WARREN J. BAKER CENTER FOR SCIENCE AND MATHEMATICS

Winter 2017

ABSTRACT

Fire and Life Safety Analysis

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FPE 596 Report

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Keywords: Life Safety Code, RSET, Performance Based Design, Fire Dynamics Simulator (FDS), Smoke Management

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Executive Summary

This report covers the fire protection features of the Warren J. Baker Center for Science and Mathematics located on Cal Poly Campus San Luis Obispo California. The prescriptive analysis of the building will focus on the structural fire protection, egress, fire suppression, fire alarm and detection systems to determine if the meet current codes and standards. The performance based analysis will discuss certain methods and design fire scenarios that can be present within the building and the buildings ability to protect occupants until they can exit safely.

The purpose of this report is to determine if the selected building is compliant with current and up to date codes and standards by analyzing the fire protection systems used. The fire protection systems analyzed for this report are the structural fire protection, egress, fire suppression, fire alarm and detection systems. Each system was analyzed using the applicable codes below.

- International Building Code (IBC) 2015
- NFPA 101 Life Safety Code (LSC) 2015
- NFPA 13 Standard for Installation of Sprinkler Systems 2013
- NFPA 72 National Fire Alarm and Signaling Code 2013
- NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water based Fire Protection Systems
- SFPE Handbook of Fire Protection Engineering 4^{th}& 5^{th} Edition

It was determine that Warren J Baker Center for Science and Mathematics structural fire protection, egress, fire suppression system, and fire alarm and detection systems complied with all applicable codes and standards.

The performance based analysis. This analysis covers typical fire scenarios present in this building and analysis of the atrium. Each section is a summary of the results and assumptions used to evaluate the building. This includes the recommendations and conclusions determined by this analysis. The performance based sections are listed below.

- Fire Scenario Selections in Atrium
  - The primary objective is to meet specific tenability criteria to limit exposures to occupants. (NFPA 101 LSC 2015 Chapter 5) There are methods used to evaluate and limit untenable conditions that occupants may be exposed too. The method used to evaluate was method 1 where the design team can set detailed performance criteria to ensure that occupants are not incapacitated by fire effects.
  - This design fire 1 is based on scenario 6 from the LSC 2015. The fire is located on the second floor in a seating area within the atrium. The area is fully sprinkled and is the largest fuel area that would affect the most floors if there was a fire. The fire will become sprinkler controlled at some point during the fire and there will be activation of the smoke management system.
  - This design fire is based on scenario 8 from the LSC 2015. The fire is located on the second floor in the atrium opening. This fire will not be sprinkler controlled but

activation of the smoke management system will occur. The fire detection system will activate but there will be no suppression of the fire.

The results from both scenarios indicated that all tenable conditions were maintain for the time limit of 600 seconds except for visibility. The visibility requirement of 10 meters was lost about 170 seconds within both fire scenarios and were well below the RSET value discussed later in this report. A recommendation was made to replace the passive naturally ventilated smoke management system with a mechanical smoke management system to help with exhausting smoke within the atrium and maintaining the visibility for a longer period. The other recommendation was to implement a phased evacuation plan for the building. The phased evacuation would use the horizontal exits within the building to compartmentalize the wings and atrium from one another. Then using the voice communication system in the building to coordinate and direct occupants on whether they should stay in place and who should evacuate.

These performance based sections using current codes and standards listed below.

- International Building Code (IBC) 2015
- NFPA 101 Life Safety Code Handbook (LSC) 2015
- NFPA 72 National Fire Alarm and Signaling Code 2013
- SFPE Handbook of Fire Protection Engineering, 5th edition

Introduction

This report analyzes the Warren J. Baker Center for Science in fire protection, including both a prescriptive analysis and a performance based analysis. The prescriptive analysis includes the analysis of the building's egress, structural fire protection, the fire suppression system, and the fire alarm system. This analysis was conducted using the International Building Code and applicable NFPA codes to determine if the current systems and construction within the building meet the requirements of these codes. If any issues are found in the requirements of the codes, recommendations will be made.

In addition, a performance based analysis was done on the natural ventilation smoke control system within the atrium of the building. The purpose of this analysis was to determine if the smoke control system was adequate to maintain tenable conditions within the atrium. The tenable conditions were measured using Fire Dynamics Simulator (FDS) to see how long these tenable conditions could be maintained. Through the performance based analysis as well as the prescriptive requirements, it can be determined if the building meets all requirements to keep occupants safe.

The Warren J. Baker Center for Science and Mathematics completed construction in 2013. The building is 6 stories and 108 feet in height, non-high-rise, and has a total area of 188,372 square feet. The building is constructed as a Type 1B construction. The building is fully sprinklered and contains a fire pump and standpipe system. The building contains a fire alarm system that includes an emergency voice alarm communication system (EVACS). There is a five-story atrium that connects floors 2 through 6 that separates the east and west wings of the building and

is protected with a natural ventilation smoke control system. The building is primarily a Group B occupancy consisting of mainly offices, classrooms and labs, but it also contains large lecture halls, storage spaces, and hazardous storage areas. Figure 1 below gives a general outline of the building APPENDIX B has construction drawings that can give more information on uses and areas within the building.

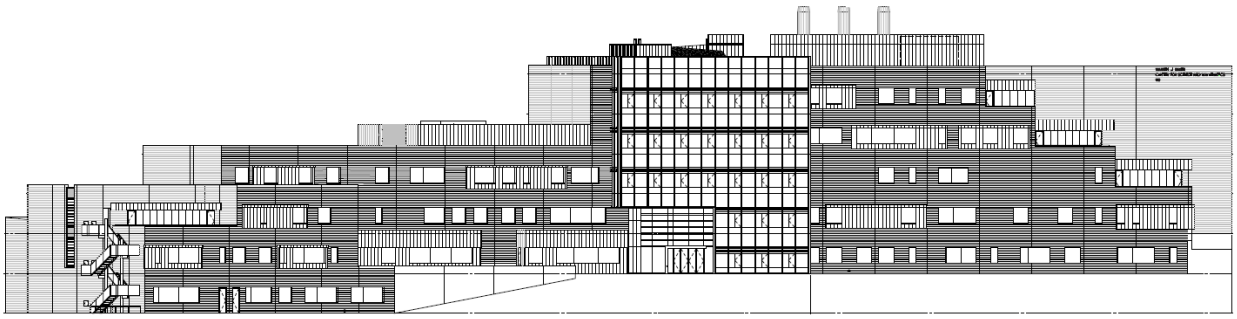


Figure 1 Warren J Bakers Center for Science and Mathematics

Prescriptive Analysis

The following section of this report will cover the codes requirements for this building. This section covers the requirements for the structural fire protection, egress, fire suppression, fire alarm and detection systems. Each section summarizes the results of the prescriptive analysis of the system in question. The prescriptive sections are.

- Structural Fire Protection
- Egress Analysis
- Fire Suppression System
- Fire Alarm and Detection System.

The prescriptive section use these applicable codes and are referenced throughout the report.

- International Building Code (IBC) 2015
- NFPA 101 Life Safety Code (LSC) 2015
- NFPA 13 Standard for Installation of Sprinkler Systems 2013
- NFPA 72 National Fire Alarm and Signaling Code 2013
- NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water based Fire Protection Systems
- SFPE Handbook of Fire Protection Engineering 4^{th}& 5^{th} Edition

Structural Fire Protection

This section covers the requirements for structural fire protection for the Warren J. Baker Center for Science and Mathematics. The section will cover occupancy and construction type for the building as well as fire protection requirements for all structural elements present in this building.

Applicable Codes

International Building Code 2015 Edition
UL listings for spray fire resistant materials:

- Tube columns ULx771
- Steel column ULx772
- Beams UL Design No. 97

Occupancy & Construction Type

Warren J. Baker Center for Science and Mathematics is a 6-story structure with a primary masonry exterior, concrete slab on grade foundation, and a steel primary structure. The primary use for this structure is education and office space with some storage areas and is classified as primarily a Group-B occupancy with a fully automatic sprinkler system under section 304.1 of the IBC. The structure is a 108 foot non-high-rise building with a 5-story atrium. The reason the building is non-high-rise is because the 1st and 2nd floors both exit to a public access way and from the second floor to the highest occupied floor is only 64ft. This is less than the 75ft. requirement defined in the IBC Chapter 2 for high rise building. Figure 2 below shows the actual versus the define building height.

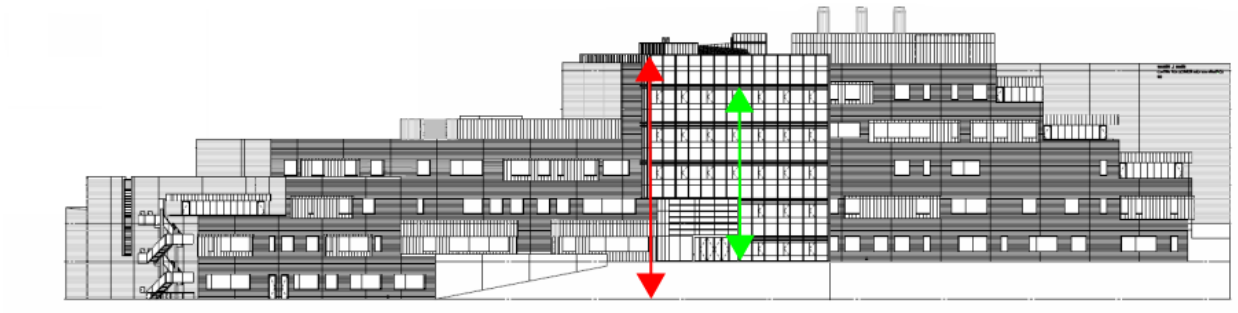


Figure 2 Actual Height of Building vs. Defined

The required construction type per Section 504.3 and 504.4 of the IBC for a 108 foot, 6-story Group B occupancy is either Type 1A or Type 1B construction. A summary of the requirements from the IBC are given in Table 1 below. The primary reason the other types of construction were ruled out is due to the height of the building and number of stories. Warren J. Baker Center

for Science and Mathematics was built as Type 1-B which meets the allowed construction type under the IBC.

Table 1

Summary of Allowable Height, Stories, and Area for Group B Occupancies									
Building Height in Feet Above Grade Plane									
	Type I		Type II		Type III		Type IV	Type V	
	A	B	A	B	A	B	HT	A	B
NS	UL	160	65	55	65	55	65	50	40
S	UL	180	85	75	85	75	85	70	60
Allowable Number of Stories Above Grade Plane									
NS	UL	11	5	3	5	3	5	3	2
S	UL	12	6	4	6	4	6	4	3
Allowable Area									
NS	UL	UL	37500	23000	28500	19000	36000	18000	9000
S1	UL	UL	150000	92000	114000	76000	144000	72000	36000
SM	UL	UL	112500	69000	85500	57000	108000	54000	27000

Legend	
Not Sprinklered	NS
Sprinklered	S
1 story with sprinklers	S1
2 or more stories with sprinklers	SM
Applicable	

Fire Protection Requirements

The required fire protection ratings for the building structural elements are found inSection601 of the IBC. The required fire protection ratings for Type 1-B construction primary structural elements for exterior and interior bearing walls, floor assemblies and associated secondary members require a fire rating of 2 hours. Interior and exterior non-bearing walls and partitions require no fire rating. The fire resistance for non-loading bearing exterior walls is based on the separation distances of Section 602 of the IBC. The separations on all sides of the building is greater than 30 feet so the required fire rating is 0 hours. Table 2 below summarizes the requirements for fire protection from the IBC.

Table 2

Summary of Building Element Fire Protection Requiremets				
Elements	Type I		Type II	
	A	B	A	B
Primary Structural Frame	3	2	1	0
Bearing Walls				
Exterior	3	2	1	0
Interior	3	2	1	0
NonBearing wall and Partitions Exterior	0	0	0	0
NonBearing wall and Partitions Interior	0	0	0	0
Floor Construction and Associated Secondary Members	2	2	1	0
Roof Construction and Associated Secondary Members	1.5	1	1	0

Foundation

The structure was built on a reinforced concrete foundation below grade. The foundation also acts as retaining walls on the first and second floors of the structure. The concrete is 16 inches thick with reinforcement.

Primary Structure

The primary structure consists of wide flange steel columns, girders, beams, and joists. The structure also consists of a moment frame rectilinear assemblages of beams and columns, with the beams rigidly connected to the columns. Resistance to lateral forces is provided primarily by rigid frame action-that is, by the development of bending moment and shear force in the frame members and joints. The rigid beam-column connections, a moment frame cannot displace laterally without bending the beams or columns depending on the geometry of the connection. The bending rigidity and strength of the frame members is therefore the primary source of lateral stiffness and strength for the entire frame. The primary structure is protected by spray applied fire resistive material (SFRM) and others are a combination of SFRM and gypsum wall board. There is also hollow structural steel used in vertical shafts. These materials require a fire resistance of 2-hours under IBC and the thickness to meet that required fire rating is given in the UL listings for spray fire resistive material.

Floor and Roof Assemblies

The floor and roof assemblies are constructed of 20-gauge metal decking with 4 inches of lightweight concrete topping. The deck is supported by wide flange steel girders and joists. The floor is of composite construction, meaning the structural member composed of two or more dissimilar materials joined together to act as a unit in which the resulting system is stronger than the sum of its parts. An example is the steel-concrete composite beam, in which a steel wide-flange shape is attached to a concrete floor slab. The floors and roofs are constructed with a 2-hour fire rating and the ceilings are constructed of 1-hour fire resistance rating. The suspended ceilings are constructed with gypsum wall board and sound proofing materials that are rated for 1-hour.

Exterior Walls

The exterior walls are non-load bearing and are constructed of 6x16-inch steel studs spaced on 16-inch centers with insulation, and 5/8-inch gypsum for the interior face and a brick veneer on the exterior face. All exterior walls are not required to be rated because the fire separation distance is greater than 30 feet, exterior doors and windows are not required to be fire rated as well.

