-4 (OFF1), energizing fan control relay K2.

Note: Relays K1 and K2 must mount within 3 ft. of 1st fan motor.

Switch SW3 (Position determines the presence or absence of 0V on terminals TB1-5 and TB1-6)

Up position = Applies 0V to TB1-5 (ON2), energizing fan control relay K3.
Center position = Presence or absence of 0V determined by the fan control module's microprocessor.
Down position = Applies 0V to TB1-6 (OFF2), energizing fan control relay K4.

Note: Relays K3 and K4 must mount within 3 ft. of 2nd fan motor.

DIP Switch SW4 (Allows for supervision of a fan control relay's wiring during the relay's de-energized state.)

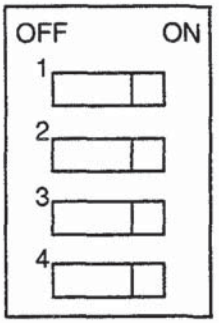
SW4-1 = OFF to supervise wiring to ON1 fan control relay. ON if circuit lacks ON1 fan control relay (or if supervision not wanted).

SW4-2 = OFF to supervise wiring to OFF1 fan control relay. ON if circuit lacks OFF1 fan control relay (or if supervision not wanted).

SW4-3 = OFF to supervise wiring to ON2 fan control relay. ON if circuit lacks ON2 fan control relay (or if supervision not wanted).

SW4-4 = OFF to supervise wiring to OFF2 fan control relay. ON if circuit lacks OFF2 fan control relay (or if supervision not wanted).

Layout, Switch SW4

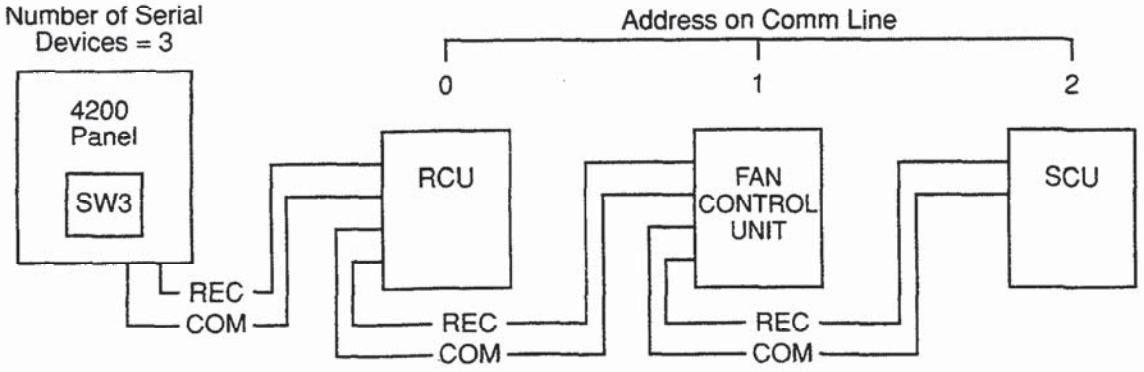


Note: If an SW4 switch is turned OFF, the appropriate TBL (yellow) LED on the fan control module illuminates — and the 4002 panel indicates trouble — when an open exists in the fan control relay circuit.

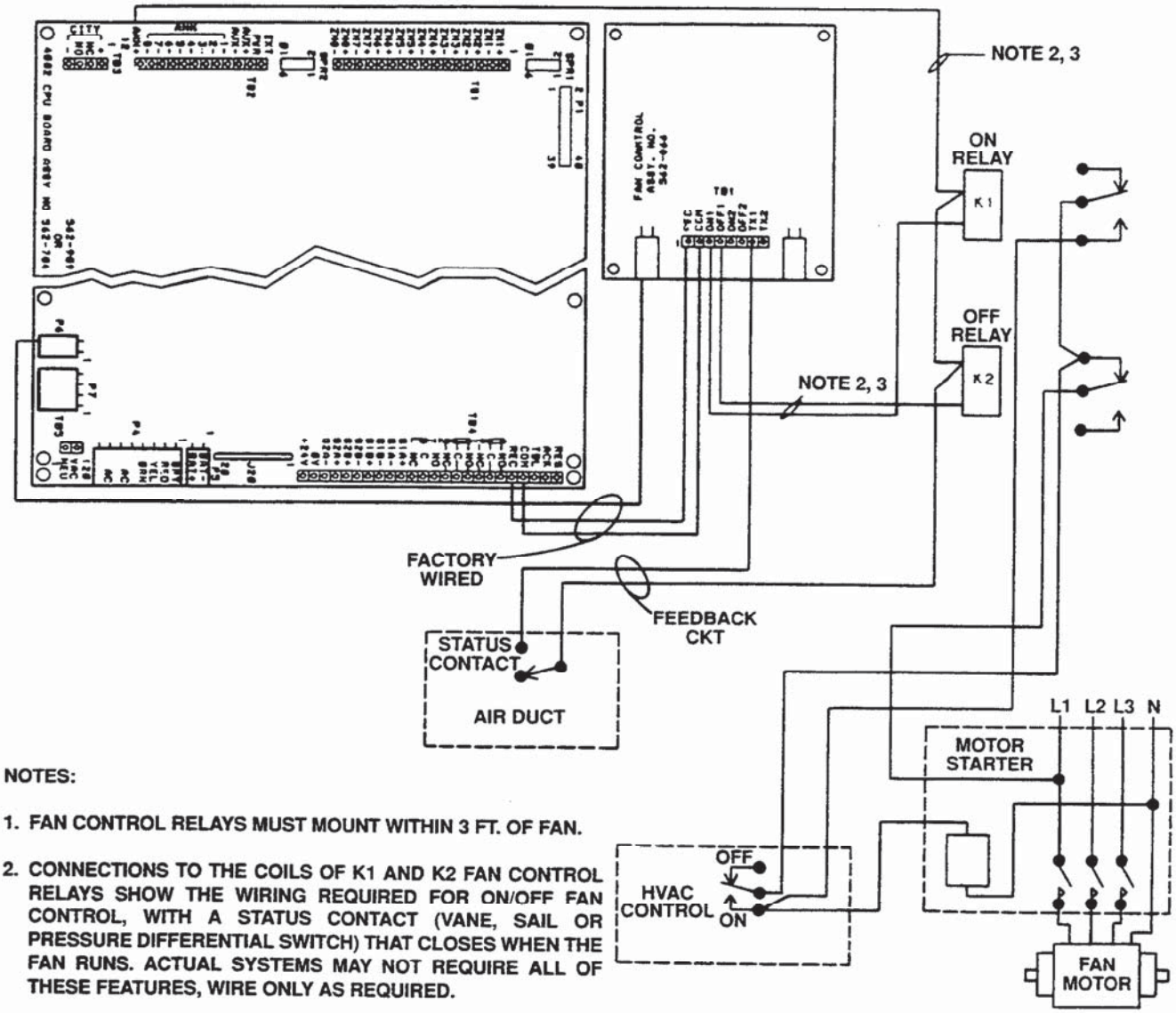
E. *DIP Switch SW3 on the CPU Module* (Figure 4 - page 15)

Set the switches on switch package SW3 as shown below

Switch Number	Number of devices (SCUs/RCUs, fan control units, etc.) in system															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SW3-1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
SW3-2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW3-3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
SW3-4	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF



F. *Interconnection Diagram*



NOTES:

1. FAN CONTROL RELAYS MUST MOUNT WITHIN 3 FT. OF FAN.
2. CONNECTIONS TO THE COILS OF K1 AND K2 FAN CONTROL RELAYS SHOW THE WIRING REQUIRED FOR ON/OFF FAN CONTROL, WITH A STATUS CONTACT (VANE, SAIL OR PRESSURE DIFFERENTIAL SWITCH) THAT CLOSES WHEN THE FAN RUNS. ACTUAL SYSTEMS MAY NOT REQUIRE ALL OF THESE FEATURES, WIRE ONLY AS REQUIRED.
3. ALL WIRING IS SUPERVISED, EXCEPT THE WIRE THAT CONNECTS THE STATUS CONTACT TO TERMINAL TK1 (TB1-7).
4. THE MODULE CONTAINS TWO IDENTICAL FAN CONTROL OUTPUTS. WIRE ON2, OFF2, AND TK2 TO OPERATE THE SAME AS THE CIRCUIT SHOWN.
5. ELECTRICAL RATINGS:

ON1, OFF1, ON2, OFF2	=	150 mA @ 24 VDC
TK1, TK2	=	24 VDC @ 0.1 mA
ANN+	=	1.2 Amps @ 24 VDC

6. FAN CONTROL RELAYS K1 AND K2 MUST BE 24VDC THAT OPERATE BETWEEN 0-150 mA.
7. ALL CONDUCTORS MUST TEST FREE OF GROUNDS.

Figure 13

G. *Wire Length Chart in Feet* (for 2-Wire Fan Control Relay Circuits)

Total Current in Amps	Wire Size			
	#12	#14	#16	#18
0.050	10,000	10,000	6,716	4,225
0.075	10,000	6,923	4,477	2,816
0.100	8,437	5,192	3,358	2,112
0.150	5,625	3,461	2,238	1,408
0.200	4,218	2,596	1,679	1,056
0.300	2,812	1,730	1,119	704
0.400	2,109	1,298	839	528
0.500	1,687	1,038	671	422
0.600	1,406	865	559	352
0.700	1,205	741	479	301
0.800	1,054	649	419	264
0.900	937	576	373	234
1.000	843	519	335	211
1.100	766	471	305	192
1.200	703	432	279	176

Figure 14

APPENDIX C

ATTERY TESTING INFORMATION

eneral Information

sealed lead-acid batteries in fire alarm service should be tested annually.

Replace all sealed lead-acid batteries that have been in service for four or more years.

It is recommended that a battery tester made specifically for checking sealed lead-acid batteries be used.

Such a tester is available under Service Part No. 553-602.

a battery tester is unavailable, the "voltage response test" described below can be used to detect batteries with ry low capacity or shorted cells.

IPORTANT: A defective battery charger circuit can cause battery failure. Check the condition of the battery charger when either a battery tester or a voltage response test reveals weakened batteries.

esting

Connect a digital voltmeter across the battery.

Connect the appropriate sized resistor(s) (see Chart 1) across the battery's terminals for the listed test time.

Record the end voltage reading.

Treat the battery as described in Chart 2.

CHART 1

VOLTAGE	AMP HR	RESISTOR (OHMS)	WATTS	PART NUMBER AND DESCRIPTION	TEST TIME
12	5.2	8.0	50	380-008 (2 in parallel)	2 Seconds
12	6.2	6.0	50	380-031	2 Seconds
12	8	4.5	50	380-031 (adj to 4.5 Ohm)	2 Seconds
12	10	4.0	50	380-031 (adj to 4 Ohm)	2 Seconds
12	18	2.0	100	380-031 (3 in parallel)	2 Seconds
12	20	1.5	100	382-090 (2 in parallel)	2 Seconds
12	33	1.0	150	382-090 (3 in parallel)	2 Seconds
6 *	50	1.0	150	382-090 (3 in parallel)	4 Seconds
12	110	1.0	150	382-090 (3 in parallel)	4 Seconds

* Test 2 batteries in series for 12V

*** * * CAUTION * * ***

Resistors will get hot during test!

Use 12AWG wire for battery-to-resistor hookup.

CHART 2

IF END VOLTAGE READING OF BATTERY IS:	INSTRUCTIONS
11.8V or more	Put in Service
11.7V to 11.0V	Charge Battery *
10.9 or less	Discard Battery

* Retest battery after charging.

Note 1: Discard if battery has been in service for four or more years (dispose of properly).

Note 2: Dispose of properly.