Interior Walls and Partitions

The non-load bearing walls and partitions are constructed of 2x4 inch steel studs on 16-inch centers with 5/8-inch gypsum wall board on both sides. Partitions containing steel beams are covered with gypsum wall board and steel beams are still covered in spray fire resistant material.

Penetrations through fire rated walls or partitions are required to be the same fire rating as what is being penetrated.

Doors

This building contains horizontal exits and these doors are required to have a fire resistance rating at the same level as the building being penetrated. These horizontal exits have a 2-hour fire rating so the doors are required to have a rating of 2-hours. These doors are tested under NFPA 288. The corridors within the building are 1-hour fire rated, so all other doors are required to be at least 1-hour rated.

Summary

In studying both the structural and non-structural elements of this building they comply with the requirements of a Type I-B construction under the IBC. The spray fire protection material for steel structures under the UL x772&x771 for columns and UL Design NO.917 for steel beams are adequate for the required fire resistance rating required in the IBC.

Egress Analysis

This section covers the requirements of Egress using the Life Safety Code (LSC) 2015.The LSC gives requirements based on occupancy classifications, exit locations, fire protection labeling, and travel distance. These requirements are discussed below.

Occupancy Classifications

Warren J. Baker Center for Science and Mathematics is a multi-occupancy building based on the LSC 6.1.14.2.1. The occupancies all share common paths of travel so the building is classified as a mixed occupancy defined in the LSC 6.1.14.2.2 and shall comply with the most restrictive requirements based on occupancy type LSC 6.1.14.3.

The primary use of this building is Group B occupancies. The Group B occupancies take up most of floors 2 through 6 in the form of lecture rooms, labs, and office spaces. These types of occupancies are discussed in the IBC Section 304.

The first floor of this building consists of Group A-3 occupancies in the form of seminar rooms. There are terrace areas on floors 4 through 6 that also fall under this classification. The IBC Section 303 discusses Group A type occupancies and other occupancies that may fall under this classification.

Lastly there are Group S occupancies that consist of storage areas (S), mechanical (S-1) and electrical rooms (S-2). The S-1 and S-2 make up a small portion of the building and are spread out throughout the building. There is one hazardous materials room located on the second floor or a Group H-3 occupancy which is discussed under IBC Section 415 for the requirements on storage of materials and flammability requirements.

Occupant Load

The occupant load is based on each space net area divided by the occupant load factor given in the LSC Table 7.3.1.2. which are given below (ft^2/person):

Lecture	20
Lab	50
Office	100
Conference	15
Storage	N/A
Mechanical	N/A
Assembly	15

Floor 1- Total occupants 451

Space Type	Total Square Feet	Total # of people
Assembly	6506	434
Office	1111	11
Conference	568	6

Floor 2- Total occupants 693

Space Type	Total Square Feet	Total #of people
Lecture	6823	341
Lab	14942	298
Office	3290	33
Conference Room	315	21

Floor 3- Total occupants 623

Space Type	Total Square Feet	Total # of people
Lecture	3830	191
Lab	20289	405
Office	2717	27

Floor 4- Total occupants 476

Space Type	Total Square Feet	Total # of people
Lecture	3594	180
Lab	12598	252
Office	2414	24
Lounge	296	20

Floor 5- Total occupants 352

Space Type	Total Square Feet	Total # of people
Lecture	5813	290
Office	2395	24
Conference Room	574	38

Floor 6- Total occupant load 249

Space Type	Total Square Feet	Total # of people
Lecture	2767	138
Lab	4382	88
Office	2262	23

Floor 7- Mechanical Room not expecting anyone to be on the 7th floor unless maintenance is required.

Level	Number of Occupants
Floor 1	451
Floor 2	693
Floor 3	623
Floor 4	476
Floor 5	352
Floor 6	249
Total Occupants	**2844**

The total occupant load for the building is about 2800 people but the building will most likely not be fully occupied to its full capacity at any one time.

Means of Egress

Exit Capacity

The egress capacity is based on the stairway and door way capacities that are calculated using the capacity factors in Table 7.3.3.1 of the LSC. This building was originally evaluated with the CBC which gives values of 0.3 inches per person for stairways and 0.2 inches per person for doorways which match the values given in the LSC. For fire escape stairs, an exit capacity value of 0.5 inches per person shall be used based on Table 7.2.8.4a of the LSC. The calculated values for each floor are below in Table 3. Tables 4 below shows the capacity for each exit component and Table 5 summarizes the total exit capacity per floor.

Table 3 Exit Capacity Factors

Table 7.3.3.1 Capacity Factors

Area	Stairways (width/person) in.	Stairways (width/person) mm	Level Components and Ramps (width/person) in.	Level Components and Ramps (width/person) mm
Board and care	0.4	10	0.2	5
Health care, sprinklered	0.3	7.6	0.2	5
Health care, nonsprinklered	0.6	15	0.5	13
High hazard contents	0.7	18	0.4	10
All others	0.3	7.6	0.2	5

Table 7.2.8.4(a) Fire Escape Stairs

Feature	Serving More Than 10 Occupants	Serving 10 or Fewer Occupants
Minimum widths	22 in. (560 mm) clear between rails	18 in. (455 mm) clear between rails
Minimum horizontal dimension of any landing or platform	22 in. (560 mm) clear	18 in. (455 mm) clear
Maximum riser height	9 in. (230 mm)	12 in. (305 mm)
Minimum tread, exclusive of nosing	9 in. (230 mm)	6 in. (150 mm)
Minimum nosing or projection	1 in. (25 mm)	No requirement
Tread construction	Solid ½ in. (13 mm) diameter perforations permitted	Flat metal bars on edge or square bars secured against turning, spaced 1¼ in. (32 mm) maximum on centers
Winders	None	Permitted subject to capacity penalty
Risers	None	No requirement
Spiral	None	Permitted subject to capacity penalty
Maximum height between landings	12 ft (3660 mm)	No requirement
Minimum headroom	6 ft 8 in. (2030 mm)	6 ft 8 in. (2030 mm)
Access to escape	Door or casement windows, 24 in. × 6 ft 8 in. (610 mm × 1980 mm); or double-hung windows, 30 in. × 36 in. (760 mm × 915 mm) clear opening	Windows providing a clear opening of at least 20 in. (510 mm) in width, 24 in. (610 mm) in height, and 5.7 ft² (0.53 m²) in area
Level of access opening	Not over 12 in. (305 mm) above floor; steps if higher	Not over 12 in. (305 mm) above floor; steps if higher
Discharge to the finished ground level	Swinging stair section permitted if approved by authority having jurisdiction	Swinging stair, or ladder if approved by authority having jurisdiction
Capacity	½ in. (13 mm) per person, if access by door; 1 in. (25 mm) per person, if access by climbing over windowsill	10 persons; if winders or ladder from bottom balcony, 5 persons; if both, 1 person

Table 4. Exit Capacity per Component

Component	Size (Inches)	LSC Factor	Total Exit Capacity People
Door	34	0.2	170
Stairway	42	0.3	140
Fire Escape	47	0.5	94
Horizontal Exit	96	0.2	480

Table 5. Total Exit Capacity per Floor

Level	Number and Type of Exit	# of people from Table 1	Total Exit Capacity of Floor
Floor 1	10 Doors	170	1700
Floor 2	10 Doors	170	1700
	2 Stairway	140	280
	1 Fire Escape	94	94
	2 Horizontal Exits	480	960
			3034
Floor 3	2 Stairways	140	280
	2 Fire Escapes	94	188
	2 Horizontal Exits	480	960
			1428
Floor 4	2 Stairways	140	280
	2 Horizontal Exits	480	960

	1 Fire Escape	94	94
			1334
Floor 5	1 Stairway	140	140
	1 Fire Escape	94	94
	1 Horizontal Exit	480	480
			714
Floor 6	1 Stairway	140	140
	1 Fire Escape	94	94
	1 Horizontal Exit	480	480
			714

Number of Exits

The number of exits required for any floor is given in the LSC section 7.4.1.2 where an occupant load of 0-499 requires 2 exits, 500-999 requires 3 exits, and 1000 and above requires 4 exits. The required number of exits for Floors 1, 4, 5, and 6 are required to have 2 exits because the occupant loads are less than 500. The number of exits for floors 2 and 3 that are required are 3 exits because the occupant load is greater than 500 but less than 1000. The required and provided number of exits per floor are summarized in Table 6 below.

Table 6 Number of Exits

Level	Required Number of Exits	Provided Number of Exits
1	2	3
2	3	9
3	3	6
4	2	5
5	2	3
6	2	3

Exit Arrangements

The exits in this building a reasonably remote based on LSC 7.5.1.3.1. Since the building is protected by an automatic sprinkler system, the minimum separation distance between exits shall be no less than 1/3 the length of the overall diagonal dimension of the building or area served based on LSC Section 7.5.1.3.3. The common paths of travel and dead end distances are not exceeded on any floors within the building using the LSC Section 38.2.5.3.1 and 38.2.5.2.

Travel Distance

The travel distance to exits shall not exceed 300 ft. when the building is protected throughout with an approved automatic sprinkler system from LSC section 38.2.6.3. The travel distances on each floor do not exceed the 300ft. which meet the requirements under the LSC. The travel distances for each floor can be seen in the floor diagram section on pages 24 through 31 in Figures 4 through 17.

Estimating Total Evacuation Time

The SFPE Handbook 4th Edition gives two methods to determine egress time to evacuate a building. Evacuating the entire building is determined by the most limiting egress component with the lowest flow of occupants. The first calculation (Method 1) which is the most simplified method determined that total evacuation of the building would take 19 minutes. The second calculation (Method 2) which takes queuing into account, determine the evacuation time to be 18 minutes. After the hand calculations were completed, Pathfinder was used to determine the evacuation time for the entire building and the total evacuation time for the building was 18 minutes. The occupants in the pathfinder model were based on the default settings given within the program. The default settings that were used in my model was each occupant traveled at 3.9ft/s which is based on the travel based on stair rise and run, goes to any exit or closest exit, and occupants are allowed to que within the simulation in stairways and at doors.

There are many significant assumptions made for my analysis in the hand calculations. One is that there were only three stairways available when some floors have more than three exits. I assume that everyone in my building is awake, alert, and oriented. I used the more restrictive densities and flows thru stairways and each floor has a different density. These methods of calculations are also assuming that everyone is moving at the same speed and that they are all equally mobile. When in reality there could be occupants that are in wheel chairs, use crutches, or other mobile devices where they cannot move as quickly as others and may require help to exit the building which could make for a slower evacuation time. Limitations to this method is everything is exact when people will move differently than one another (slow or fast), densities on floors will be different, number of exits, familiarity of the building, and so on. None of these factors are considered when calculating the total egress time.

Hand Calculations

Since floors 1 and 2 evacuate to public access way I will evaluate the total egress time from floors 3 thru 6. Also, floor 7 is only accessible to maintenance staff therefore, I will assume there are not occupants on this floor.

Method 1

The effective width in stairways is shown below.

42 in-12 = 30in (2.5ft)
47in- 12= 35 in (2.92ft)

The tread of stairs is 7" by 11" so a value of 18.5 people/ min/ ft. will be used.

18.5* 2.5 = 46 people/ min
18.5* 2.92= 54 people/ min

The effective width of doors is shown below.

34in-12 = 22 in

22*2 = 44 people/min

The door width is the most restrictive so a value of 44 people/min will be used.

The flow down stairways is based on Table 3-13.2 and 0.175 is used because it's the most restrictive density. This flow is show below.

212-(2.86*212*0.175) = 105ft/min

The stairway landings are 4' by 10' with a 10' landing and Table 3-13.3 for the 7"by 11" tread on the stairways.

1.85*10ft = 18.5ft
18.5 + (2*10) = 38.2ft

38.2ft/105ft=0.367min (22sec)

Total Occupancy 2470

2470people /44 people/min = 56min

56min/3 exits= 18.7 min

19 min. for total evacuation time

Method 2

The total square footage per floor is indicated below.

Floor 3 total square feet 8353
Floor 4 total square feet 6563
Floor 5 total square feet 4232
Floor 6 total square feet 2519

The density per floor is determined by the occupant load divided by the total square footage of the floor.

Floor 3 623/8353= 0.075
Floor 4 476/6563= 0.073
Floor 5 352/4232= 0.083
Floor 6 259/2519= 0.103

The highest density is 0.103 which is used on all floors because is the most restrictive.

Using 0.103 for density because most restrictive

Equation 5 S=k-k*a*D
Table 3-13.2, k=275

Corridor

S= 275-(275*2.86*0.103) = 194ft/min

Equation 7 F_s= (1-a*D) *k*D

F_s= [1-(2.86*0.103)] *275*0.103 = 20 people/min/ft.

From Table 3-13.5 F_s less than the specific flow F_{sm} so F_s will be used

The width of my corridors is 8.5ft clear width

Effective width corridor = 8.5- (2*0.5) = 7.5ft effective

Equation 9, F_c = (1- a*D) k*D*W_e

F_c = [1-(2.86*0.103)] *275*0.103*7.5 = 150 people/min

Impact of stairway doors

34in doors clear width

34-12 = 22in (1.83ft) effective width (W_e)

Equation 12, $F_{sd} = (F_{sc}*W_{ec})/ W_{ed}$)

F_{sd} = (20*7.5)/1.83 = 82 people/min/ft.

Since F_{sm} is less than calculated F_{sd} = 22 people/min/ft.

Equation 8, $F_c = F_s*W_e$

F_c = 22*2 = 44 people/min

F_c of door = 44 people/min
F_c of corridor= 150 people/min

150-44 = 106 people/min

Impact of stairway

47in stairway
42in stairway

Effective width of stairway

47-12 = 35in (2.92ft)
42-12 = 30in (2.5ft)

Use the 30in stair for calculations most restrictive

Equation 12 F_{ss} = (22*2)/2.5 = 17.6 people/min/ft.

Using table 3-13.8 the stairway density is about 0.12

Equation 5 speed of movement 7 in. by 11in. tread k =212

212-(2.86*212*0.12) = 139ft/min

Floor to floor distance from first order is 38.5ft

38.5/139 = 0.277min (17sec)

17.6*2.5 = 44 people/ min

44*0.277= 12 people in each stairway if floors 3 to 6 all exit at the same time

Assuming there are only three stairways because of floors 5 & 6

12*3= 36 people in the stairway

If all occupants start evacuating at the same time (0) the initial flow rate is 194ft/min. Assume that the congested flow will reach the stairways in 30 seconds. This assumption is based on the distance occupants must travel 100ft to 150ft to an exit traveling at 194ft/min. At 30 seconds' occupants begin moving into the stairways at 44 people/min for the next 17 seconds. At 47 seconds 36 occupants are in each stairway and 112 queue at stairway entrances.

Queue at stair entrance	**112 occupants**
Door rate of	**44 people/min**
Stairway rate of	**44 people/ min**
Descent rate of	**17 sec**

Equations 8, 10, and 11

(112/44) *60 + 47 = 200 seconds (all occupants have evacuated 6th floor)

200 + 17 = 217 seconds (end of flow reaches 5th floor)

217 + [(112/44) *60] = 370 seconds (all occupants have evacuated 5th floor)

370 +17 = 387 seconds (end of flow reaches 4th floor)

387 + [(112/44) *60] = 540 seconds (all occupants have evacuated 4ht floor)

540 + 17 = 557 seconds (end of flow reaches 3rd floor)

557 + [(112/44) *60] = 710 seconds (all occupants have evacuated)

710 + 17 = 717 seconds (all occupants have evacuated the building)

717/60 = 12 minutes

Safety Factor 1.5* 12 = **18 minutes for total evacuation time**

Pathfinder

The Pathfinder model did not use the horizontal exits within the building. The occupants only used the stairways, fire escapes, and exit doors ways for exiting the building. Pathfinder was used to determine the evacuation time for the entire building and the total evacuation time for the building was 18 minutes. The occupants in the pathfinder model were based on the default settings given within the program. The default settings that were used in my model was each occupant traveled at 3.9ft/s, goes to any exit or closest exit, and occupants can que within the simulation in stairways and at doors. The time for total evacuation of the building was determined to be about 18 minutes. Figure 3 below is a screen shot of my simulation for total evacuation of the building.

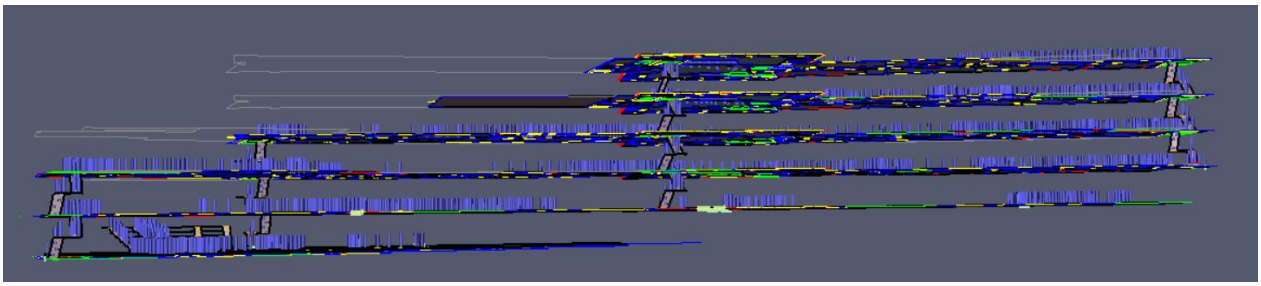


Figure 3 Total Evacuation Simulation

Fire Rating Requirements

Horizontal exits are located on floors 2 thru 6. Since floor 2 is at ground level it falls under 7.2.4.3.1 of the LSC where the horizontal exit shall provide a barrier to ground level. The horizontal exits have a 2-hour fire rating under 7.2.4.3.1 as well. The fire resistance rating for stairways is 2-hour fire rated under 8.6.5 of the LSC because the stairway is connecting 4 floors. Exits other than main exits shall be marked by an approved sign that is readily visible from any direction of exit access under 7.10.1.2.1 under the LSC. Under A.7.10.1.5.2 the signs should be located no more than 100ft apart due to viewing distance. This code also must be in accordance with 7.10.6 stating that the exit signage is clearly legible at 100ft.

Interior Finishes

The interior finish requirements for the building are in Table 7. The requirements for a Business Occupancy is exits and exit access corridors can have Class A or B wall and ceiling finishes. The other spaces within the building can have Class A, B, or C interior wall and ceiling finishes.

Table 7 Interior Finish Requirements

Table A.10.2.2 Interior Finish Classification Limitations

Occupancy	Exits	Exit Access Corridors	Other Spaces
Assembly — New			
>300 occupant load	A I or II	A or B I or II	A or B NA
≤300 occupant load	A I or II	A or B I or II	A, B, or C NA
Assembly — Existing			
>300 occupant load	A	A or B	A or B
≤300 occupant load	A	A or B	A, B, or C
Educational — New	A I or II	A or B I or II	A or B; C on low partitions† NA
Educational — Existing	A	A or B	A, B, or C
Day-Care Centers — New	A I or II	A I or II	A or B NA
Day-Care Centers — Existing	A or B	A or B	A or B
Day-Care Homes — New	A or B I or II	A or B	A, B, or C NA
Day-Care Homes — Existing	A or B	A, B, or C	A, B, or C

Continues

Table A.10.2.2 Continued

Occupancy	Exits	Exit Access Corridors	Other Spaces
Health Care — New	A NA I or II	A B on lower portion of corridor wall† I or II	A B in small individual rooms† NA
Health Care — Existing	A or B	A or B	A or B
Detention and Correctional — New (sprinklers mandatory)	A or B I or II	A or B I or II	A, B, or C NA
Detention and Correctional — Existing	A or B I or II	A or B I or II	A, B, or C NA
One- and Two-Family Dwellings and Lodging or Rooming Houses	A, B, or C	A, B, or C	A, B, or C
Hotels and Dormitories — New	A I or II	A or B I or II	A, B, or C NA
Hotels and Dormitories — Existing	A or B I or II†	A or B I or II†	A, B, or C NA
Apartment Buildings — New	A I or II	A or B I or II	A, B, or C NA
Apartment Buildings — Existing	A or B I or II†	A or B I or II†	A, B, or C NA
Residential Board and Care — *(See Chapters 32 and 33.)*			
Mercantile — New	A or B I or II	A or B	A or B NA
Mercantile — Existing			
Class A or Class B stores	A or B	A or B	Ceilings — A or B; walls — A, B, or C
Class C stores	A, B, or C	A, B, or C	A, B, or C
Business and Ambulatory Health Care — New	A or B I or II	A or B	A, B, or C NA
Business and Ambulatory Health Care — Existing	A or B	A or B	A, B, or C
Industrial	A or B I or II	A, B, or C I or II	A, B, or C NA
Storage	A or B I or II	A, B, or C	A, B, or C NA

NA: Not applicable.Notes:

(1) Class A interior wall and ceiling finish — flame spread index, 0–25 (new applications); smoke developed index, 0–450.

(2) Class B interior wall and ceiling finish — flame spread index, 26–75 (new applications); smoke developed index, 0–450.

(3) Class C interior wall and ceiling finish — flame spread index, 76–200 (new applications); smoke developed index, 0–450.

(4) Class I interior floor finish — critical radiant flux, not less than 0.45 W/cm^2.

(5) Class II interior floor finish — critical radiant flux, not more than 0.22 W/cm^2, but less than 0.45 W/cm^2.

(6) Automatic sprinklers — where a complete standard system of automatic sprinklers is installed, interior wall and ceiling finish with a flame spread rating not exceeding Class C is permitted to be used in any location where Class B is required, and Class B interior wall and ceiling finish is permitted to be used in any location where Class A is required; similarly, Class II interior floor finish is permitted to be used in any location where Class I is required, and no interior floor finish classification is required where Class II is required. These provisions do not apply to new detention and correctional occupancies.

(7) Exposed portions of structural members complying with the requirements for heavy timber construction are permitted.

†See corresponding chapters for details.

Floor Diagrams

The floor diagrams below Figures 4 through 17 summarize everything that was discussed above. The first figure for each floor shows the occupancy type, room use, and exit locations. The second figure for each floor indicates the fire requirements for the corridors and separations within the building like horizontal exits. This figure also indicates that longest travel distance found on each floor complying with the longest travel distance being less than 300 ft.

Summary

In preforming the egress analysis on the Warren J. Baker Center for Science and Mathematics all requirements are met. The occupancy classifications, exit locations, travel distances, exit capacities, number of exits, fire ratings and interior finish all comply with the NFPA 101 Life Safety Code 2015. Next is the analysis for the fire suppression system used in Warren J. Baker Center for Science and Mathematics. Below are the floor diagrams for the entire building summing up the exit locations, occupancy type, travel distances, and rating requirements.