Simplex

True*Alert*® Multi-Candela Notification Appliances

UL, ULC, CSFM Listed; FM Approved;
*MEA (NYC) Acceptance**

Smart*Sync*™ Operation Audible/Visible Notification
with Horn and Synchronized Flash, Non-Addressable

Features

Audible/visible (A/V) notification appliances with efficient electronic horn and high output xenon strobe, available for wall or ceiling mount:

- Operation is compatible with ADA requirements (refer to important installation information on page 3)
- Rugged, high impact, flame retardant thermoplastic housings are available in red or white with clear lens

Operates over a two-wire SmartSync circuit to provide:

- Horns that are controlled separately from strobes on the same two-wire circuit
- "On-until-silenced" and "on-until-reset" operation on the same two-wire pair
- SmartSync horn activation of Temporal pattern, March Time pattern (at 60 BPM), or on continuously
- Strobe appliances on the same circuit operating at a synchronized 1 Hz flash rate
- Operation requires connection to a compatible SmartSync operation NAC or to SmartSync Control Module (SCM) 4905-9938

Wall mount A/Vs features:

- Wiring terminals are accessible from the front of the housing providing easy access for installation, inspection, and testing
- Covers are available separately to convert housing color
- Optional UL/ULC listed sound damper for locations requiring attenuation of 5 to 6 dBA (stairwells, small rooms, highly reverberant areas, etc.)

Optional adapters and wire guards:

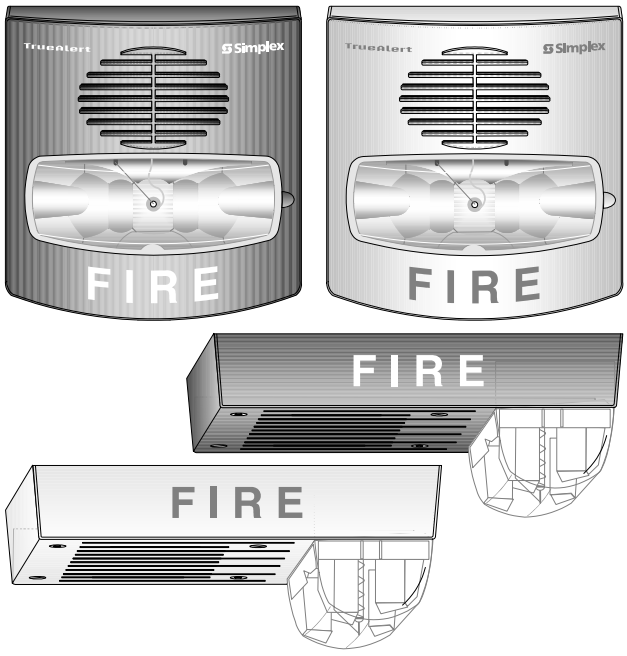
- Wall mount A/V adapters are available to cover surface mounted electrical boxes and to adapt to Simplex® 2975-9145 boxes
- UL listed red wire guards are available for wall or ceiling mount A/Vs*

Visible notification appliance (strobe):

- 24 VDC xenon strobe; intensity is selectable as 15, 30, 75, or 110 candela with visible selection jumper secured behind strobe housing
- Regulated circuit design ensures consistent flash output and provides controlled inrush current
- Listed to UL 1971 and ULC S526

Audible notification appliance (horn):

- Low current, 24 VDC electronic horn with harmonically rich sound output suitable for either steady or coded operation (Temporal or 60 BPM March Time pattern)
- Listed to UL 464 and ULC S525



Wall and Ceiling Mount A/Vs

Description

Multi-Candela TrueAlert A/Vs with horn and synchronized strobe provide convenient installation to standard electrical boxes. The enclosure designs are both impact and vandal resistant and provide a convenient strobe intensity selection. Since each model can be selected for strobe intensity output, on-site model inventory is minimized and changes encountered during construction can be easily accommodated.

Wall mount A/V housings are a one-piece assembly (including lens) that mounts to a single or double gang, or 4" square standard electrical box. The cover can be quickly removed (a tool is required) and covers are available separately for color conversion.

Ceiling mount A/Vs install using standard 4" electrical boxes. Color choice is determined by model number.

Strobe Intensity Selection

During installation, a selection plug at the back of the housing determines the desired strobe intensity. An attached flag with black letters on a highly visible yellow background allows the selected intensity to be seen at the side of the strobe lens.

* Refer to page 2 for guard listing. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7125-0026:317 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Accepted for use – City of New York Department of Buildings – MEA35-93E. Refer to page 2 for listing status of wire guards. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Safety Products Westminster.

** Simplex multi-candela SmartSync two-wire horn/strobe appliance operation is protected under one or more of the following U.S. Patent Numbers: 5,559,492; 5,622,427; 5,865,527; 5,886,620; 6,281,789; 6,954,137; 7,005,971; and 7,006,003.

Strobe Application Selection

Proper selection of visible notification is dependent on occupancy, location, local codes, and proper applications of: the *National Fire Alarm Code* (NFPA 72), ANSI A117.1; the appropriate model building code: BOCA, ICBO, or SBCCI; and the application guidelines of the Americans with Disabilities Act (ADA).

Synchronized Strobes

Multiple Strobes. When multiple strobes and their reflections can be seen from one location, synchronized flashes reduce the probability of photo-sensitive reactions as well as the annoyance and possible distraction of random flashing. The multi-candela strobes of these A/Vs are synchronized by the controlling SmartSync operation NAC.

SmartSync Two-Wire Control

SmartSync operation mode allows a two-wire circuit to provide the ability to activate both the horn and strobe on the same NAC and then allow the horn to be silenced while the strobe remains flashing. The horn operates as "on-until-silenced" while the strobe operation is "on-until-reset."

SmartSync Control Sources

- 4006, 4008, 4100U, and 4010 Fire Alarm Control Panels (refer to individual product data sheets for more information)
- 4009 IDNet NAC Extender (refer to data sheet S4009-0002)
- SmartSync Control Module (SCM) 4905-9938 (refer to data sheet S4905-0003)

Additional SmartSync compatible notification appliances include separate horns and combination horn/strobe notification appliances.

Product Selection

Multi-Candela A/Vs

Model	Mounting	Housing Color	"FIRE" Lettering	Description
4906-9127	Wall	Red	White	Horn with Multi-Candela Strobe; strobe intensity selectable as: 15, 30, 75, or 110 candela; operates with SmartSync two-wire control
4906-9129		White	Red	
4906-9128	Ceiling	Red	White	
4906-9130		White	Red	

Wall Mount A/V Accessories

Model	Description		Dimensions
4905-9937	Red	Surface Mount Adapter Skirt; use to cover 1-1/2" (38 mm) deep surface mounted boxes	5-3/8" H x 5-1/4" W x 1-5/8" D (136 mm x 133 mm x 41 mm) depth with strobe = 4-3/8" (111 mm)
4905-9940	White		
4905-9931	Red Adapter Plate for mounting to Simplex 2975-9145 box (typically for retrofit, may be mounted vertical or horizontal)		8-5/16" x 5-3/4" x 0.060" Thick (211 mm x 146 mm x 1.5 mm)
2975-9145	Red Mounting Box, requires Adapter Plate 4905-9931		7-7/8" x 5-1/8" x 2-3/4" D (200 mm x 130 mm x 70 mm)
4905-9838	Optional Sound Damper; package of 20; field installed adhesive backed horn output attenuator; reduces output 5 to 6 dBA **NOTE:** After Sound Damper installation, measure sound level to ensure compliance with applicable code requirements		1-3/4" Diameter (44.5 mm) with 0.31" (8 mm) sound opening

SmartSync Control Module

Model	Description	Dimensions
4905-9938	SmartSync Control Module with Class B or Class A output; mounts in 4" (102 mm) square box; refer to data sheet S4905-0003 for details	4" x 4-1/8" x 1-1/4" D (102 mm x 105 mm x 32 mm)

Replacement Covers for Wall Mount A/Vs

Model	Description	Dimensions
4905-9994	Red cover with white "FIRE" lettering	5-1/8" H x 5" W x 1-1/2" D (130 mm x 127 mm x 38 mm)
4905-9995	White cover with red "FIRE" lettering	

Wire Guards and Ceiling Mount A/V Adapter

Model	Description			Dimensions
4905-9961*	Wall mount red wire guard with mounting plate, compatible with semi-flush or surface mounted boxes			6-1/16" H x 6-1/16" W x 3-1/8" D (154 mm x 154 mm x 79 mm)
4905-9927*	Ceiling Mount	Red Wire Guard for mounting to flush mounted electrical box		8-1/2" x 6-1/8" x 3" (216 mm x 156 mm x 76 mm)
4905-9928*		Red Adapter Plate, required to mount guard to surface mounted electrical box		9" x 7" (229 mm x 178 mm)
4905-9915		White	Surface Mount Adapter Box Extension, use to cover 1-1/2" deep surface mounted boxes	4-3/4" x 6-7/8" x 1-1/2" deep, (121 mm x 175 mm x 38 mm)
4905-9916		Red		

* UL listed by Space Age Electronics Inc.

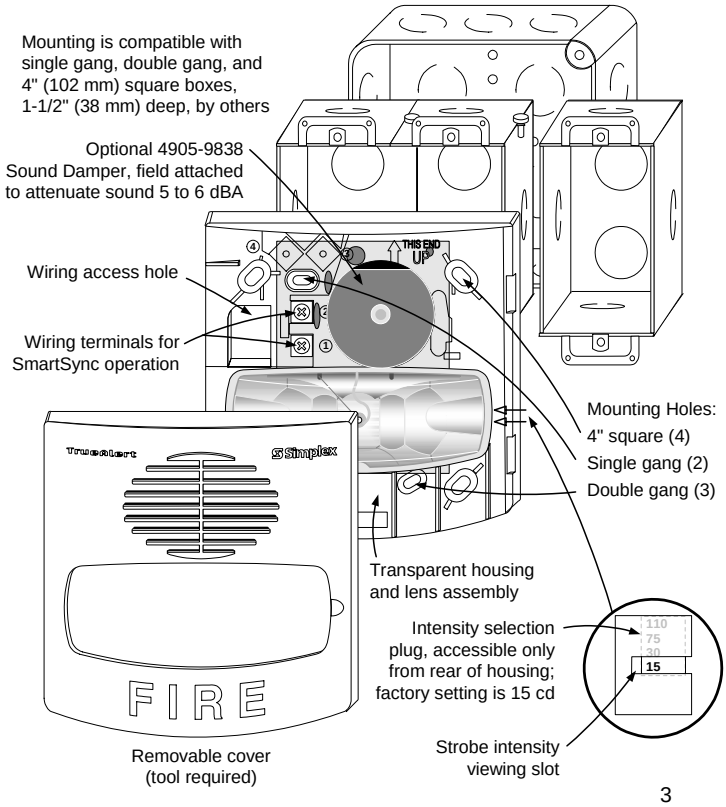
A/V Specifications

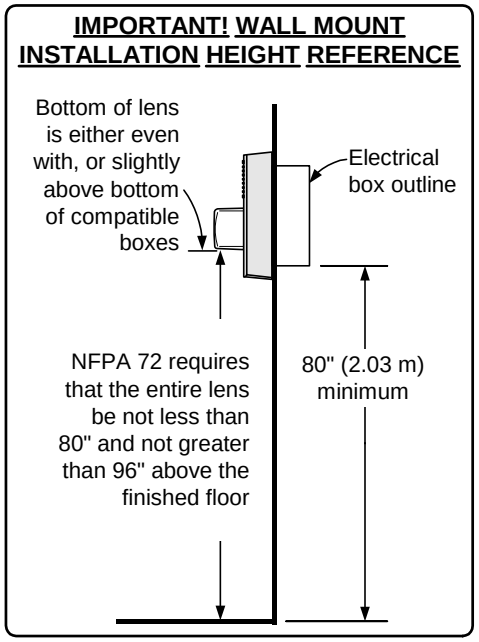
Wall Mount or Ceiling Mount, Common Specifications						
Rated Voltage Range			Regulated 24 DC; see Note 1 below			
Flash Rate and Synchronized NAC Loading			1 Hz; with up to 35 synchronized strobes maximum per NAC			
Environmental; Temperature and Humidity			32° to 122° F (0° to 50° C); 10% to 93%, non-condensing at 100° F (38° C)			
Connections			Terminal blocks for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2) ; two wires per terminal for in/out wiring			
Horn Output Characteristics			2400 to 3700 Hz sweep, modulated at 120 Hz rate			
Horn Output Ratings (see Note 2 for polar dispersion reference)		Model Type	**Wall Mount**		**Ceiling Mount**	
		Sound Type (see Note 2)	**Steady**	**Coded**	**Steady**	**Coded**
		Reverberant Chamber Test, per UL 464 @ 10 ft (~3 m)	86 dBA	82 dBA	87 dBA	83 dBA
		Anechoic Chamber Test, per ULC S525 @ 3 m (~10 ft)	88 dBA	94 dBA	90 dBA	98 dBA
Wall Mount	Housing Dimensions (with lens)		5-1/8" H x 5" W x 2-3/4" D (130 mm x 127 mm x 70 mm)			
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			75 mA	**116 mA**	**221 mA**	**285 mA**
	Reference RMS Currents at other voltages	18 VDC	67 mA	103 mA	196 mA	253 mA
		24 VDC	50 mA	77 mA	147 mA	190 mA
Ceiling Mount	Housing Dimensions (with lens)		4-3/4 L" x 6-7/8" W x 2-5/8" D (121 mm x 175 mm x 67 mm)			
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			86 mA	**132 mA**	**250 mA**	**320 mA**
	Reference RMS Currents at other voltages	18 VDC	76 mA	117 mA	222 mA	284 mA
		24 VDC	57 mA	88 mA	167 mA	213 mA