Floor Diagrams

Floor 1

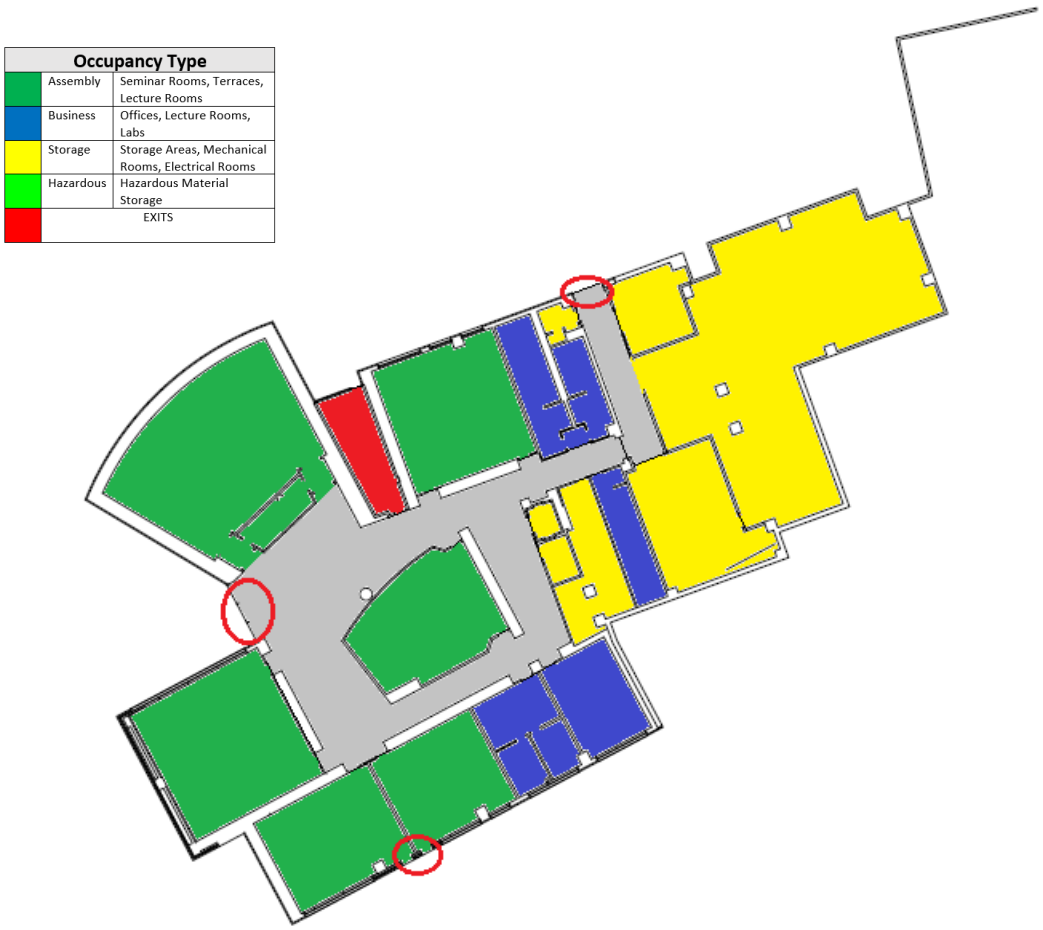


Figure 4 Occupancy Type and Exit Locations Floor 1

Figure 5 Fire Separation and Travel Distances

Floor 2

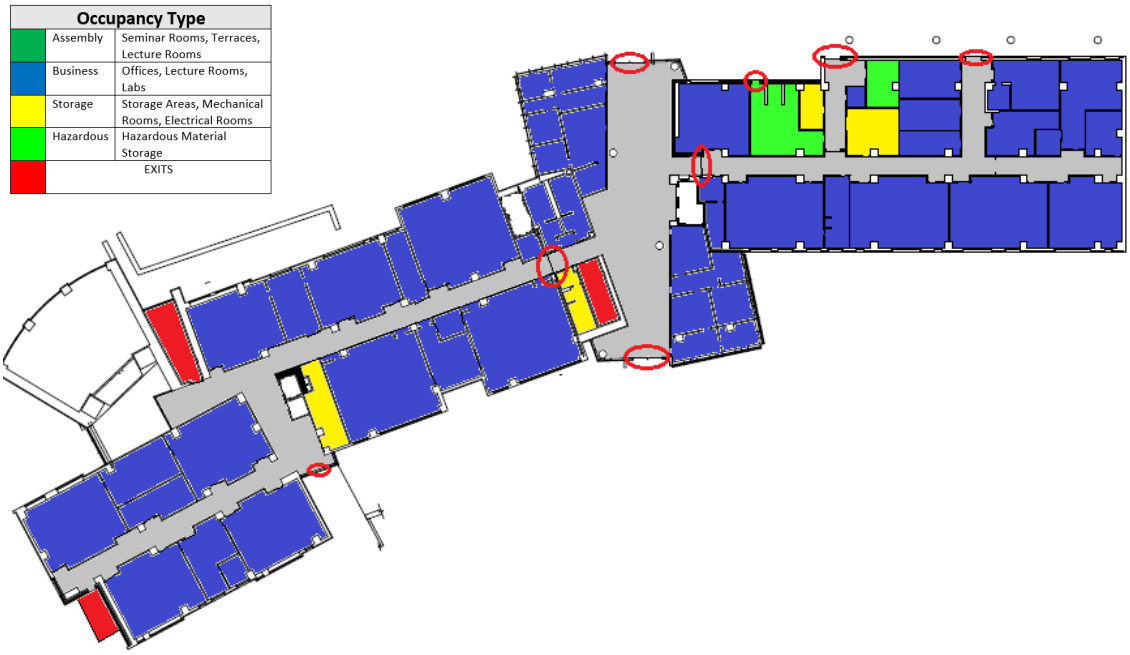


Figure 6 Occupancy Type and Exit Locations Floor 2

Figure 7 Fire Separation and Travel Distances

Floor 3

Figure 8 Occupancy Type and Exit Locations Floor 3

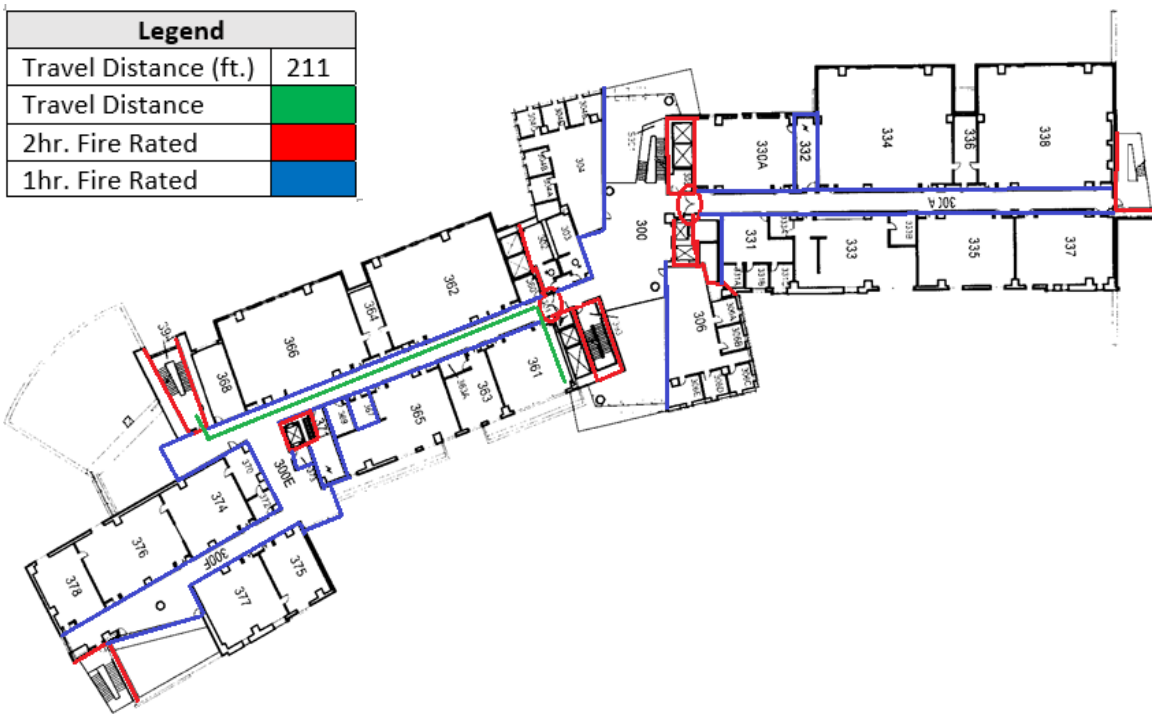


Figure 9 Fire Separation and Travel Distances

Floor 4

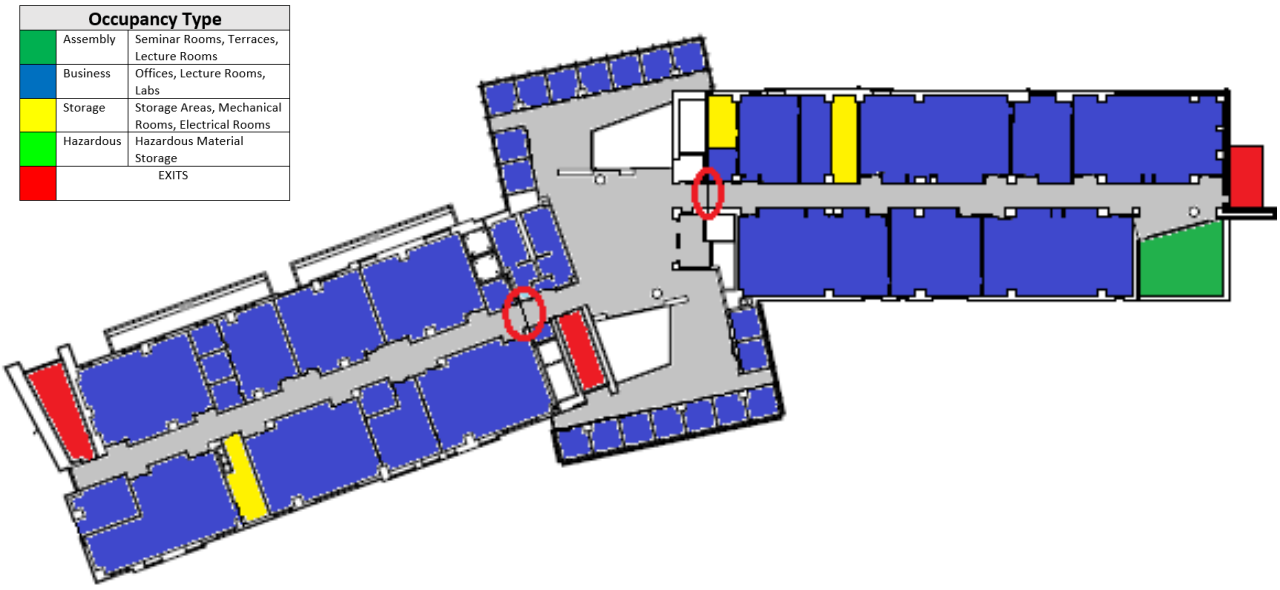


Figure 10 Occupancy Type and Exit Locations Floor 4

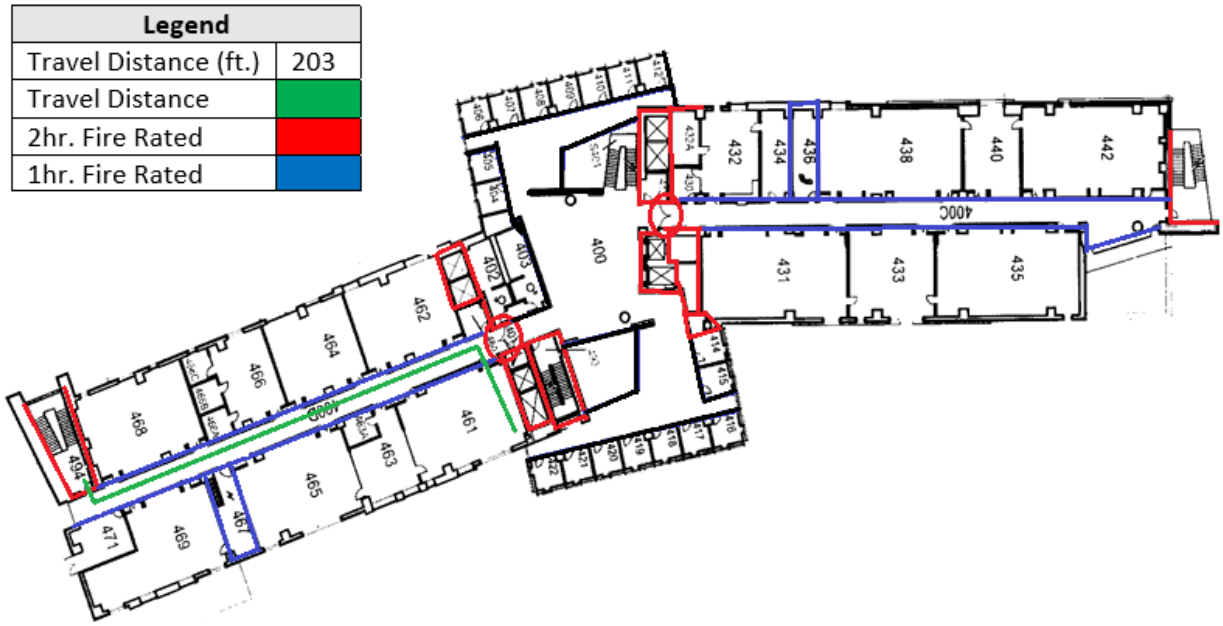


Figure 11 Fire Separation and Travel Distances

Floor 5

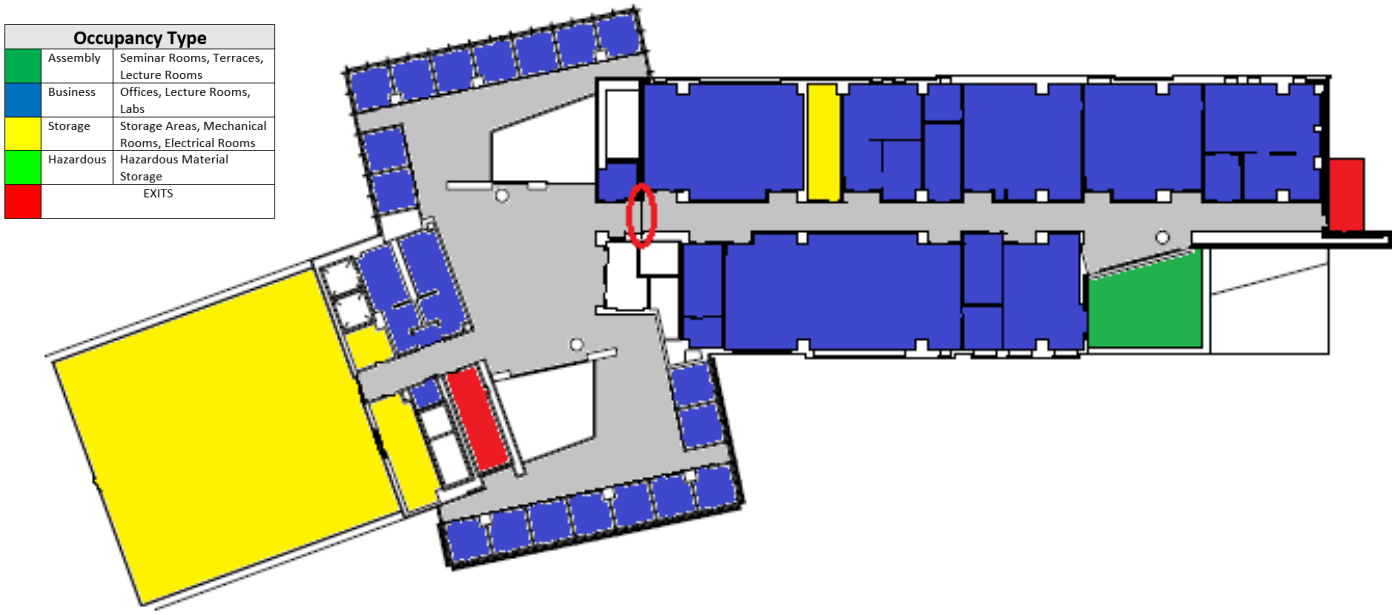


Figure 12 Occupancy Type and Exit Locations Floor 5

Figure 13 Fire Separation and Travel Distances

Floor 6

Occupancy Type		
	Assembly	Seminar Rooms, Terraces, Lecture Rooms
	Business	Offices, Lecture Rooms, Labs
	Storage	Storage Areas, Mechanical Rooms, Electrical Rooms
	Hazardous	Hazardous Material Storage
	EXITS	

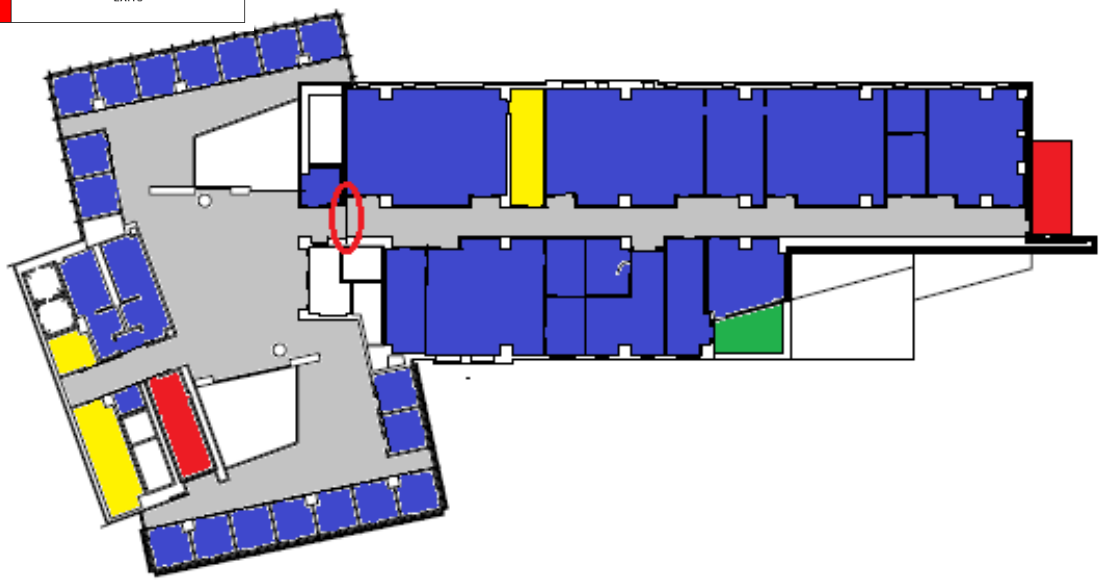


Figure 14 Occupancy Type and Exit Locations Floor 6

Legend	
Travel Distance (ft.)	197
Travel Distance	
2hr. Fire Rated	
1hr. Fire Rated	

Figure 15 Fire Separation and Travel Distances

Floor 7

Occupancy Type		
	Assembly	Seminar Rooms, Terraces, Lecture Rooms
	Business	Offices, Lecture Rooms, Labs
	Storage	Storage Areas, Mechanical Rooms, Electrical Rooms
	Hazardous	Hazardous Material Storage
	EXITS	

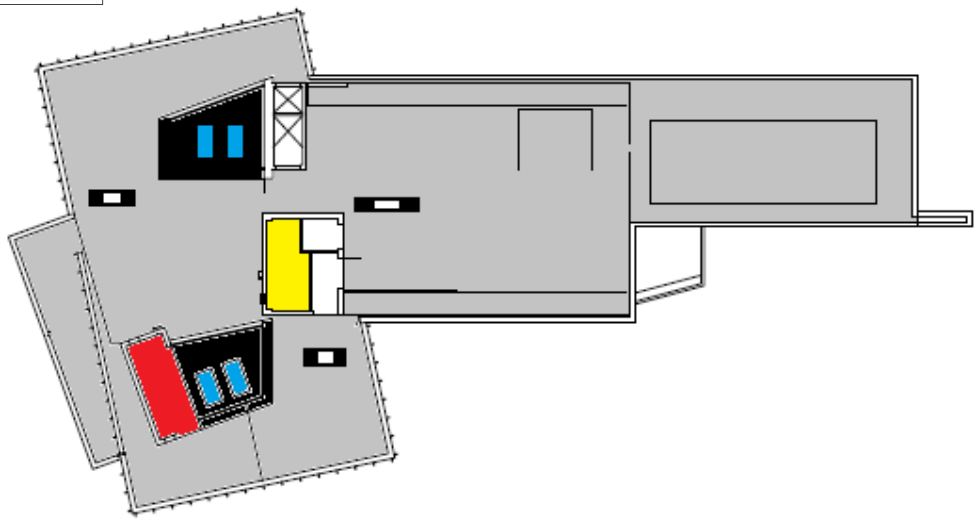


Figure 16 Occupancy Type and Exit Locations Floor 7

Legend	
Travel Distance	
2hr. Fire Rated	
1hr. Fire Rated	

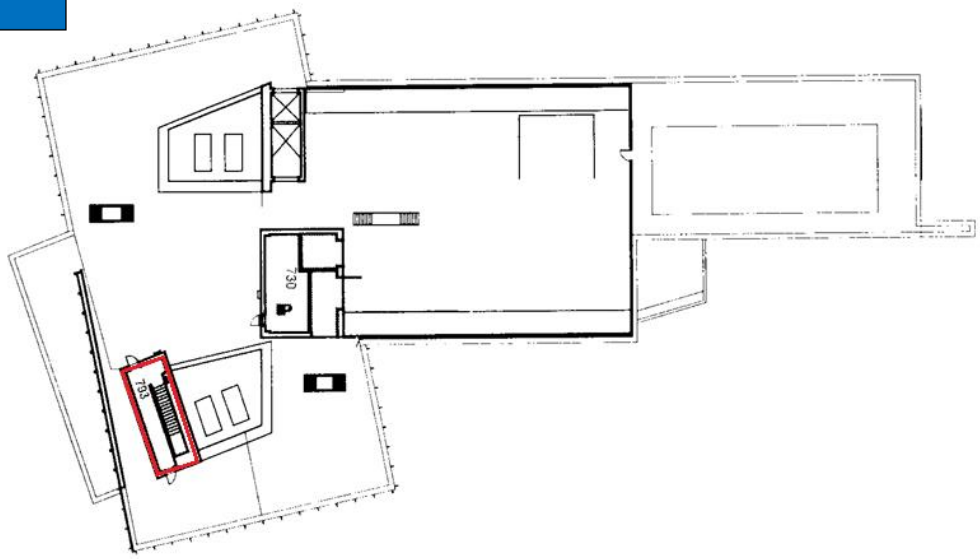


Figure 17 Fire Separation and Travel Distances

Fire Suppression System Analysis

This section covers an analysis of the fire suppression system requirements using NFPA 13 Standard for the Installation of Sprinkler Systems 2013. This analysis will cover design criteria, water supplies, occupancy classifications, system components, hydraulic calculations, and inspection, testing, and maintenance requirements.

Building Detail

This building provides a complete wet pipe fire sprinkler system for a six-story classroom and laboratory building with a fire pump and a class 1 standpipe system. This building is Type 1 fire resistive construction and a Group B occupancy (Business). This report is intended to help serve as a guide in design, installation, and maintenance of water based suppression systems. Some of the drawings in this report were obtained from the facilities office of Cal Poly.

Design Criteria

The design criteria that must be met are water supply and demand for system, spacing of sprinklers, and bracing of the system. The water supply must be adequate to supply the sprinkler system in the most remote area of the building. The flowrate and pressure of the water supply must meet or exceed the required demand of the system. If the water supply does not meet the systems required flow and pressure a fire pump can be put in place to increase the flow and pressure. The water supply requirements can be found in Chapter 23 of NFPA 13. The sprinkler spacing is based on a maximum protection area and is not allowed to exceed this design area. There is a summarization of the requirements for sprinklers installation in Chapter 8 of the NFPA 13. The sprinkler system is required to be restrained to prevent collapse of the system in the event of building movement i.e. an earthquake. The requirements for bracing of sprinkler systems is given in Chapter 9 of NFPA 13. A routine inspection and test program is essential for any fire protection system to insure it is in proper operating condition. NFPA 25 standards for Inspection, Testing, and Maintenance of Water Based Fire Protection Systems should be used to determine the required frequency the system should be tested and should be used to determine the proper methods of inspection to use.

Water Supply

The city water main loops on the north, east, and west sides of this building which supplies two fire hydrants to the north of the building. The point of connection to the building is on the north side with an eight-inch line to the fire pump. From the fire pump the pipes supplying the water to the suppression system are six-inch pipes and at the west end of the building the piping reduces to four-inch pipes to supply one of the risers. All piping in the building is to be black steel pipe schedule 10 and 40.

The fire pump is a vertical inline pump rated at 113psi at 750gpm with a 60-horsepower electric motor. There is also a jockey pump to keep the suppression system up to pressure so the fire pump does not activate unless a fire occurs. The jockey pump starts at 155psi and stops at 165psi. The fire pump will activate at 150psi.

The fire department connection is located on the north side of the building with a four-way department connection. The piping from the connection is six-inch piping that tees to the system. Figure 18 indicates the fire hydrants where the flow test was taken, location of the fire pump room and fire department connection location, and the point of connection to the building and city water supply.

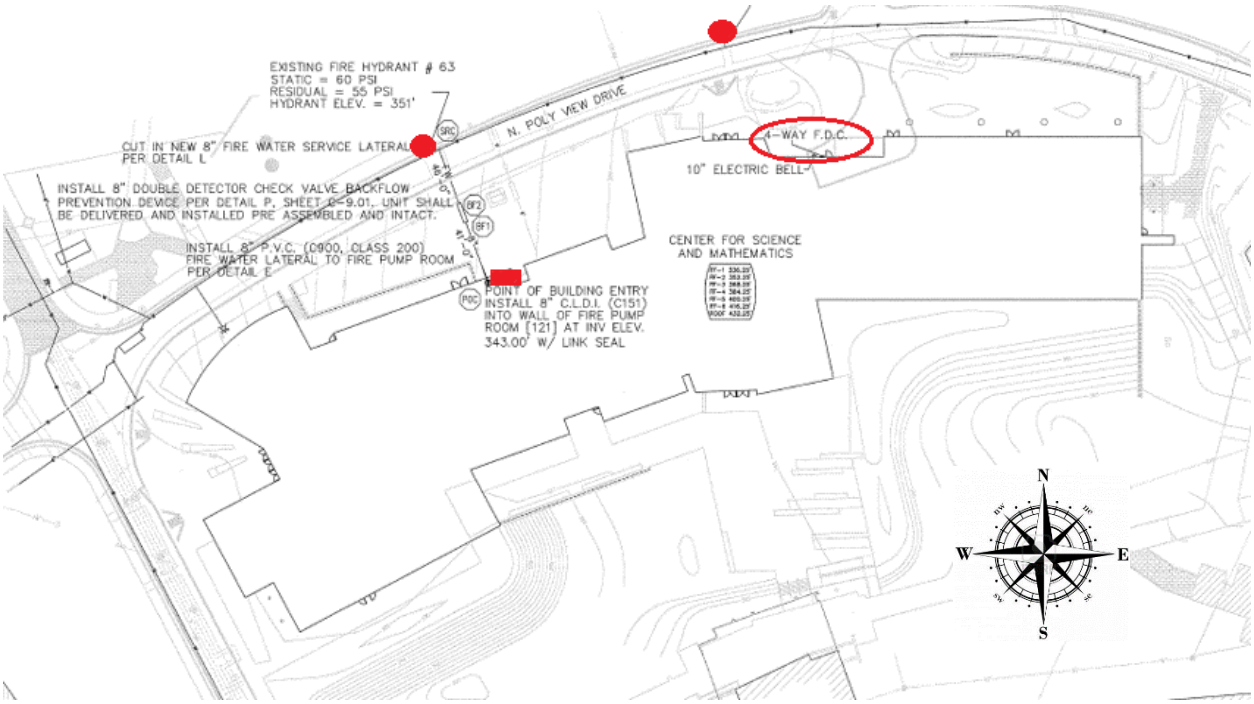


Figure 18 Fire Hydrant, Fire Pump, FDC Locations

<u>City Supply</u>
Static- 60 psi
Residual- 55 psi
Flow- 914gpm

<u>Fire Pump</u>
Churn 125psi
Design 113psi at 750gpm
150% 86psi at 1125gpm

<u>10% Reduction</u>
Static- 54psi
Residual- 49psi
Flow- 914gpm

Occupancy Classifications

This building consists of light hazard occupancies which are the lecture halls, lobbies, office spaces, and conference rooms. This building also has some Ordinary Hazard 1 areas which consist of the laboratories, storage spaces, electrical rooms, and mechanical rooms. The storage areas in this building are not specified on what types of storage areas, but for this analysis, were

assumed to be miscellaneous storage areas which is discussed in Chapter 13 of NFPA 13 to meet the ordinary hazards. These classifications are discussed more in Chapter 5 of NFPA 13.

The design criteria for light hazard classifications is required to have a density of 0.10gpm/ft^2,a max design area of 1500ft^2, and a max coverage per sprinkler of 225ft^2. The design criteria for ordinary hazard 1 classifications is required to have a density of 0.15gpm/ft^2, a max design area of 1500ft^2, and a max coverage per sprinkler of 130ft^2. Table 8 below summarizes occupancy classifications and requirements.

Table 8 Occupancy Classifications

OCCUPANCY CLASSIFICATION

◇	OCCUPANCY	HAZARD	MAX SPACING	DESIGN	HOSE
A-3	LOBBIES/LECTURE	LIGHT HAZARD	225	.10/1500	100/0
B	OFFICE/CONFERENCE RM	LIGHT HAZARD	130	.10/1500	100/0
B	LABORATORIES	O.H. GR. 1	130	.15/1500	100/150
S-1	STORAGE/MECH/ELECT RM	O.H. GR. 1	130	.15/1500	100/150

System Components

Standpipes and Risers

This building has five risers that supply the fire sprinkler system. Each riser supplies both light hazard and ordinary hazard occupancies. The risers are class 1 risers. There are also two of the standpipes/risers located at the fire escape stairs on the east and west sides of the building that have recessed fire hoses that can be used. There are also three stairways inside the building that contain the risers within the building. The piping for the risers are schedule 10 black steel piping. Figure 19 below indicates riser locations within the building.