NOTES:

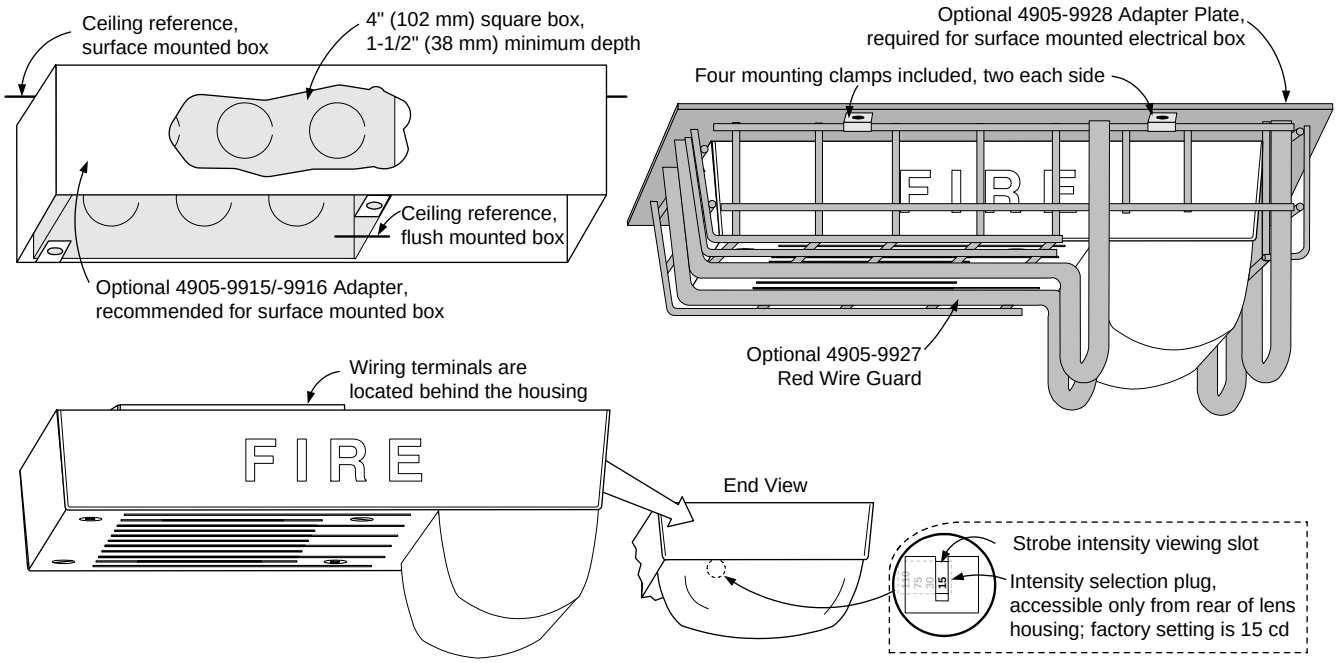
1. "Regulated 24 DC" refers to the voltage range of 16 to 33 VDC per UL Standard 1971, *Signaling Devices for the Hearing Impaired*, changes effective May 1, 2004. This voltage range is the absolute operating range. Operation outside of this range may cause permanent damage to the appliance. Please note that 16 VDC is the lowest operating voltage that is allowed at the last appliance on the NAC under worst case conditions.
2. Coded values are typical of the output measured with a Temporal coded or a March Time coded pulse and with a sound level meter reading on a "fast" setting. Polar dispersion per ULC S525 testing = -3 dBA at +/-40° off-axis; -6 dBA at +/- 50° off-axis.
3. Currents are with horn on steady. The maximum RMS current listed is the device nameplate rating. Strobe designs are constant wattage and the maximum RMS current rating occurs at the lowest allowable operating voltage. (RMS is root mean square and refers to the effective value of a varying current waveform.)

Installation Reference, Surface or Semi-Flush Mounting

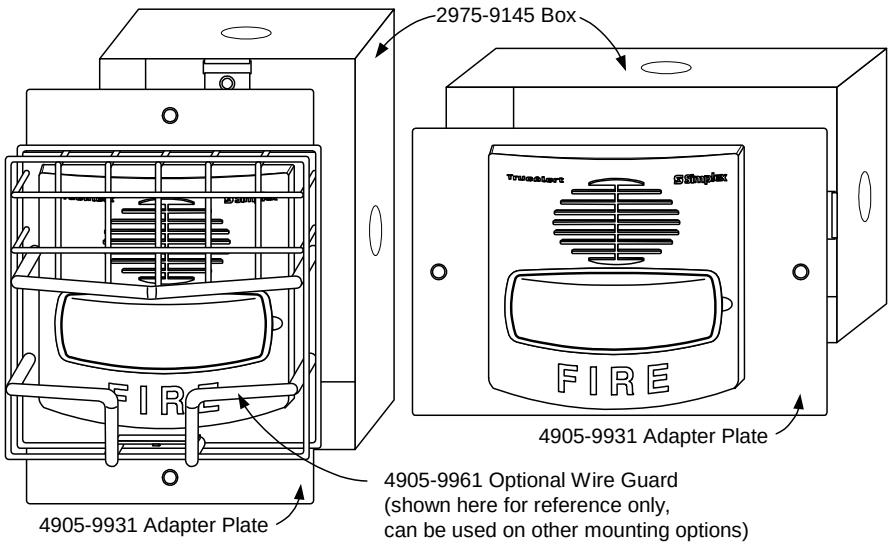




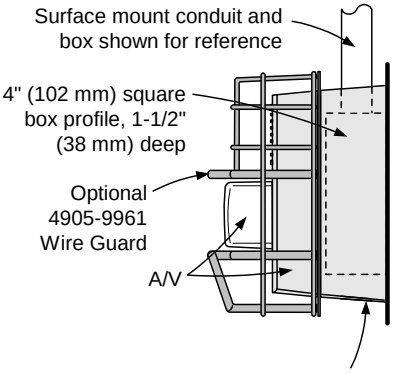
Ceiling Mount A/V and Guard Installation Reference



Wall Mount Installation Reference; Adapter Plate, Guard, and Adapter Skirt



Surface Mounting Reference with Optional Adapter Skirt and Optional Wire Guard



TrueAlert® Multi-Candela Notification Appliances

UL, ULC, CSFM Listed;
*FM Approved**

Multi-Candela, High Intensity (non-addressable)
Strobe (V/O) and Horn/Strobe (A/V)

Features

24 VDC high intensity notification appliance common features:

- Xenon strobe with intensity selectable as 135, 177, or 185 candela; visible selection jumper is secured behind strobe housing
- Regulated circuit design ensures consistent flash output and provides controlled inrush current
- Control is compatible with Simplex® SmartSync™ two-wire operation
- Operation is compatible with ADA requirements (refer to important installation information on page 3)
- Rugged, high impact, flame retardant thermoplastic housings available in red or white with clear lens
- Models are available for wall or ceiling mount
- Strobe operation is UL listed to Standard 1971

Appliances with audible notification (horn):

- Low current electronic horn with harmonically rich sound output suitable for either steady or coded operation (Temporal or 60 BPM March Time pattern)
- Horn operation is UL listed to Standard 464

Strobes provide synchronized flash for use with:

- Simplex fire alarm control panels and NAC Extenders when selected to provide strobe synchronization or SmartSync™ two-wire control**
- Separate strobe Synchronization Modules or SmartSync Control Modules (SCMs) that convert conventional NAC inputs to a Smartsync output

SmartSync two-wire operation provides:

- Horns controlled separately from strobes on the same two-wire circuit, activated as Temporal pattern, March Time pattern (at 60 BPM), or on continuously

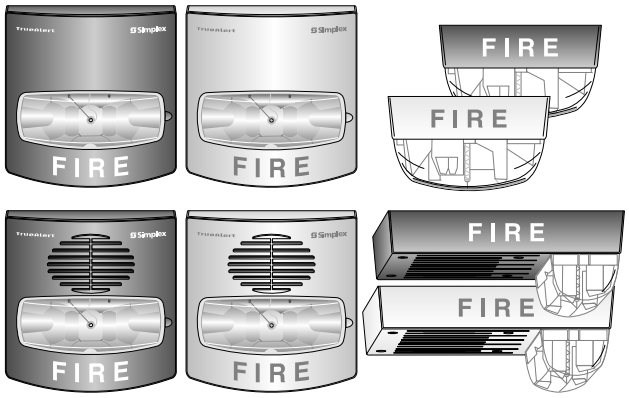
Wall mount appliance features:

- Wiring terminals are accessible from the front of the housing providing easy access for installation, inspection, and testing
- Covers are available separately to convert housing color
- A/V models have an available UL listed sound damper for locations requiring attenuation of 5 to 6 dBA (stairwells, small rooms, highly reverberant areas, etc.)

Optional adapters and wire guards:

- Wall mount A/V adapters are available to cover surface mounted electrical boxes and to adapt to Simplex 2975-9145 boxes
- UL listed red wire guards are available for wall or ceiling mount A/Vs

** Simplex multi-candela SmartSync two-wire horn/strobe appliance operation is protected under one or more of the following U.S. Patent Numbers: 5,559,492; 5,622,427; 5,865,527; 5,886,620; 6,281,789; 6,954,137; 7,005,971; and 7,006,003.



Wall and Ceiling Mount High Intensity
Strobes (top) and Horn/Strobes (bottom)

Description

Convenient Selection and Installation. TrueAlert multi-candela high intensity appliances provide convenient installation to standard electrical boxes. They are both impact and vandal resistant and provide a convenient strobe intensity selection. Since each model can be selected for strobe intensity output, on-site model inventory is minimized and changes encountered during construction can be easily accommodated.

Wall Mount. Housings are a one-piece assembly (including lens) that mounts to a single or double gang, or 4" square standard electrical box. The cover can be quickly removed (a tool is required) and covers are available separately for color conversion.

Ceiling Mount. Strobe appliances install using standard single gang electrical boxes. Horn/strobe appliances install using standard 4" electrical boxes. Color choice is determined by model number.

Strobe Intensity Selection

During installation, a selection plug at the back of the housing determines the desired strobe intensity. An attached flag with black letters on a highly visible yellow background allows the selected intensity to be seen at the side of the strobe lens.

Strobe Application Selection

Proper selection of visible notification is dependent on occupancy, location, local codes, and proper applications of: the *National Fire Alarm Code* (NFPA 72), ANSI A117.1; the appropriate model building code: BOCA, ICBO, or SBCCI; and the application guidelines of the Americans with Disabilities Act (ADA).

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7125-0026:333 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Safety Products Westminster.

SmartSync Two-Wire Control

SmartSync operation mode allows a two-wire circuit to provide the ability to activate both the horn and strobe on the same NAC and then allow the horn to be silenced while the strobe remains flashing. The horn operates as "on-until-silenced" while the strobe operation is "on-until-reset."

SmartSync Control Sources

SmartSync two-wire control is available from:

- 4006, 4008, 4100U, and 4010 Fire Alarm Control Panels (refer to individual product data sheets for more information)
- 4009 IDNet NAC Extenders (refer to data sheet S4009-0002)
- SmartSync Control Module (SCM) Model 4905-9938 (refer to data sheet S4905-0003)

Product Selection

Strobe (V/O)

Model	Housing	Lettering	Mounting	Description
4906-9109	Red	White	Wall	Multi-candela strobe with intensity selectable as: 135, 177, or 185 candela; synchronized flash rate; SmartSync two-wire control compatible
4906-9111	White	Red		
4906-9110	Red	White	Ceiling	
4906-9112	White	Red		

Horn/Strobe (A/V)

Model	Housing	Lettering	Mounting	Description
4906-9139	Red	White	Wall	Horn and multi-candela strobe with intensity selectable as: 135, 177, or 185 candela; synchronized flash rate; operates with SmartSync two-wire control
4906-9141	White	Red		
4906-9140	Red	White	Ceiling	
4906-9142	White	Red		

Wall Mount Common Accessories

Model	Description		Dimensions
4905-9937	Red	Surface Mount Adapter Skirt; use to cover 1-1/2" (38 mm) deep surface mounted boxes	5-3/8" H x 5-1/4" W x 1-5/8" D (136 mm x 133 mm x 41 mm) depth w/strobe = 4-3/8" (111 mm)
4905-9940	White		
4905-9931	Red Adapter Plate for mounting to Simplex 2975-9145 box (typically for retrofit, may be mounted vertical or horizontal)		8-5/16" x 5-3/4" x 0.060" Thick (211 mm x 146 mm x 1.5 mm)
4905-9838	**A/V only;** Optional Sound Damper; package of 20; field installed adhesive backed horn output attenuator; reduces output 5 to 6 dBA **NOTE:** After Sound Damper installation, measure sound level to ensure compliance with applicable code requirements		1-3/4" Diameter (44.5 mm) with 0.31" (8 mm) sound opening

V/O Model	A/V Model	Description	Dimensions
4905-9992	4905-9994	Red Wall Mount Replacement cover with white "FIRE" lettering	5-1/8" H x 5" W x 1-1/2" D (130 mm x 127 mm x 38 mm)
4905-9993	4905-9995	White Wall Mount Replacement cover with red "FIRE" lettering	

Synchronization Module Reference (refer to data sheet S4905-0003 for additional information)

Model	Description		Dimensions
4905-9914	Class B	Synchronized Flash Module; epoxy encapsulated with in/out 18 AWG (0.82 mm^2) wire leads, rated for 2 A NAC, requires 10 mA for power; for use with V/O only when not supplied from panel	1-3/8" x 2-7/16" x 13/16" (35 mm x 62 mm x 20 mm)
4905-9922	Class A		
4905-9938	SmartSync Control Module with Class B or Class A output; mounts in 4" (102 mm) square box; refer to data sheet S4905-0003 for details		4" x 4-1/8" x 1-1/4" D (102 mm x 105 mm x 32 mm)

Wire Guards and Adapters (see page 4 for reference diagrams)

Model	Description		Dimensions
4905-9961*	**A/V or V/O Wall** Mount Red Wire Guard with Mounting Plate, for semi-flush or surface mounted boxes		6-1/16" H x 6-1/16" W x 3-1/8" D (154 mm x 154 mm x 79 mm)
4905-9926	**V/O Ceiling** Mount Red Wire Guard with Mounting Plate, for semi-flush or surface mounted boxes		6-1/8" x 4-3/8" x 2-7/8" deep (156 mm x 111 mm x 73 mm)
4905-9927*	**A/V Ceiling** Mount Red Wire Guard for mounting to flush mounted electrical box		8-1/2" x 6-1/8" x 3" (216 mm x 156 mm x 76 mm)
4905-9928*	Red Adapter Plate, required to mount 4905-9927 guard to surface mounted electrical box		9" x 7" (229 mm x 178 mm)
4905-9910	Surface Mount Adapter Plate; zinc plated; **required for mounting to handy box; not needed when using 4905-9926 guard**		4-7/8" x 3-1/8" x 0.060" D (124 mm x 79 mm x 1.5)
4905-9915	White	Ceiling Mount A/V Surface Mount Adapter Box Extension, use to cover 1-1/2" deep surface mounted boxes	4-3/4" x 6-7/8" x 1-1/2" deep, (121 mm x 175 mm x 38 mm)
4905-9916	Red		

* UL listed by Space Age Electronics Inc.

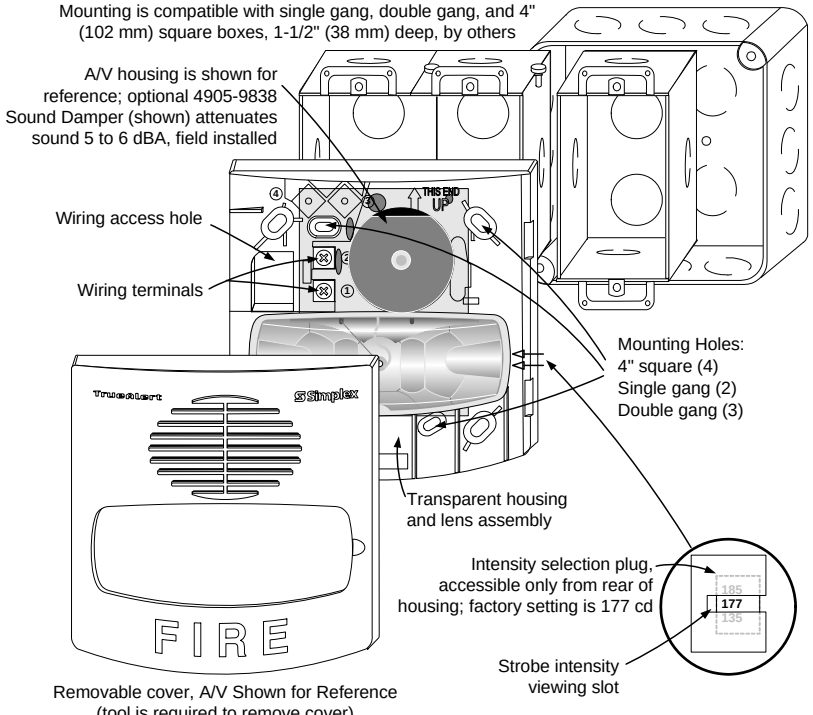
Specifications (refer to Instructions 579-859 for additional information)

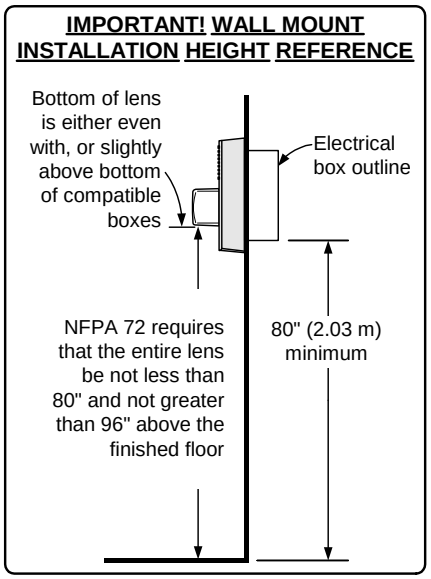
Rated Voltage Range	UL Listed Rating	Regulated 24 DC; see Note 1 below					
	ULC Listed Rating	20 VDC to 30 VDC per ULC S526-M878					
Flash Rate and Synchronized NAC Loading		1 Hz; with up to 35 synchronized strobes maximum per NAC					
Environmental; Temperature and Humidity		32° to 122° F (0° to 50° C); 10% to 93%, non-condensing at 100° F (38° C)					
Screw Terminal Connections		18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2); two wires per terminal for in/out wiring					
Dimensions (with lens)	A/V and V/O Wall Mount	5-1/8" H x 5" W x 2-3/4" D (130 mm x 127 mm x 70 mm)					
	V/O Ceiling Mount	4-3/4" L x 2-5/16" W x 2-5/8" D (121 mm x 75 mm x 67 mm)					
	A/V Ceiling Mount	4-3/4 L" x 6-7/8" W x 2-5/8" D (121 mm x 175 mm x 67 mm)					
Horn Output Characteristics		2400 to 3700 Hz sweep, modulated at 120 Hz rate					
A/V Horn Ratings, dBA @ 10 ft (3 m); at 24 VDC (see Note 2)		**Steady Sound Output**			**Coded Sound Output** (see Note 2)		
		Wall Mount	**Ceiling Mount**		**Wall Mount**	**Ceiling Mount**	
	UL 464 Reverberant Chamber	86 dBA	87 dBA		82 dBA	83 dBA	
	Anechoic Chamber	92 dBA	93 dBA		92 dBA	93 dBA	
	Angular Dispersion	Per ULC S525; -3 dB at 45° off-axis for both wall and ceiling mount models					
Wall Mount		**Visible Only (V/O)**			**Audible/Visible (A/V)**		
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)	**135 cd**	**177 cd**	**185 cd**	**135 cd**	**177 cd**	**185 cd**
		314 mA	**390 mA**	**409 mA**	**333 mA**	**418 mA**	**433 mA**
	Reference RMS Currents at other voltages 18 VDC	279 mA	347 mA	364 mA	296 mA	372 mA	385 mA
	Reference RMS Currents at other voltages 24 VDC	209 mA	260 mA	273 mA	222 mA	279 mA	289 mA
Ceiling Mount		**Visible Only (V/O)**			**Audible/Visible (A/V)**		
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)	**135 cd**	**177 cd**	**185 cd**	**135 cd**	**177 cd**	**185 cd**
		356 mA	**431 mA**	**447 mA**	**389 mA**	**456 mA**	**463 mA**
	Reference RMS Currents at other voltages 18 VDC	316 mA	383 mA	397 mA	346 mA	405 mA	412 mA
	Reference RMS Currents at other voltages 24 VDC	237 mA	287 mA	298 mA	259 mA	304 mA	309 mA

NOTES:

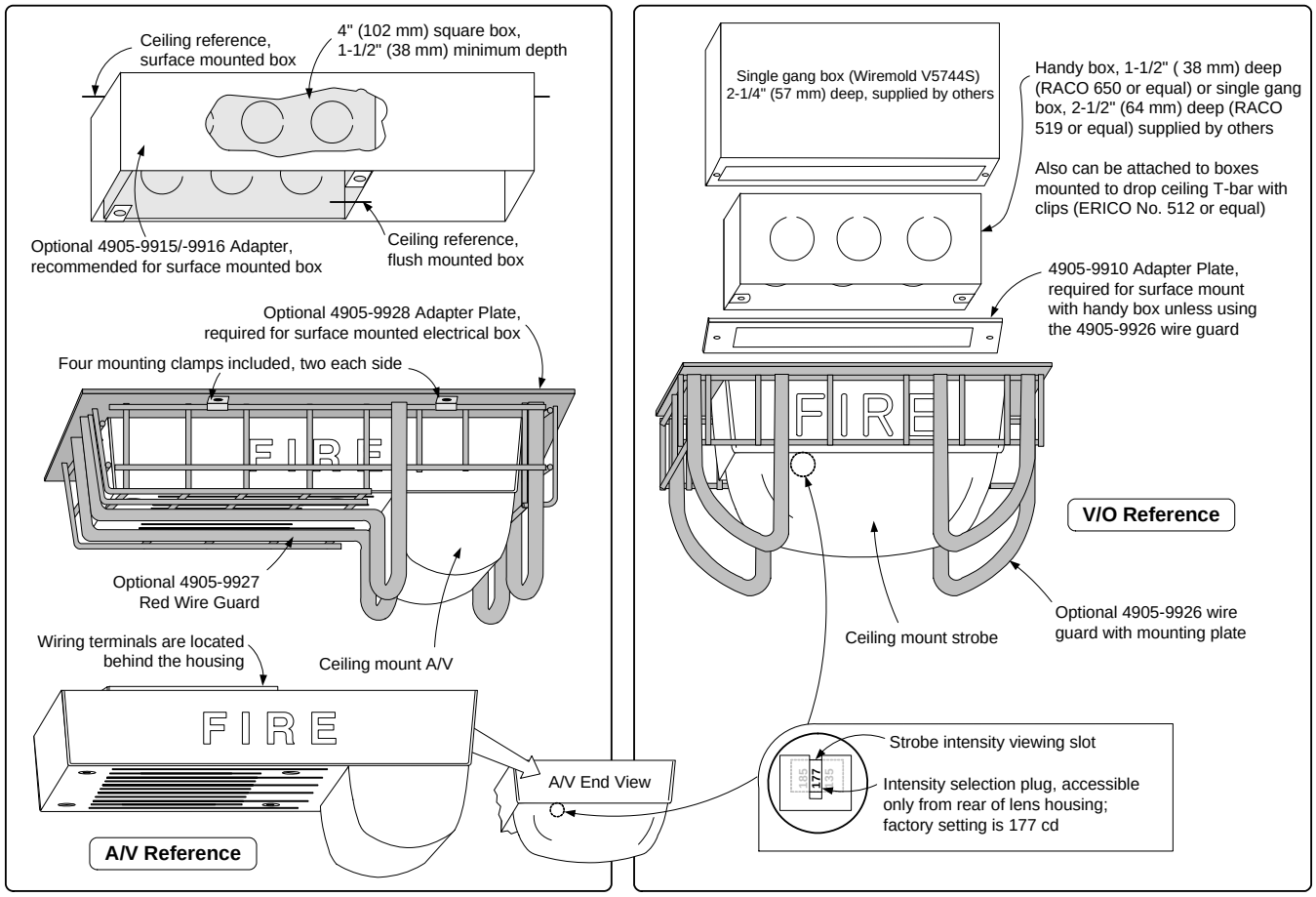
1. "Regulated 24 DC" refers to the voltage range of 16 to 33 VDC per UL Standard 1971, *Signaling Devices for the Hearing Impaired*. This voltage range is the absolute operating range. Operation outside of this range may cause permanent damage to the appliance. Please note that 16 VDC is the lowest operating voltage that is allowed at the last appliance on the NAC under worst case conditions.
2. Coded values are typical of the output measured with a Temporal pattern or a March Time coded pulse and with a sound level meter reading on a "fast" setting. Under the same test conditions, coded horn output "peak" sound level readings are typically 4 dBA higher. Anechoic horn output ratings are typically more representative of actual installed sound output.
3. Currents are with horn on steady. The maximum RMS current listed is the device nameplate rating. Strobe designs are constant wattage and the maximum RMS current rating occurs at the lowest allowable operating voltage. (RMS is root mean square and refers to the effective value of a varying current waveform.)

Installation Reference, Surface or Semi-Flush Mounting

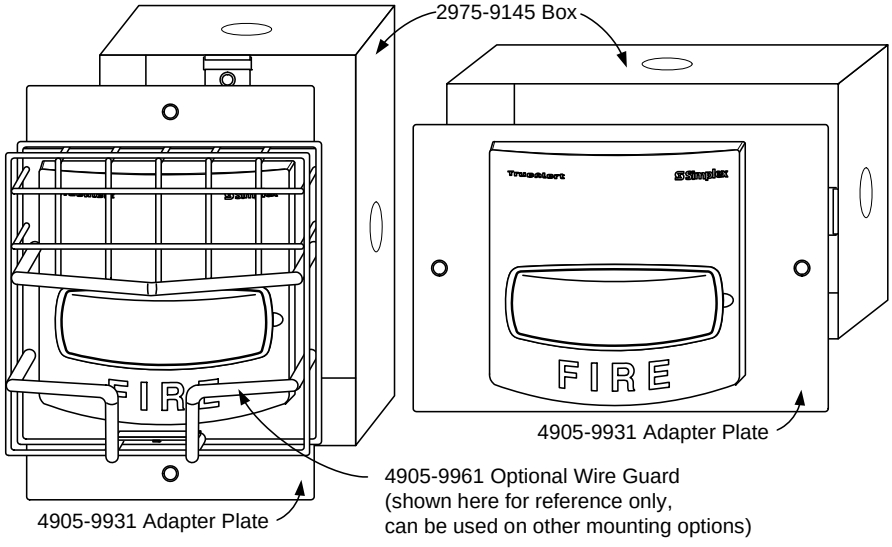




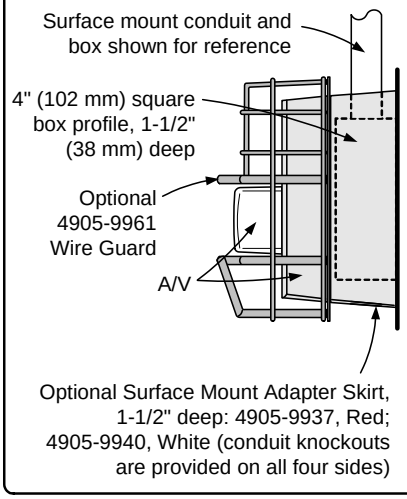
Ceiling Mount High Candela Appliances Installation Reference



Wall Mount Installation Reference; Adapter Plate, Guard, and Adapter Skirt



Surface Mounting Reference with Optional Adapter Skirt and Optional Wire Guard



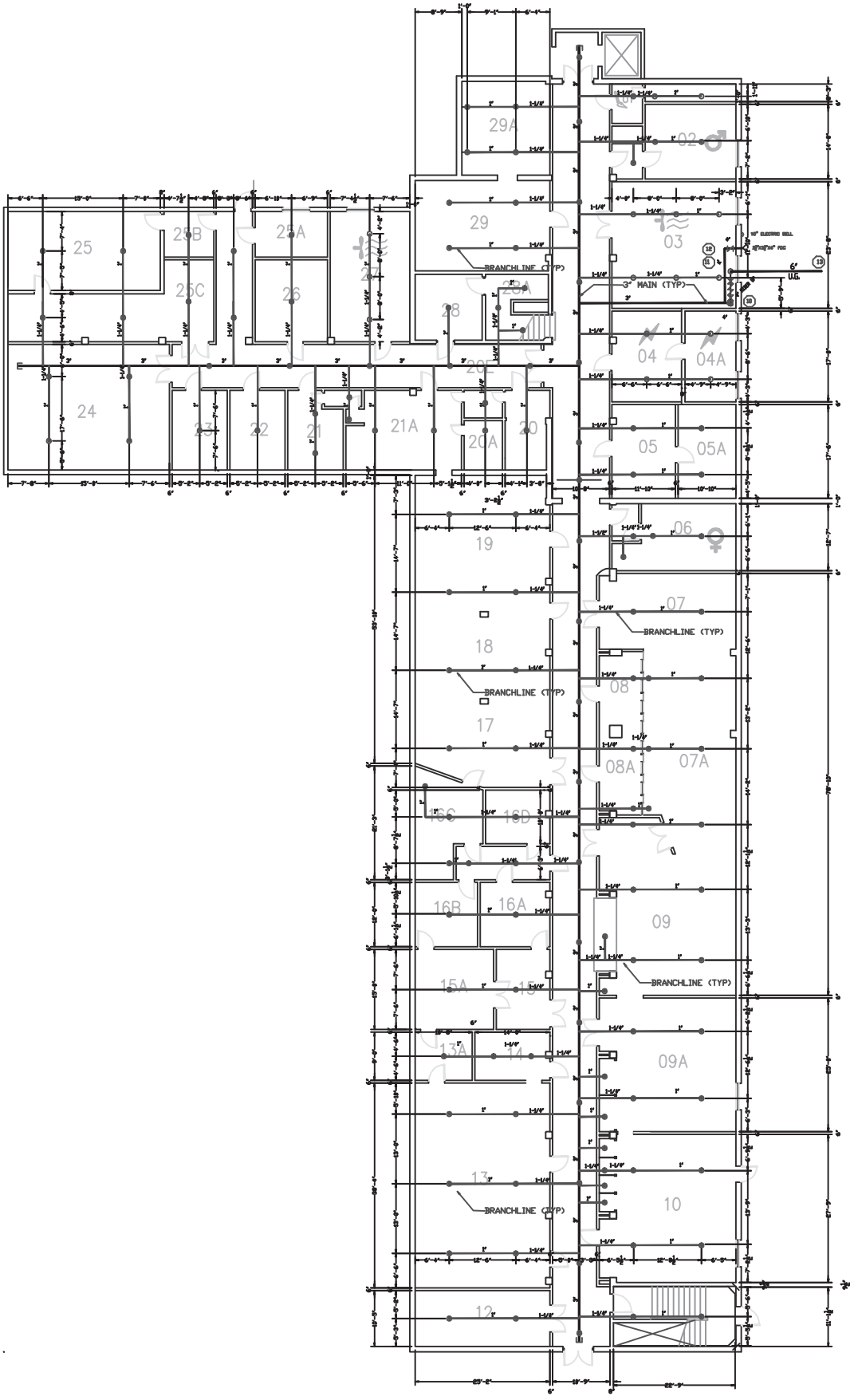
NOTE: V/O is shown for reference, A/V mounts the same