Standpipe Codes of NFPA 14 2013 Edition

- Class 1 risers/standpipes shall be at least 4inches in size by 7.6.1
- The minimum flow at the most remote standpipe is 500gpm by 7.10.1.1.1.
- The minimum flow for all other standpipes shall be no less than 250gpm by 7.10.1.1.3
- The max flow is 1000gpm for a standpipe by 7.10.1.1.5
- 7.2.3.2* Where the static pressure at a 2-1⁄2 in. (65 mm) hose connection exceeds 175 psi (12.1 bar), an approved pressure regulating device shall be provided to limit static and residual pressures at the outlet of the hose connection to 175 psi

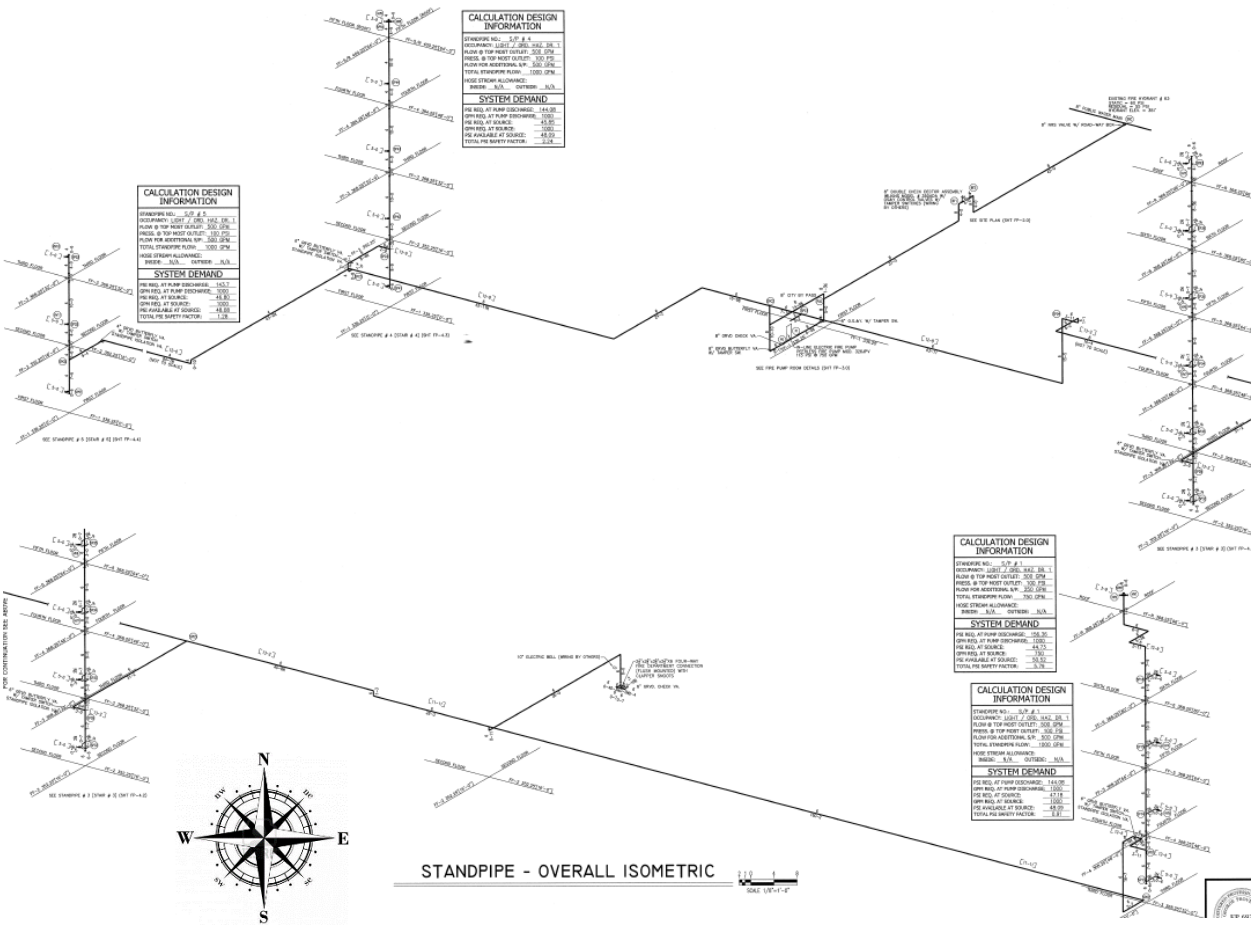


Figure 19 Riser Locations

Cross Mains and Branch lines

The cross mains in the building run the length of the corridors within the building and the branch lines run from the cross main into the individual spaces. The cross mains and branch lines are recessed into the ceiling and are not visible. The cross mains are constructed of schedule 10 piping at 2 ½ inches throughout the building. The branch lines throughout the building are also constructed of schedule 10 piping but range from sizes of 1 inch to 1 ¼ inch lines.

Sprinklers

The building is equipped throughout with quick response sprinklers that have a K-factor of 5.6. In areas with finished ceilings pendant sprinklers are used and upright sprinklers are used in lab and utility spaces. The majority of the sprinklers within the building have an activation temperature of 155 degrees Fahrenheit but in the mechanical and server spaces higher activation temperature sprinklers are used with an activation temperature of 200 degrees Fahrenheit.

Hydraulic Calculations

The hydraulic calculations for this building were evaluated from the most remote area of the building to the base of the riser. The most remote area was determined to be room 638 which is a lab on the 6th floor of the building. The room is classified as an Ordinary Hazard 1. If all sprinklers were to activate in the room, the demand was calculated to be 275gpm at 104psi. The water supply is adequate with the assistance of the fire pump. Table 9 below is the hand calculations I performed in the most remote room with highest demand which is shown in Figure 20. Figure 21 is the supply and demand curve for the city water supply, fire pump, and most demanding room.

Hand Calculations

Most remote area is room 638 on the sixth floor of the building
Occupancy Classification- Ordinary Hazard Group 1 (Laboratory)
Density- 0.15gpm/ft^2
Area of room- 898ft^2
Minimum Design Area- 1500ft^2
Reduction for QRS- (39.25% for 10.5ft. ceiling height for design area of 911ft^2)
Max Coverage per sprinkler- 130 ft^2
Number of sprinklers Calculated- 7
Number of sprinklers in room- 12
Type of Sprinkler- Tyco; Mod. TY-FRB; 1/2"; 1/2”; K=5.6; 155 Deg.
Hose Stream- 250gpm at 60minutes
Type of system- Wet
The demand at the base of the riser is 275gpm at 104psi

Table 9 Hydraulic Hand Calculations

Step No.	Nozzle Ident and Location		Flow in gpm		Pipe size	Pipe Fittings and Devices	Equivalent Pipe Length		Friction loss (psi/ft)		Pressure Summary		Normal Pressure		Notes	
	1		q	19.5			L	8	C=	120	Pt	12.1	Pt		5.6	19.5
1		BL1			1.049		F				Pe		Pv		130	
	2		Q	19.5			T	8	pf	0.124	Pf	1.0	Pn		0.15	
	2		q	20.3			L	8	C=	120	Pt	13.1	Pt		5.6	20.3
2		BL1			1.049		F				Pe		Pv		130	
	3		Q	39.8			T	8	pf	0.465	Pf	3.7	Pn		0.15	
	3		q	23			L	8	C=	120	Pt	16.8	Pt		5.6	23
3		BL1			1.049		F				Pe		Pv		130	
	4		Q	62.8			T	8	pf	1.081	Pf	8.6	Pn		0.15	
	4		q	28.3		1E=3	L	7.5	C=	120	Pt	25.5	Pt		5.6	28.3
4		BL1			1.38	1T=6	F	9			Pe	0.4	Pv		168	
	CM		Q	91			T	16.5	pf	0.569	Pf	9.4	Pn		0.1	
	CM		q				L	10.75	C=	120	Pt	35.3	Pt		15.3	
5					2.635		F				Pe		Pv			
	BL2		Q	91			T	10.75	pf	0.025	Pf	0.3	Pn			
	BL2CM		q	91.2			L	10.75	C=	120	Pt	35.6	Pt		15.3	91.2
6					2.635		F				Pe		Pv			
	BL3		Q	182.2			T	10.75	pf	0.089	Pf	1.0	Pn			
	BL3		q	92.5		2E=6	L	220.75	C=	120	Pt	36.5	Pt		15.3	92.5
7					2.635	3T=18	F	24			Pe		Pv			
	CM		Q	274.7			T	244.75	pf	0.190	Pf	46.6	Pn			
	CM		q				L	48.5	C=	120	Pt	83.1	Pt			
8					6.357		F				Pe	21.0	Pv			
	BOR		Q	275.0			T	48.5	pf	0.003	Pf	0.1	Pn			
			q				**L**		**C=**		**Pt**	**104.3**	**Pt**			
							F				**Pe**		**Pv**			
			Q	**275.0**			**T**		**pf**		**Pf**		**Pn**			

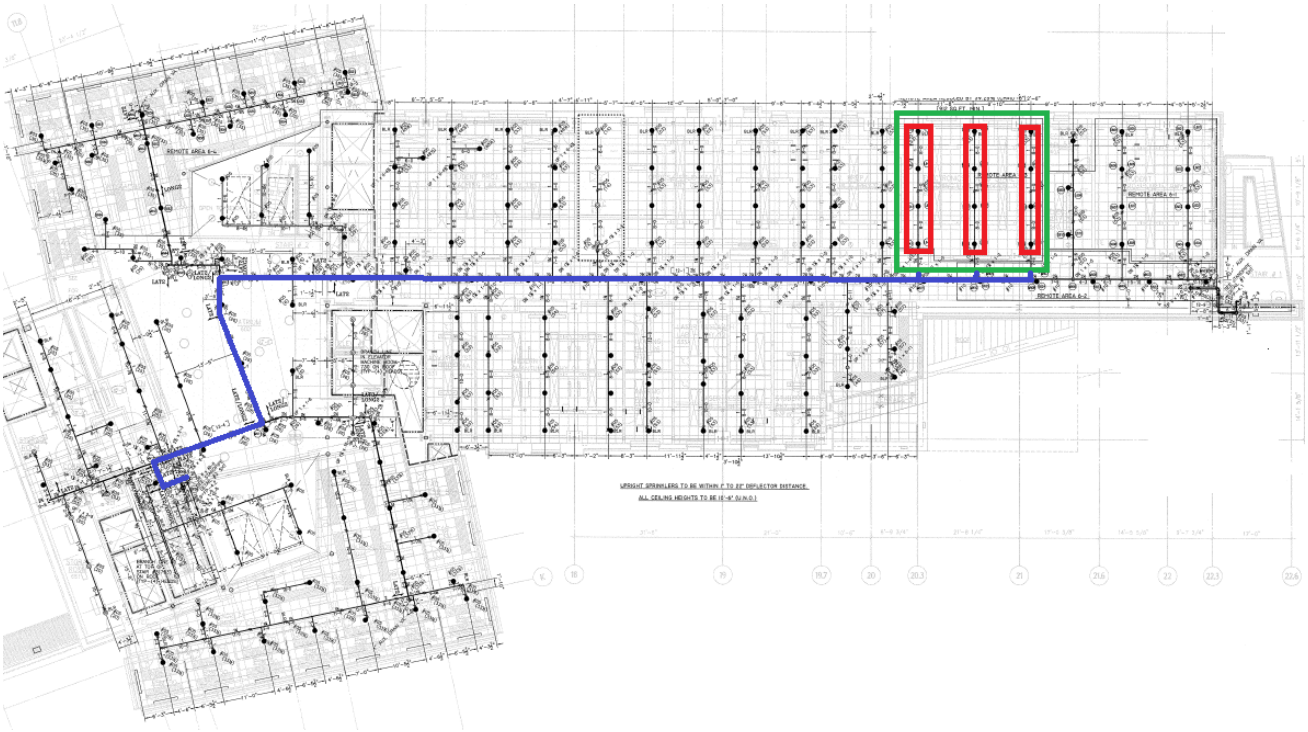


Figure 20 Most Remote Area

Legend	
City Water	
Fire Pump	
Combined	
Demand Sprinkler/Hose Stream	

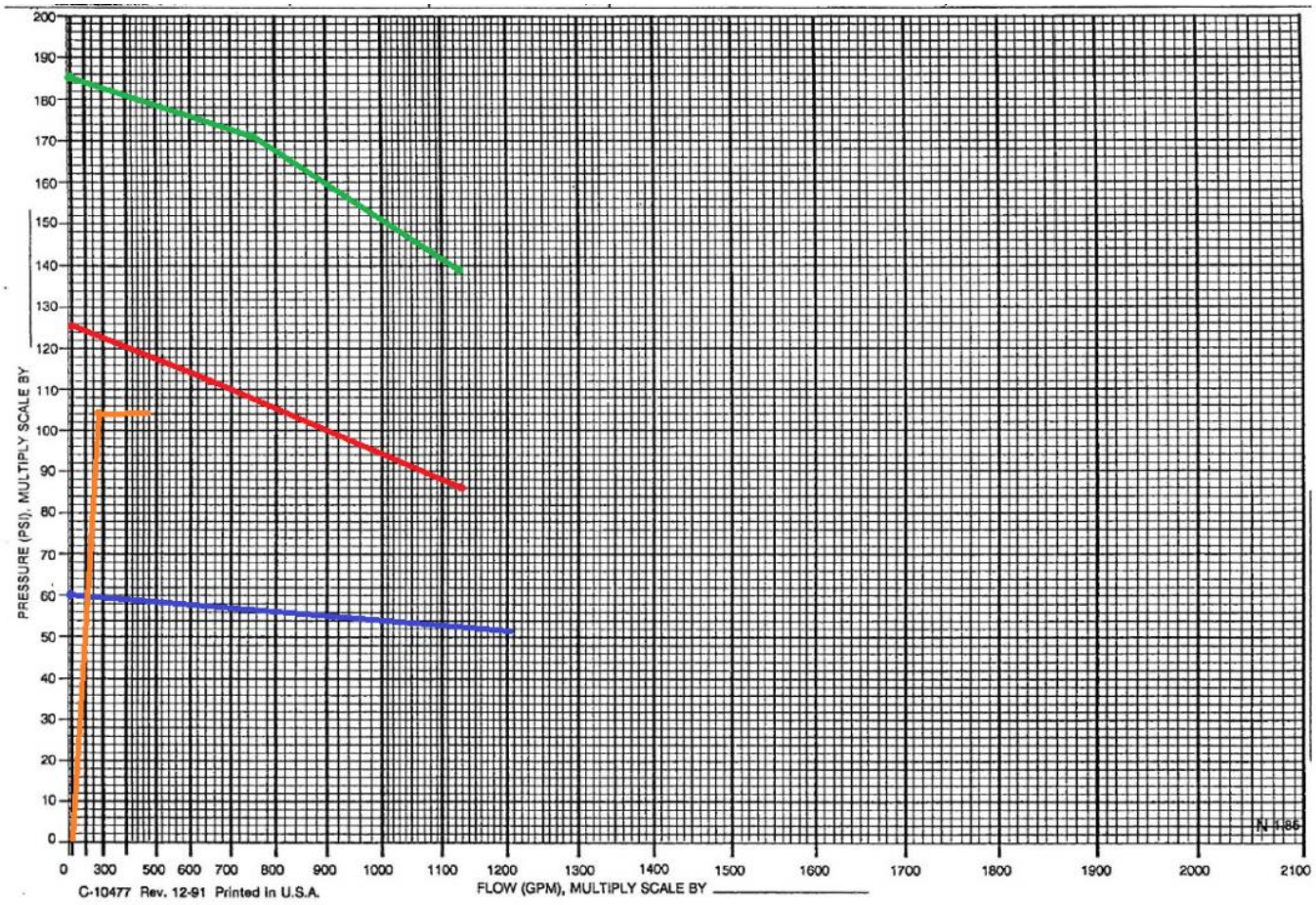


Figure 21 Hydraulic Graph

Inspection, Testing and Maintenance

A routine inspection and test program is essential for any fire protection system to insure it is in proper operating condition. NFPA 25 standards for Inspection, Testing, and Maintenance of Water Based Fire Protection Systems should be used to determine the required frequency the system should be tested and should be used to determine the proper methods of inspection to use.

For inspection, testing, and maintenance of sprinkler systems, standpipes and hose streams, fire pumps, and valve components refer to tables below. For additional information reference NFPA 25. Table 10 is the summary of inspection testing and maintenance requirements for sprinkler systems under NFPA 25

Table 10 Inspection, Testing, Maintenance Tables from NFPA 25

Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Gauges (dry, preaction, and deluge systems)	Weekly/quarterly	5.2.4.2, 5.2.4.3, 5.2.4.4
Control valves		Table 13.1.1.2
Waterflow alarm devices	Quarterly	5.2.5
Valve supervisory signal devices	Quarterly	5.2.5
Supervisory signal devices (except valve supervisory switches)	Quarterly	5.2.5
Gauges (wet pipe systems)	Quarterly	5.2.4.1
Hydraulic nameplate	Quarterly	5.2.6
Buildings	Annually (prior to freezing weather)	4.1.1.1
Hanger/seismic bracing	Annually	5.2.3
Pipe and fittings	Annually	5.2.2
Sprinklers	Annually	5.2.1
Spare sprinklers	Annually	5.2.1.4
Information sign	Annually	5.2.8
Fire department connections		Table 13.1.1.2
Valves (all types)		Table 13.1.1.2
Obstruction, internal inspection of piping	5 years	14.2
Heat trace	Per manufacturer's requirements	5.2.7
Test		
Waterflow alarm devices		
Mechanical devices	Quarterly	5.3.3.1
Vane and pressure switch–type devices	Semiannually	5.3.3.2
Valve supervisory signal devices		Table 13.1.1.2
Supervisory signal devices (except valve supervisory switches)		Table 13.1.1.2
Main drain		Table 13.1.1.2
Antifreeze solution	Annually	5.3.4
Gauges	5 years	5.3.2
Sprinklers (extra-high or greater temperature solder type)	5 years	5.3.1.1.1.4
Sprinklers (fast-response)	At 20 years and every 10 years thereafter	5.3.1.1.1.3
Sprinklers	At 50 years and every 10 years thereafter	5.3.1.1.1
Sprinklers	At 75 years and every 5 years thereafter	5.3.1.1.1.5
Sprinklers (dry)	At 10 years and every 10 years thereafter	5.3.1.1.1.6
Sprinklers (in harsh environments)	5 years	5.3.1.1.2
Valves (all types)		Table 13.1.1.2
Valve status test		13.3.1.2.1
Maintenance		
Valves (all types)		Table 13.1.1.2
Low-point drains (dry pipe system)		13.4.4.3.2
Sprinklers and automatic spray nozzles protecting commercial cooking equipment and ventilation systems	Annually	5.4.1.9
Investigation		
Obstruction		14.3

Table 6.1.1.2 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Control valves		Table 13.1.1.2
Pressure-regulating devices		Table 13.1.1.2
Piping	Annually	6.2.1
Hose connections		Table 13.1.1.2]
Cabinet	Annually	NFPA 1962
Gauges	Weekly/quarterly	6.2.2
Hose	Annually	NFPA 1962
Hose storage device	Annually	NFPA 1962
Hose nozzle	Annually and after each use	NFPA 1962
Hydraulic design information sign	Annually	6.2.3
Hose valves		Table 13.1.1.2
Hose connection		Table 13.1.1.2
Test		
Waterflow alarm devices		Table 13.1.1.2
Valve supervisory devices		Table 13.1.1.2
Supervisory signal devices (except valve supervisory switches)		Table 13.1.1.2
Hose storage device	Annually	NFPA 1962
Hose	5 years/3 years	NFPA 1962
Pressure control valve		Table 13.1.1.2
Pressure-reducing valve		Table 13.1.1.2
Hydrostatic test	5 years	6.3.2
Flow test	5 years	6.3.1
Main drain test		Table 13.1.1.2
Hose valves		Table 13.1.1.2
Hose connections		Table 13.1.1.2
Valve status test		13.3.1.2.1
Maintenance		
Hose connections	Annually	Table 6.1.2
Valves (all types)	Annually/as needed	Table 13.1.1.2
Hose valves		Table 13.1.1.2

Table 8.1.2 Alternative Fire Pump Inspection, Testing, and Maintenance Procedures

Complete as Applicable	Visual Inspection	Inspect	Change	Clean	Test	Frequency
Pump System						
Pump bearings		X				Annually
Lubricate pump bearings			X			As needed
Inspect pump shaft end play		X				Annually
Inspect accuracy of pressure gauges and sensors		X	X			Annually (replace or recalibrate when 5% out of calibration)
Inspect pump coupling alignment		X				Annually
Wet pit suction screens		X		X		After each pump operation
Mechanical Transmission						
Lubricate coupling			X			Annually
Lubricate right-angle gear drive			X			Annually
Electrical System						
Exercise isolating switch and circuit breaker					X	Monthly
Trip circuit breaker (if mechanism provided)					X	Annually
Operate manual starting means (electrical)					X	Semiannually
Inspect and operate emergency manual starting means (without power)	X				X	Annually
Tighten electrical connections as necessary		X				Annually
Lubricate mechanical moving parts (excluding starters and relays)		X				Annually
Calibrate pressure switch settings		X				Annually
Grease motor bearings		X				Annually
			X			Annually or as needed
Voltmeter and ammeter for accuracy (5%)		X				Annually
Any corrosion on printed circuit boards (PCBs)	X					Annually
Any cracked cable/wire insulation	X					Annually
Any leaks in plumbing parts	X					Annually
Any signs of water on electrical parts	X					Annually

Table 13.1.1.2 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Control Valves		
Sealed	Weekly	13.3.2.1
Locked or electrically supervised	Monthly	13.3.2.1.1
Valve Supervisory Signal Initiating Device	Quarterly	13.3.2.1.2
Alarm Valves		
Exterior	Monthly	13.4.1.1
Interior	5 years	13.4.1.2
Strainers, filters, orifices	5 years	13.4.1.2
Check Valves		
Interior	5 years	13.4.2.1

Pressure-Reducing and Relief Valves		
Sprinkler systems	Quarterly	13.5.1.1
Hose connections	Annually	13.5.2.1
Hose racks	Annually	13.5.3.1
Fire pumps		
Casing relief valves	Weekly	13.5.7.1, 13.5.7.1.1
Pressure-relief valves	Weekly	13.5.7.2, 13.5.7.2.1
Backflow Prevention Assemblies		
Reduced pressure	Weekly/monthly	13.6.1
Reduced-pressure detectors	Weekly/monthly	13.6.1
Fire Department Connections	Quarterly	13.7.1
Testing		
Main Drains	Annually/quarterly	13.2.5, 13.2.5.1, 13.3.3.4
Gauges	5 years	13.2.7.2
Waterflow Alarms	Quarterly/semiannually	13.2.6
Control Valves		
Position	Annually	13.3.3.1
Operation	Annually	13.3.3.1
Supervisory	Semiannually	13.3.3.5
Preaction/Deluge Valves		
Priming water	Quarterly	13.4.3.2.1
Low air pressure alarms	Quarterly/annually	13.4.3.2.13, 13.4.3.2.14
Full flow	Annually	13.4.3.2.2
Air leakage	3 years	13.4.3.2.6

Summary

After analysis of the fire suppression system used in Warren J. Baker Center for Science and Mathematics, the requirements of NFPA 13 2013 are met. The occupancy classifications, design areas, and water supply demand are all adequate. The fire pump may have been oversized for this application for this building but will be discussed more in the recommendation section of this report. Next the fire alarm and detection system design will be analyzed.

Fire Alarm and Detection Analysis

This section covers the analysis of the fire alarm and detection systems in Warren J. Baker Center for Science and Mathematics using the requirement specified in NFPA 72 2013 edition. The analysis covers the fire alarm system, fire detection system, and the required inspection, testing, and maintenance.

This building provides a complete wet pipe fire sprinkler system for a six-story classroom and laboratory building with a fire pump and a class 1 standpipe system. This building is Type 1 fire resistive construction and a Group B occupancy (Business). The fire alarm system in the building is a fire emergency voice alarm communication system (EVACS). The system in the building is a mass notification/fire alarm combination system. The location of the fire alarm control panel is one the first floor in the main electrical/ transformer room. The model is NFS2-640.

Fire Alarm Initiating Devices

Sprinklers (primary detectors used in this building)
Quick Response Tyco; Mod. TY-FRB ½", ½" K=5.6; 155 degree
Used in both Light/Ordinary Hazard 1 areas
Max Design area 1500 sq. ft.
Light Hazard max coverage 225 sq. ft.
Ordinary Hazard 1 max coverage 130 sq. ft.

Fire Alarm Control Panel

The fire control panel in located in room 122 on the first floor in the fire pump room which is accessible from the fire department access areas. The FACP for this building is a Honeywell NOTIFIER Model NFS2-640 which is designed to minimize installation time, enable faster response times, and simplify usability and maintenance. This comes with a built in integrated Digital Voice Command System which is used in the application of this building.

Water Flow Switch

A water flow switch is the interface between the building's fire suppression system and the building's fire alarm system. It detects water flowing in the sprinkler system and initiates the fire alarm system to sound the evacuation. The water flow switch is located in the fire pump room which can only be accessed by authorized personnel.

Smoke Detectors

Type: FSP-851 INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR

The FSP-851 Intelligent Photoelectric Sensor's unique optical sensing chamber is designed with superior signal to noise ratio. Flash Scan is a new communication protocol that greatly enhances the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel's CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of earlier designs.

Spot-type smoke detectors shall be located on the ceiling or, if on a sidewall, between the ceiling and 12 in. (300 mm) down from the ceiling to the top of the detector. (NFPA 72-2016 17.7.3.2) The smoke detector spacing for this project was based upon smooth ceilings protection for spot-type smoke detectors in accordance with (NFPA 72 – 2016 17.7.3.2.3). In the absence of specific performance-based design criteria, the distance between smoke detectors shall not exceed a nominal spacing of 30 ft. (9.1 m) and there shall be detectors within one-half the nominal spacing, measured at right angles from all walls or partitions extending upward to within the top 15 percent of the ceiling height. (NFPA 72- 2016 17.7.3.2.3.1)

Heat Detectors

Type: Honeywell FST-851H Heat Detector
FST-851 Series intelligent plug-in thermal detectors with integral communication has features that surpass conventional detectors. Point ID capability allows each detector's address to be set with decade address switches, providing exact detector locations. FST-851 Series thermal detectors use an innovative thermistor sensing circuit to produce 135°F/57°C fixed-temperature (FST-851) and rate-of-rise thermal detection (FST-851R) in a low-profile package. FST-851H provides fixed high-temperature detection at 190°F/88°C. These thermal detectors provide effective, intelligent property protection in a variety of applications. This device also has the Flash Scan protocol mentioned previously.

The smoke detector spacing for this building was based upon smooth ceilings protection for spot-type smoke detectors in accordance with (NFPA 72 – 2016 17.7.3.2.3) The provisions of this section permit nominal 30 ft. smoke detector spacing where there is an absence of specific performance-based design criteria.

Duct Detectors

Type: Intelligent Non-Relay Photoelectric Duct Smoke Detector

DNRW duct smoke detector, with its NEMA-4 rating, is listed as a watertight, UV resistant enclosure providing protection against falling dirt, rain, and windblown dust, splashing and hose directed water, allowing operators to use the detector in the most extreme environments. These units' sense smoke in the most challenging conditions, operating in airflow speeds of 100 to 4,000 feet per minute, temperatures of -4 degrees F to 158 degrees F, and a humidity range of 0 to 95 percent (non-condensing.)

Smoke detectors listed for use in air distribution systems shall be located as follows:
(1) Downstream of the air filters and ahead of any branch connections in air supply systems having a capacity greater than 944 L/sec (2000 ft3/min).
(2) At each story prior to the connection to a common return and prior to any recirculation or fresh air inlet connection in air return systems having a capacity greater than7080 L/sec (15,000 ft3/min) and serving more than one story.
(NFPA 90A-2015 6.4) other previsions under (NFPA 72-2016 17.7.5.5)

Beam Detector

Type: SRA-24 Reflective Beam Detector

The Photoelectric reflective beam detector consists of the SRA-24 unit and a reflector, which face each other at a distance of between 25ft and 100ft. In the event of fire, the smoke generated will decrease the amount of near infrared light energy on the SRA-24, this decrease is electronically interpreted to identify the occurrence of fire. An important feature of the detector is that it monitors the protected space linearly. This enables the detector to identify a fire before

it spreads, even when the smoke is scattered over a large area. The fire detection sensitivity is factory set at 20% beam obscuration and it can be changed to 30% with a sensitivity switch.