Fire Protection Analysis

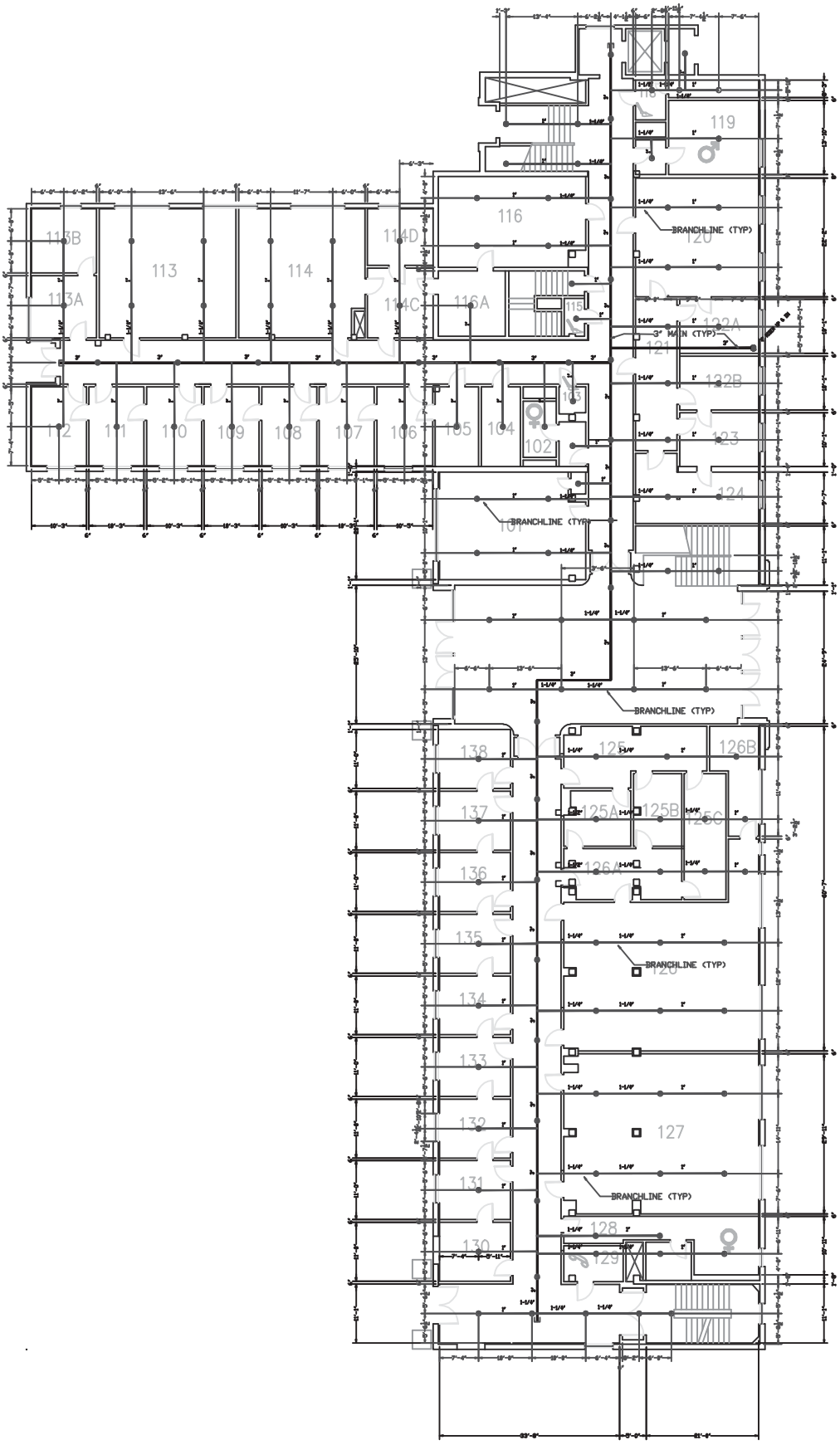
Cotchett Education Building

Appendix 12

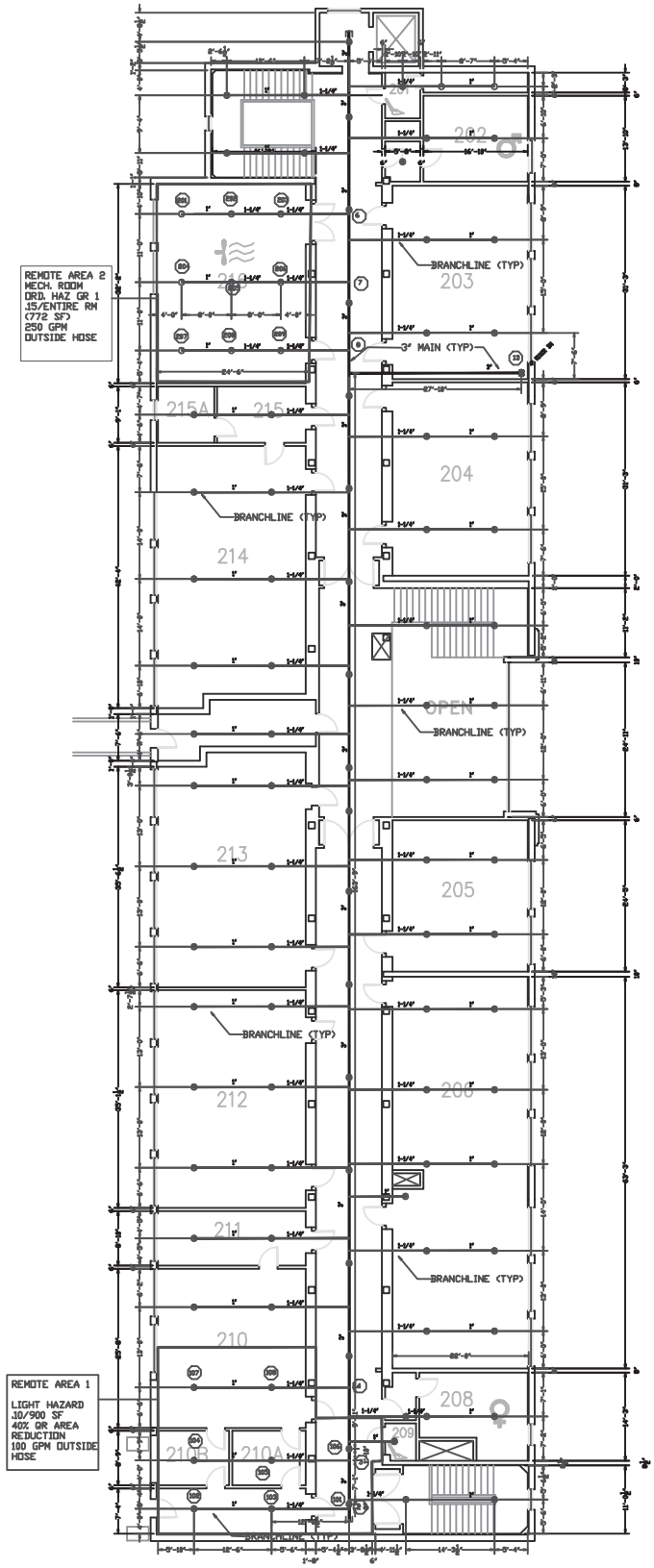
Sprinkler Layout



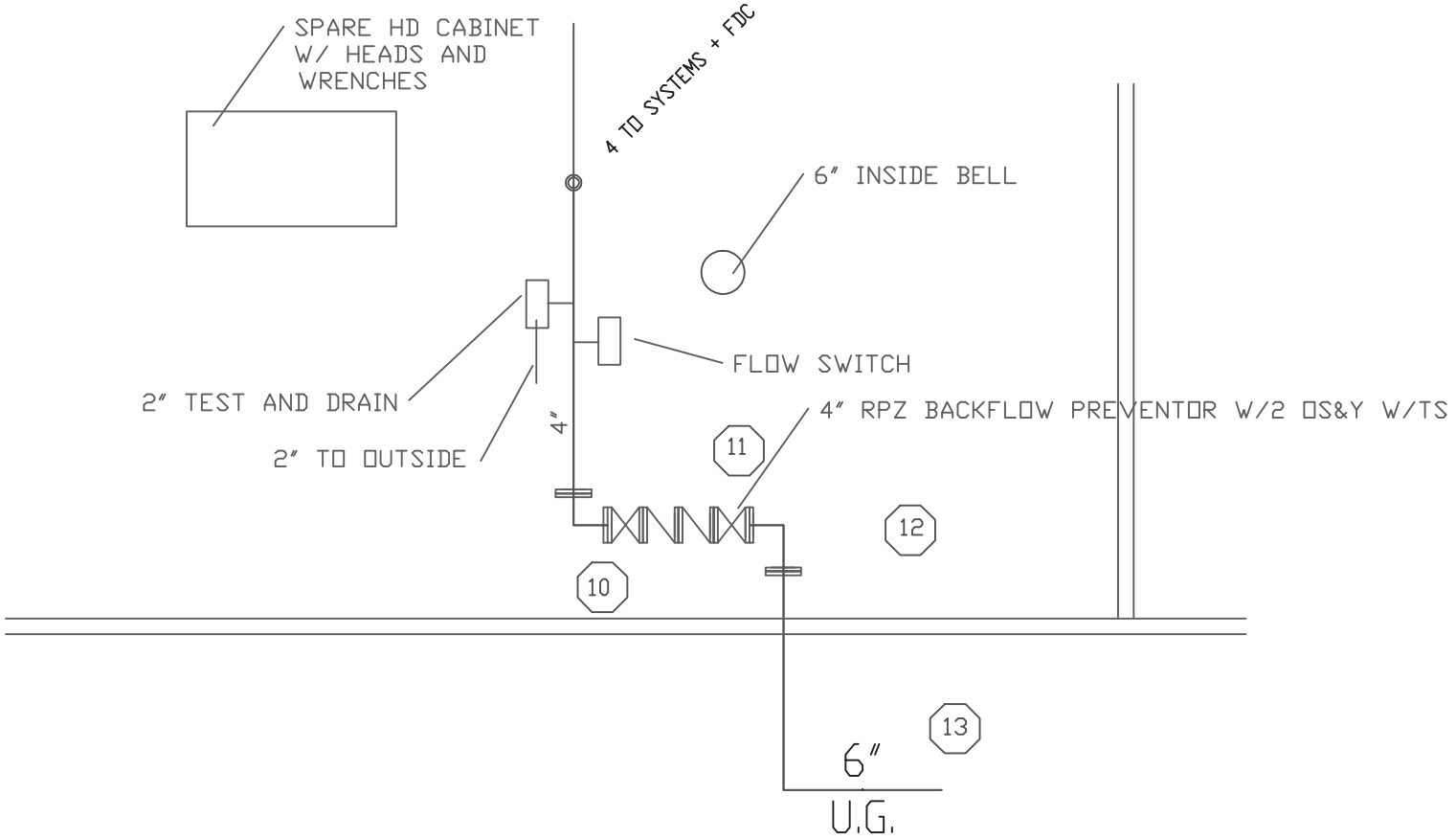
Cotchett Education Building 0020 Floor1



Cotchett Education Building 0020 Floor2



Cotchett Education Building 0020 Floor3



RISER ELEVATION

Fire Protection Analysis

Cotchett Education Building

Appendix 13

Fire Sprinkler Hydraulic Calculations

Hydraulic Calculations

For

Cotchett Education Building

Building 002
Cal Poly
San Luis Obispo
February 14, 2013

Remote Area: 1
Remote Area Location: Second Floor
Occupancy Classification: Light Hazard
Density: 0.10 gpm/ft^2
Area of Application: 900 ft^2
Coverage per Sprinkler: 225 ft^2 max
Type of Sprinklers Calculated: ½" orifice, K= 5.6, Quick Response
Number of Sprinklers Calculated: 8

Hose Stream: 100 gpm
Total Water Required (Including Hose Stream): 238.2 gpm @ 42.8 psi

Type of System: Wet Pipe

Water Supply Information:
Static: 50 psi
Residual: 40 psi
Flow: 1000 gpm

Date: N/A
Location: Site
Source: Local Municipality

HYDRAULIC CALCULATIONS

CONTRACT NAME REMOTE AREA 1 - K FACTORS SHEET 1 OF 2

NOZZLE IDENT. AND LOCATION	FLOW IN GPM	PIPE SIZE	PIPE FITTINGS AND DEVICES	EQUIV. PIPE LENGTH	FRICTION LOSS PSI/FT	PRESSURE SUMMARY	NORMAL PRESSURE	D=.10 GPM/SF K=5.6 NOTES
K FACTOR TYP PEND.	q			L		Pt	Pt	13'-0" x 12'-6" = 162.5 SF CMAX SPKR MIN RA
	Q			F		Pe	Pv	
				T		Pf	Pn	
	q	1" SCH 40	1-T (5')	L 1	.0912	Pt 8.5	Pt	162.5 SF x .10 = 16.3 GPM $P=\left(\frac{16.3}{5.6}\right)^2 = 8.5$ psi
	Q 16.3			F 5		Pe .4	Pv	
				T 6		Pf .54	Pn	
	q			L		Pt 8.6	Pt	TYP PEND K = $\frac{16.3}{\sqrt{8.6}} = 5.56$
	Q 16.3			F		Pe	Pv	
				T		Pf	Pn	
	q			L		Pt	Pt	
	Q			F		Pe	Pv	
				T		Pf	Pn	
K FACTOR TYP BL	q			L		Pt	Pt	TYP BL
	Q 16.3			F		Pe	Pv	
				T		Pf	Pn	
102	q	1" SCH 40		L 13'	.0912	Pt 8.6	Pt	K = 5.56
	Q 16.3			F		Pe	Pv	
				T 13'		Pf 1.2	Pn	
103	q 17.4	1¼" SCH 40	1-T	L 13'	.0913	Pt 9.8	Pt	$q = 5.56\sqrt{9.8} = 17.4$
	Q 33.7			F 6'		Pe	Pv	
				T 19'		Pf 3.1	Pn	
2	q			L		Pt 12.9	Pt	TYP BL K = $\frac{33.7}{\sqrt{12.9}} = 9.38$
	Q 33.7			F		Pe	Pv	
				T		Pf	Pn	
	q			L		Pt	Pt	
	Q			F		Pe	Pv	
				T		Pf	Pn	
	q			L		Pt	Pt	
	Q			F		Pe	Pv	
				T		Pf	Pn	
	q			L		Pt	Pt	
	Q			F		Pe	Pv	
				T		Pf	Pn	
						Pt		

American Fire Sprinkler Association
12750 Merit Drive, Suite 350, Dallas, Texas 75251
Tele: 214.349.5965
Fax: 214.343.8898
www.firesprinkler.org

HYDRAULIC CALCULATIONS

CONTRACT NAME REMOTE AREA 1 - MAIN SHEET 2 OF 2

NOZZLE IDENT. AND LOCATION	FLOW IN GPM	PIPE SIZE	PIPE FITTINGS AND DEVICES	EQUIV. PIPE LENGTH	FRICTION LOSS PSI/FT	PRESSURE SUMMARY	NORMAL PRESSURE	NOTES
2 (101)	q Q 33.7	3" SCH 10		L 1' F T 1'	.0013	Pt 12.9 Pe Pf 0.0	Pt Pv Pn	TYP BL FROM SHEET 1
101	q 20.0 Q 50.7	3" SCH 10		L 7' F T 7'	.0029	Pt 12.9 Pe Pf 0.0	Pt Pv Pn	TYP PEND K = 5.56 $5.56\sqrt{12.9} = 20.0$
3	q 33.7 Q 84.4	3" SCH 10		L 2' F T 2'	.0076	Pt 12.9 Pe Pf 0.0	Pt Pv Pn	TYP BL K = 9.38 $9.38\sqrt{12.9} = 33.7$
106	q 20.0 Q 104.4	3" SCH 10		L 10' F T 10'	.0110	Pt 12.9 Pe Pf 0.1	Pt Pv Pn	TYP PEND K = 5.56 $5.56\sqrt{12.9} = 20.0$
4	q 33.8 Q 138.2	3" SCH 10	1-T (15') 1-E (7') 22' x 1.34	L 192' F 29' T 221	.0185	Pt 13.0 Pe Pf 4.1	Pt Pv Pn	TYP BL K = 9.38 $9.38\sqrt{13.0} = 33.8$ SCH 10 EQ LEN. $(13.26/13.07)^{4.85} = 1.34$
9	q Q 138.2	4" SCH 10	1E (20') 20 x 1.32 = 26'	L 33' F 26' T 59'	.0051	Pt 17.1 Pe 14.3 Pf 0.3	Pt Pv Pn	ADJ SCH 10 $(4.26/4.03)^{4.87}$ = 1.32
10	q Q 138.2	4" RPZ		L F T		Pt 31.7 Pe Pf 10	Pt Pv Pn	10 PSI RPZ BACKFLOW PREVENTOR
11	q Q 138.2	4" SCH 10	1E, 20' 20 x 1.32 = 26	L 2 F 26 T 28	.0051	Pt 41.7 Pe 0.9 Pf 0.1	Pt Pv Pn	
12	q Q 138.2	6" D.I. U.G	1E, 14' 1T, 30' 16 V 3'	L 100 F 54 T 154	.0008	Pt 42.7 Pe Pf 0.1	Pt Pv Pn	$(5.89/6.06)^{4.87} = .87$ $(140/120)^{1.85} = 1.33$ 47' x .87 x 1.33 = 54'
13	q 100 Q 238.2	HOSE		L F T		Pt 42.8 Pe Pf	Pt Pv Pn	REQD AT CITY SUPPLY
	q Q			L F T		Pt Pe Pf	Pt Pv Pn	
						Pt		

American Fire Sprinkler Association
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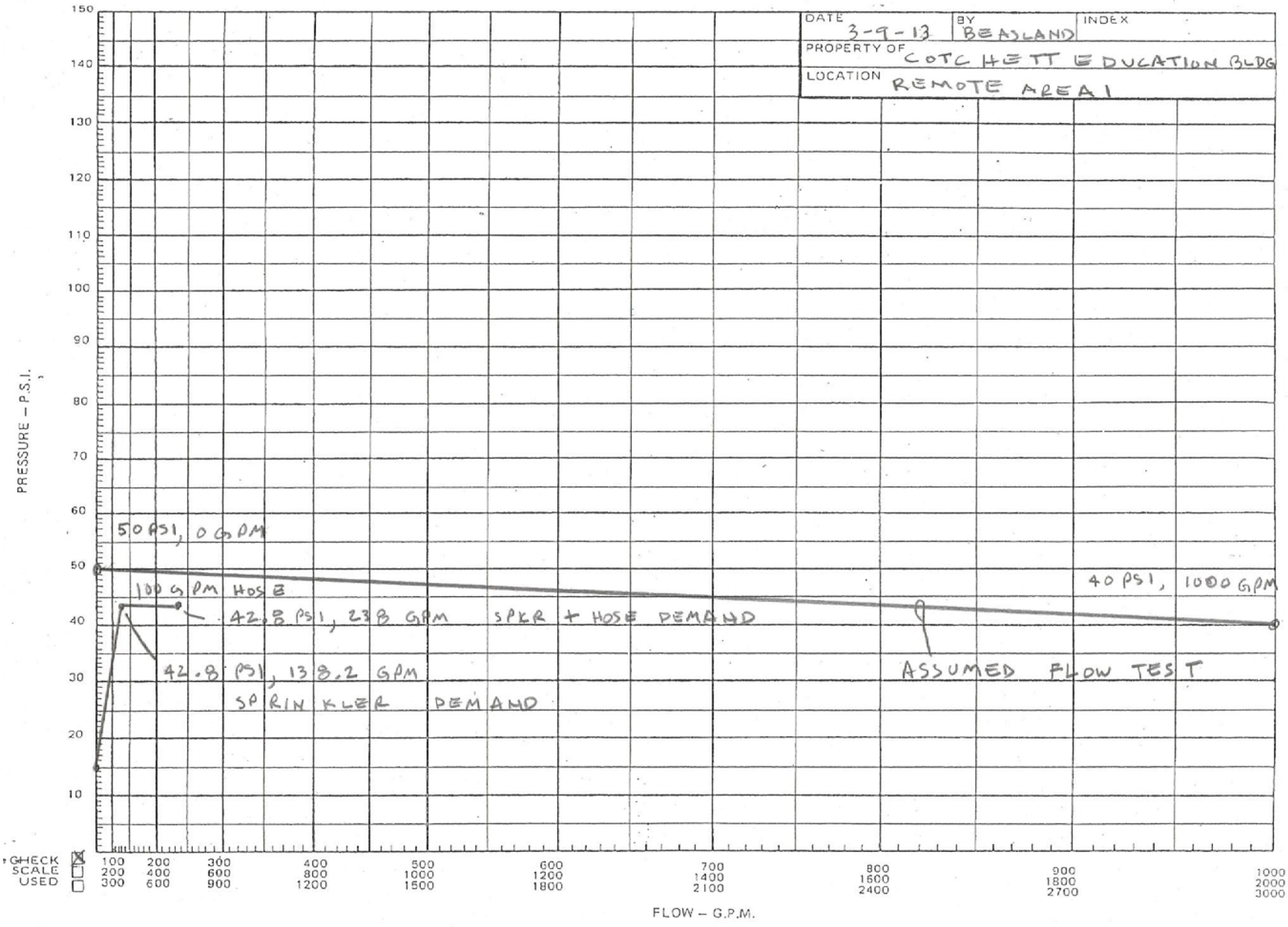
Fax: 214.343.8898

WATER SUPPLY GRAPH · NO.N[1.85]



Hydraulic Calculations

For

Cotchett Education Building

Building 002
Cal Poly
San Luis Obispo
February 14, 2013

Remote Area: 2
Remote Area Location: Second Floor
Occupancy Classification: Ordinary Hazard (Group 1)
Density: 0.15 gpm/ft^2
Area of Application: Entire Room
Coverage per Sprinkler: 130 ft^2 max
Type of Sprinklers Calculated: ½" orifice, K= 5.6, Quick Response
Number of Sprinklers Calculated: 9

Hose Stream: 250 gpm
Total Water Required (Including Hose Stream): 388.8 gpm @ 37.7 psi

Type of System: Wet Pipe

Water Supply Information:
Static: 50 psi
Residual: 40 psi
Flow: 1000 gpm

Date: N/A
Location: Site
Source: Local Municipality

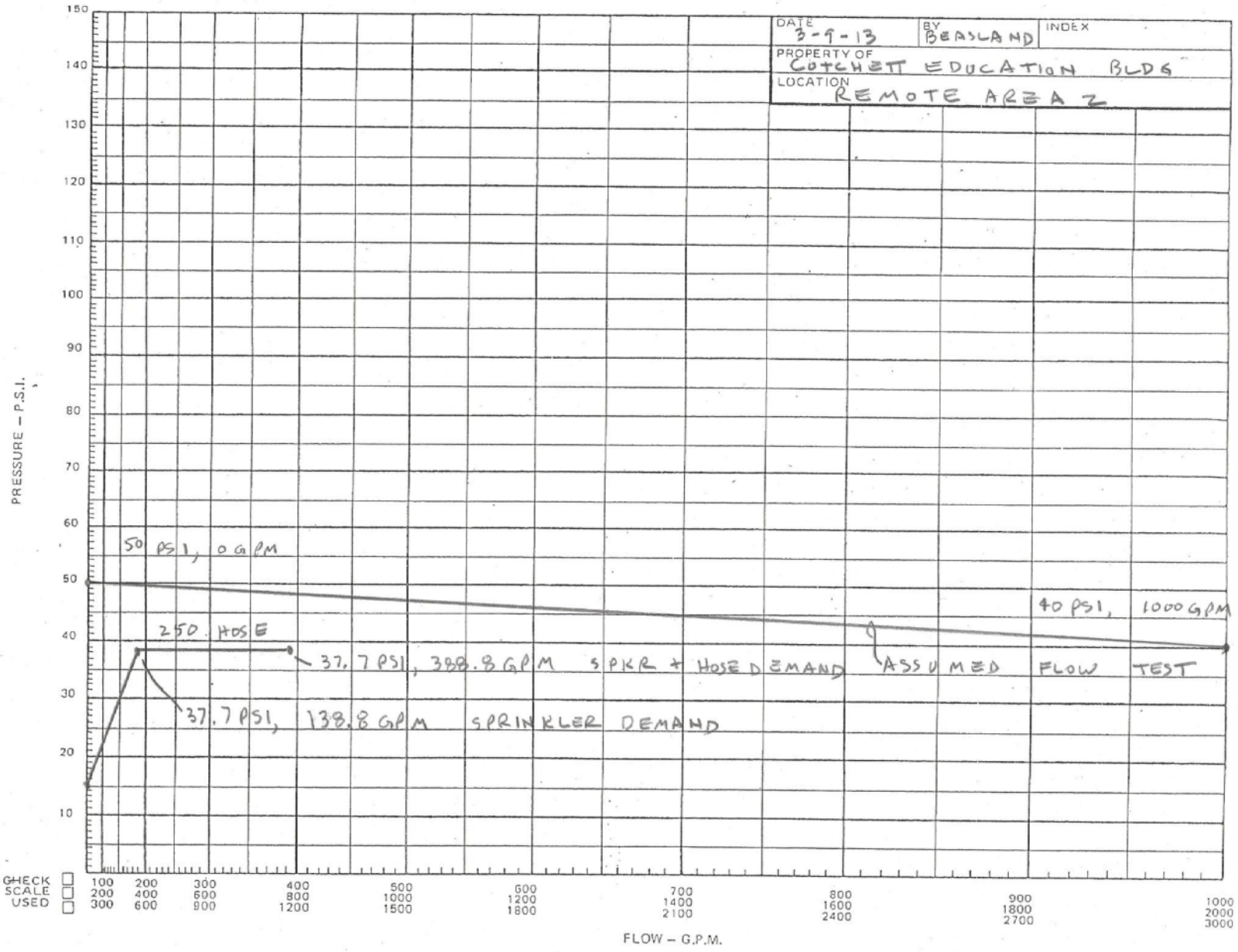
HYDRAULIC CALCULATIONS

CONTRACT NAME REMOTE AREA 2 SHEET 1 OF 1

NOZZLE IDENT. AND LOCATION		FLOW IN GPM	PIPE SIZE	PIPE FITTINGS AND DEVICES	EQUIV. PIPE LENGTH	FRICTION LOSS PSI/FT	PRESSURE SUMMARY	NORMAL PRESSURE	NOTES
204	Typ BL 201	q Q 14.8	1" SCH 40		L 8.0 F T 8.0	C=120 .0764	Pt 7.0 Pe Pf 0.6	Pt Pv Pn	D=0.15 gpm/ft² K=5.6 Q=88 SF x 0.15=13.2 P=(13.2/5.6)²=5.6 psi USE 7psi min √7 x 5.6 = 14.8 gpm
202	201	q 15.4 Q 30.2	1¼" SCH 40		L 8.0 F T 8.0	.0725	Pt 7.6 Pe Pf 0.6	Pt Pv Pn	q = 5.6√7.6 = 15.4
203	203	q 16.0 Q 46.2	1¼ SCH 40	1-T, 6'	L 11.0 F 6.0 T 17.0	.1598	Pt 8.2 Pe Pf 2.7	Pt Pv Pn	q = 5.6√8.2 = 16.0
	6	q – Q 46.2	3" SCH 10		L 11.0 F T 11.0	.0024	Pt 10.9 Pe Pf 0.0	Pt Pv Pn	BL K FACTOR = 46.2/√10.9 = 14.0
	7	q 46.2 Q 92.4	3" SCH 10		L 11.0 F T 11.0	.0088	Pt 10.9 Pe Pf 0.1	Pt Pv Pn	BL K = 14.0 14.0 x √10.9 = 46.2
	8	q 46.4 Q 138.8	3" SCH 10	1-T, 15' 1-E, 7' 22' x 1.34	L 32 F 29 T 61	.0185	Pt 11.0 Pe Pf 1.1	Pt Pv Pn	BL K = 14.0 14 x √11.0 = 46.4 ADJ SCH 10 EQ. LEN (3.26/3.07)^4.87 = 1.34
	9	q Q 138.8	4" SCH 10	1-E, 20' 20 x 1.32 = 26	L 33 F 26 T 59	.0051	Pt 12.1 Pe 14.3 Pf 0.3	Pt Pv Pn	ADJ SCH 10 EQ LEN (4.26/4.03)^4.87 = 1.32
	10	q Q 138.8	4" RPZ		L F T		Pt 26.7 Pe Pf 10.0	Pt Pv Pn	10 PSI RPZ BACKFLOW PREVENTOR
	11	q Q 138.8	4" SCH 10	1-E 20' 20 x 1.32 = 26	L 2 F 26 T 28	.0051	Pt 36.7 Pe .9 Pf 0.1	Pt Pv Pn	
	12	q Q 138.8	6" D.I. UG	1-E 14 1-T, 30 1-GV, 3	L 100 F 54 T 154	.0008	Pt 37.7 Pe Pf .1	Pt Pv Pn	(5.89/6.06)^4.87 = .87 (140/120)^1.85 = 1.33 47' x .87 x 1.33 = 54
	13	q 250 Q 388.8	HOSE		L F T		Pt 37.7 Pe Pf	Pt Pv Pn	REQD AT CITY SUPPLY
							Pt		

American Fire Sprinkler Association
12750 Merit Drive, Suite 350, Dallas, Texas 75251
Tele: 214.349.5965
Fax: 214.343.8898
www.firesprinkler.org

WATER SUPPLY GRAPH · NO.N 1.85



Fire Protection Analysis

Cotchett Education Building

Appendix 14

Fire Modeling: Design Fire Scenario 1

Design Scenario 1
Fire Modeling Output

	m	m	m	m	m	%/m	%/m
s	SMOKE LAYER HEIGHT 1W	SMOKE LAYER HEIGHT 1N	SMOKE LAYER HEIGHT 1S	SMOKE LAYER HEIGHT 2N	SMOKE LAYER HEIGHT 2S	Smoke Det 1	Smoke Det 2
Time	3.00	3.00	3.00	2.50	2.50	0.00	0.00
0	3.00	3.00	3.00	2.50	2.50	0.00	0.00
10	3.00	3.00	3.00	2.50	2.50	0.00	0.00
20	3.00	3.00	3.00	2.50	2.50	0.00	0.60
30	3.00	3.00	3.00	2.21	2.50	0.00	3.45
40	3.00	3.00	3.00	2.04	2.50	0.00	5.25
50	3.00	2.47	3.00	1.46	2.50	0.01	6.68
60	3.00	1.60	3.00	0.92	2.50	1.19	8.42
70	3.00	1.26	3.00	0.73	2.50	3.26	9.20
80	3.00	1.43	3.00	0.61	2.50	5.24	10.13
90	3.00	1.37	3.00	0.66	2.50	6.82	11.03
100	3.00	0.80	3.00	0.66	2.50	8.34	12.42
110	3.00	1.11	3.00	0.70	2.50	10.20	13.46
120	3.00	0.92	3.00	0.83	2.50	10.79	15.91
130	3.00	0.99	3.00	0.73	2.50	12.73	17.59
140	3.00	0.92	3.00	0.68	2.50	14.51	18.54
150	3.00	0.89	3.00	0.64	2.50	17.02	20.33
160	3.00	0.78	2.75	0.70	2.50	17.88	22.72
170	3.00	0.91	0.56	0.60	2.50	18.68	25.37
180	3.00	0.86	0.60	0.59	2.50	19.86	27.70
190	3.00	0.86	0.58	0.62	2.50	21.36	29.83
200	3.00	0.84	0.56	0.60	2.24	23.80	31.04
210	3.00	0.80	0.57	0.63	2.50	26.07	32.21
220	3.00	0.80	0.56	0.62	2.50	27.32	34.17
230	3.00	0.85	0.69	0.55	2.50	28.44	36.09
240	3.00	0.80	0.61	0.55	2.32	30.55	37.60
250	3.00	0.80	0.57	0.59	2.50	31.97	38.33
260	3.00	0.79	0.53	0.59	2.50	33.30	38.92
270	3.00	0.83	0.56	0.60	2.50	34.94	40.12
280	3.00	0.80	0.55	0.64	2.50	36.06	41.46
290	3.00	0.81	0.54	0.58	2.50	37.26	42.29
300	3.00	0.78	0.57	0.65	2.50	38.77	43.78
310	3.00	0.77	0.55	0.55	2.50	40.12	45.01
320	3.00	0.79	0.55	0.57	2.19	41.30	46.10
330	3.00	0.74	0.55	0.57	2.10	42.29	46.90
340	3.00	0.79	0.55	0.58	2.33	43.12	47.78
350	3.00	0.83	0.53	0.57	1.88	44.22	48.22
360	3.00	0.77	0.53	0.59	1.84	45.32	49.38
370	3.00	0.76	0.54	0.63	2.29	46.55	50.11
380	3.00	0.78	0.54	0.64	2.50	47.33	51.20
390	3.00	0.81	0.53	0.57	2.16	47.45	52.15
400	3.00	0.82	0.54	0.60	1.81	48.85	53.56
410	3.00	0.77	0.53	0.61	2.50	50.60	54.11
420	3.00	0.76	0.53	0.59	1.55	51.59	54.94
430	3.00	0.78	0.53	0.58	2.37	52.14	55.84
440	3.00	0.77	0.55	0.54	2.50	52.65	56.57
450	3.00	0.78	0.53	0.59	2.01	53.81	57.51
460	3.00	0.80	0.54	0.57	1.03	54.35	58.45
470	3.00	0.74	0.53	0.59	1.29	55.89	59.07
480	3.00	0.76	0.53	0.59	1.59	56.42	59.90
490	3.00	0.75	0.54	0.60	2.50	56.79	60.45
500	3.00	0.78	0.54	0.56	2.50	57.42	61.32
510	3.00	0.78	0.53	0.59	1.68	58.34	61.81
520	3.00	0.79	0.54	0.59	1.44	59.31	62.34
530	3.00	0.76	0.53	0.58	1.86	59.77	63.00
540	3.00	0.78	0.52	0.56	2.46	60.78	63.55
550	3.00	0.74	0.53	0.58	0.53	61.82	64.00
560	3.00	0.78	0.55	0.58	2.17	62.45	64.64
570	3.00	0.77	0.54	0.61	2.50	62.89	65.22
580	3.00	0.78	0.54	0.60	2.12	63.76	66.10
590	3.00	0.70	0.55	0.63	0.86	63.98	66.84

Yellow highlighted entries are times when smole layer decends below 1.83 m (6 feet)
Orange highlighted entries are times when smoke detectors activate

Fire Protection Analysis

Cotchett Education Building

Appendix 15

Fire Modeling: Design Fire Scenario 2

Design Scenario 2
Fire Modeling Output

	m	m	m	%/m
s	SMOKE LAYER HEIGHT N	SMOKE LAYER HEIGHT S	SMOKE LAYER HEIGHT C	Smoke Det
Time	4.00	4.00	8.00	0.00
0	4.00	4.00	8.00	0.00
10	4.00	4.00	8.00	0.00
20	4.00	4.00	8.00	0.35
30	4.00	4.00	8.00	1.66
40	4.00	4.00	8.00	2.12
50	4.00	4.00	8.00	2.60
60	4.00	4.00	8.00	3.02
70	4.00	4.00	8.00	3.60
80	4.00	4.00	8.00	4.05
90	4.00	4.00	8.00	4.69
100	4.00	4.00	8.00	6.33
110	4.00	4.00	5.88	10.53
120	4.00	4.00	5.29	15.01
130	4.00	4.00	4.33	18.78
140	4.00	4.00	3.69	24.08
150	2.05	4.00	3.62	29.00
160	3.91	4.00	3.30	34.01
170	0.96	1.50	3.07	36.53
180	1.24	1.65	3.08	40.70
190	1.55	1.77	3.03	44.87
200	3.62	1.24	3.00	49.22
210	1.13	1.16	2.99	51.59
220	0.78	1.43	2.75	56.56
230	0.62	1.17	2.73	59.29
240	1.39	0.70	2.59	62.42
250	0.76	0.58	2.38	65.90
260	0.62	0.73	2.35	67.80
270	0.76	0.87	2.31	70.44
280	0.94	1.08	2.14	72.03
290	0.60	0.71	2.07	73.27
300	0.57	0.60	1.94	76.18
310	0.81	0.70	1.96	77.13
320	0.67	0.63	2.10	79.19
330	0.59	0.66	2.08	79.64
340	0.68	0.64	1.97	81.56
350	0.61	0.66	1.88	83.06
360	0.60	0.61	1.93	84.22
370	0.56	0.75	1.89	85.68
380	0.71	0.68	1.91	85.61
390	0.64	0.64	1.85	86.67
400	0.59	0.57	2.11	87.12
410	0.67	0.66	2.32	87.44
420	0.65	0.58	1.78	88.67
430	0.65	0.63	2.09	89.80
440	0.55	0.66	2.00	90.65
450	0.76	0.78	2.02	91.53
460	0.66	0.61	2.14	91.93
470	0.59	0.67	1.91	92.47
480	0.75	0.61	1.97	92.87
490	0.76	0.59	2.07	93.50
500	0.63	0.68	2.03	94.00
510	0.62	0.65	1.94	94.41
520	0.72	0.63	1.96	94.73
530	0.59	0.82	2.30	95.23
540	0.68	0.61	2.08	95.45
550	0.78	0.63	2.09	95.79
560	0.61	0.69	2.15	96.02
570	0.54	0.63	2.26	96.24
580	0.83	0.65	2.08	96.56
590	0.66	0.65	2.15	96.77
600				

Yellow highlighted entries are times when smole layer decends below 1.83 m (6 feet)
Orange highlighted entries are times when smoke detectors activate