The beam smoke detector is often used in large open spaces with high ceilings where the use of spot-type detectors is impractical due to the problems of smoke stratification. The spacing for these devices are under the specification sheets given with the device. This device is used for the atrium in Baker Center for Science and Mathematics. (NFPA 72-2016 B 4.9)

Manual Pull Station

Pushing in, then pulling down on the handle causes it to latch in the down/activated position. Once latched, the word "ACTIVATED" (in bright yellow) appears at the top of the handle, while a portion of the handle protrudes from the bottom of the station. This device also has the Flash Scan protocol mentioned previously.

Each manual fire alarm box (manual pull station) is required be securely mounted not less than 42 inches, and not more than 48 inches above the finished floor. Manual pull stations are also required to be located within 5 ft. of the exit doorways opening at each exit on each floor. Additional pull stations are required to be provided so that the travel distance to the nearest pull station will not be in excess of 200 feet measured horizontally on the same floor. (NFPA 72 – 2016 17.14)

Fire Alarm Notification Devices

Strobes/ Speakers and Strobe Speaker Combination

Type: Indoor Selectable Output Speaker/Strobes
The SpectrAlert Advance Series of speakers and speaker strobes have many different options that can be chosen for the candela output (brightness of the strobe) and audible output. The strobe for this device is 1 flash per second and the decibels are taken at a 10-ft. distance from the device. See the Table 11 below for more information on output for devices:

Table 11 Candela Rating and Sound Output for Devices Present in Building

UL Maximum Strobe Current Draw (mA RMS)					
	Candela	8 to 17.5 Volts		16 to 33 Volts	
		DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258

Sound Output				
UL Reverberant (dBA @ 10ft)	2W	1W	½W	¼W
Wall Mount SP Series	86	83	80	77
Wall Mount SPV Series	90	87	84	81
Ceiling Mount SPC Series	86	83	80	77
Ceiling Mount SPCV Series	90	87	84	81
Wall Mount SPS Series	85	82	79	76
Wall Mount SPSV Series	89	86	83	80
Ceiling Mount SPSC Series	85	82	79	76
Ceiling Mount SPSCV Series	89	86	83	80

Audible

To ensure that audible public mode signals are clearly heard, unless otherwise permitted by 18.4.3.2 through 18.4.3.5, they shall have a sound level at least 15 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 ft. (1.5 m) above the floor in the area required to be served by the system. (NFPA 72-2016 18.4.3.1)
If ceiling heights allow, and unless otherwise permitted by 18.4.8.2 through 18.4.8.5, wall-mounted appliances shall have their tops above the finished floors at heights of not less than 90 in. (2.29 m) and below the finished ceilings at distances of not less than 6 in. (150 mm). (NFPA 72 18.4.8.1)

Visual

Wall-mounted appliances shall be mounted such that the entire lens is not less than 80 in. (2.03 m) and not greater than 96 in. (2.44 m) above the finished floor. (NFPA 72-2016 18.5.5.1)
Spacing shall be in accordance with Figure 22 which shows the required spacing for wall mounted devices within the building.

Table 18.5.5.4.1(a) Room Spacing for Wall-Mounted Visible Appliances

Maximum Room Size		Minimum Required Light Output [Effective Intensity (cd)]	
ft	m	One Light per Room	Four Lights per Room (One Light per Wall)
20 × 20	6.10 × 6.10	15	NA
28 × 28	8.53 × 8.53	30	NA
30 × 30	9.14 × 9.14	34	NA
40 × 40	12.2 × 12.2	60	15
45 × 45	13.7 × 13.7	75	19
50 × 50	15.2 × 15.2	94	30
54 × 54	16.5 × 16.5	110	30
55 × 55	16.8 × 16.8	115	30
60 × 60	18.3 × 18.3	135	30
63 × 63	19.2 × 19.2	150	37
68 × 68	20.7 × 20.7	177	43
70 × 70	21.3 × 21.3	184	60
80 × 80	24.4 × 24.4	240	60
90 × 90	27.4 × 27.4	304	95
100 × 100	30.5 × 30.5	375	95
110 × 110	33.5 × 33.5	455	135
120 × 120	36.6 × 36.6	540	135
130 × 130	39.6 × 39.6	635	185

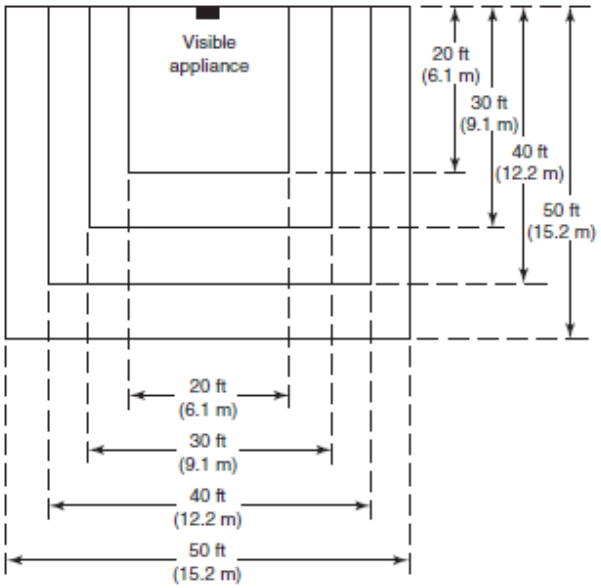


FIGURE 18.5.5.4.1 Room Spacing for Wall-Mounted Visible Appliances.

Figure 22 Spacing Requirements for Wall Mounted Visual Notification Devices

The installation of visible notification appliances in corridors 20 ft. (6.1 m) or less in width shall be in accordance with the requirements of either 18.5.5.4 or 18.5.5.5. Corridors greater than 20 ft. (6.1 m) wide shall comply with the spacing requirements for rooms.
Visible notification appliances shall be located not more than 15 ft. (4.57 m) from the end of the corridor with a separation not greater than 100 ft. (30.5 m) between appliances.
If there is an interruption of the concentrated viewing path, such as a fire door, an elevation change, or any other obstruction, the area shall be treated as a separate corridor.
(NFPA 72-2016 18.5.5.5)

Outdoor Strobes

Type: Outdoor Selectable Output Speaker Strobes
The SpectrAlert Advance series offers the broadest line of outdoor speakers and speaker strobes. The strobe for this device is 1 flash per second and the decibels are taken at a 10ft. distance from the device. See Table 12 for sound and candela ratings for outdoor devices.

Table 12 Sound Output and Candela Rating for Devices Present Outside Building

Sound Output				
UL Reverberant (dBA @ 10ft)	2W	1W	½W	¼W
Outdoor Speaker	90	87	84	81
Outdoor Speaker/Speaker Strobe	89	86	83	80

UL Maximum Strobe Current Draw (mA RMS)					
	Candela	8 to 17.5 Volts		16 to 33 Volts	
		DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258

There were no codes on the spacing or location of outside fire notification devices in NFPA 72. There are probably codes that indicate where the authority having jurisdiction would like these devices located. They are located on the outside of the building on all four corners of the building or at least on the sides of the building that the fire lane/ fire department would enter on so they can identify the building easily.

Battery Calculations

The fire alarm control panel, fire alarm initiating devices, and fire alarm notification devices are required to have a secondary power supply. This secondary power source is provided by a standby battery supply. The secondary power supply for emergency voice/alarm communications systems are required to operate the system under a standby load for a minimum of 24 hours and can operate the system during a fire or other emergency condition for a period of 15 minutes at maximum alarm load. (NFPA 72-2016 10.6.7.2.1.2) The battery calculations were found to be adequate for this building. The results from the hand calculations determined that the required back up power for the system on standby for 24 hours and 0.25 hours (15mintutes) would be 24.2 amp hours for all devices within the building. The provided amp hours within the building are 36 amp hours. Table 13 is a summary of the total amp hours required for the alarm system present in Warren J Baker Center for Science and Mathematics.

Table 13 Battery Calculations

Description	Standby Current(AMPS)	QTY	Total Standby Current Per Unit(AMPS)	Alarm Current(AMPS)	QTY	Total Alarm Current Per Unit (AMPS)
FACP	0.2850	1	0.2850	0.2850	1	0.2850
Manual Pull Station	0.0003	30	0.0090	0.0030	30	0.0900
Smoke Detector	0.0040	30	0.1200	0.0004	30	0.0120
Duct Detector	0.0030	62	0.1860	0.0003	62	0.0186
Strobe	0.0000	66	0.0000	0.0660	66	4.3560
Speaker Strobe	0.0000	172	0.0000	0.1040	172	17.8880
Bell	0.0000	1	0.0000	0.0400	1	0.0400
Outdoor Strobes	0.0000	2	0.0000	0.2340	2	0.4680
Total System Standby Current (AMPS)			0.6000	Total System Alarm Current (AMPS)		23.1576

Required Operating Time for Secondary Power Source Under NFPA 72			
Standby	24Hrs.	Alarm	0.25Hrs.

STANDBY			ALARM		
Required SB Time	Total SSB Current (AMPS)	Required Amp-Hours	Required Alarm Time	Total System Alarm Current (AMPS)	Required Amp-Hours
24	0.6	14.4	0.25	23.16	5.79

Required Standby Amp-Hours	Required Alarm Amp-Hours	Total	Safety Factor	Required Battery Capacity Amp-Hours
14.4	5.79	20.19	1.2	24.2

Operating Characteristics of Fire Alarm System

The operating characteristics of this fire alarm system is shown in Figure 23:
-hold open door release devices
-initiate smoke management system
-HVAC shutdown
- activate fire/ smoke dampers
-elevator recall

EVENT	ACTION: SUPERVISORY CONDITION AT FACU	TROUBLE CONDITION AT FACU	ALARM CONDITION AT FACU	ACTIVATE FIRE ALARM AUDIO/VISUAL DEVICES AND VOICE ALARM COMMUNICATION	DISPLAY TEXT ON LCD ANNUNCIATOR	ACTIVATE SHUNT TRIP RELAY	SHUTDOWN AIR HANDLER UNIT	ACTIVATE ELEVATOR RECALL	SHUTDOWN INDIVIDUAL ASSOCIATED DAMPERS	DEACTIVATE MAGNETIC DOOR HOLDERS	ACTIVATE SUPERVISORY SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	ACTIVATE TROUBLE SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	ACTIVATE ALARM DIALER SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	BYPASS ALL ALARM OUTPUTS (NOTIFICATION, SHUNTS, RELAY OUTPUTS) FOR TESTING	OPEN ATRIUM DOORS WITH MOTORIZED DOOR OPERATORS	ACTIVATE ATRIUM PASSIVE SMOKE EVACUATION SYSTEM
FIRE ALARM CONTROL UNIT																
PANEL SUPERVISORY CONDITION (TEST BYBASS) ON ACM-24 AT	X			X						X			X			
PANEL TROUBLE CONDITION (AC POWER FAIL, LOW BATTERY, OPEN CIRCUIT, GROUND FAULT, ETC.)		X		X							X					
PANEL ALARM CONDITION			X	X	X		X			X			X			
MANUAL PULL STATION ACTIVATION			X	X	X					X			X			
SPOT SMOKE DETECTOR ACTIVATION			X	X	X					X			X			
DUCT SMOKE DETECTOR ACTIVATION			X	X	X				X	X			X			
AIR HANDLING UNIT DUCT SMOKE DETECTOR ACTIVATION			X	X	X		X						X			
SPRINKLER TAMPER SWITCH	X				X					X			X			
SPRINKLER WATER FLOW ACTIVATION			X	X	X					X			X			
FIRE PUMP RUNNING			X	X	X					X			X			
FIRE PUMP LOSS OF PH ASE	X				X						X					
FIRE PUMP PHASE REVERSAL	X				X						X		X			
HEAT DETECTOR ACTIVATION (ELEVATOR EQUIPMENT)			X	X	X	X				X			X			
ELEVATOR LOBBY/ EMR SMOKE / ELEVATOR HOISTWAYS			X	X	X			X		X			X			
SHUNT TRIP POWER SUPERVISION	X				X						X					
GENERAL ALARM (ANYWHERE WITHIN THE BUILDING)			X	X	X		X			X			X			
ATRIUM SMOKE CONTORL SYSTEM ALARM			X	X	X					X			X		X	X
BEAM SMOKE DETECTION WITHIN ATRIUM			X	X	X					X			X		X	X
PULL STATION WITHIN ATRIUM			X	X	X					X			X		X	X
SPRINKLER WATER FLOW WITHIN ATRIUM			X	X	X					X			X		X	X

Figure 23 Operation Matrix for Fire Alarm and Smoke Management System.

Smoke Management System

Warren J. Baker for Science and Mathematics has a passive naturally ventilated smoke management system for the five-story atrium in the building. The atrium is fully sprinkled and has a fully functioning smoke detection system. In the event of a fire within the atrium and detection by a smoke detector, beam detector, or sprinkler activation the smoke management system will activate. In activation of the smoke management system the alarm will sound, the police will be notified, and magnetic door locks for the horizontal exits present in the atrium will deactivate. The doors will shut to keep smoke and hot gases from entering other parts of the building. There will also be activation of the smoke vents and makeup air vents to help exhaust the smoke. The exhaust vents are located on the 7th floor of the building and the makeup air vents are the exit doors located on the second floor of the building. The figure below shows the makeup air vents and the exhaust vents. The blue areas each have two 5ft. by 10ft. smoke exhaust vents. The red areas indicate the makeup air vents which both on the north and south side of the building are four 3ft. by 12ft. doors that have motors to automatically open in the event of a fire. These exit doors are motorized which in activation of the smoke management these motors will open the doors automatically and remain open to supply the makeup air required for the smoke exhaust within the atrium. The matrix above in Figure 23 above shows other systems that shut down in the event of an alarm within the atrium such as HVAC units shut down and elevator recall. Figure 24 below indicates red as the makeup air vents and the blue is the location of the smoke exhaust vents. Figure 25 below is a visual representation of the opening in the atrium.

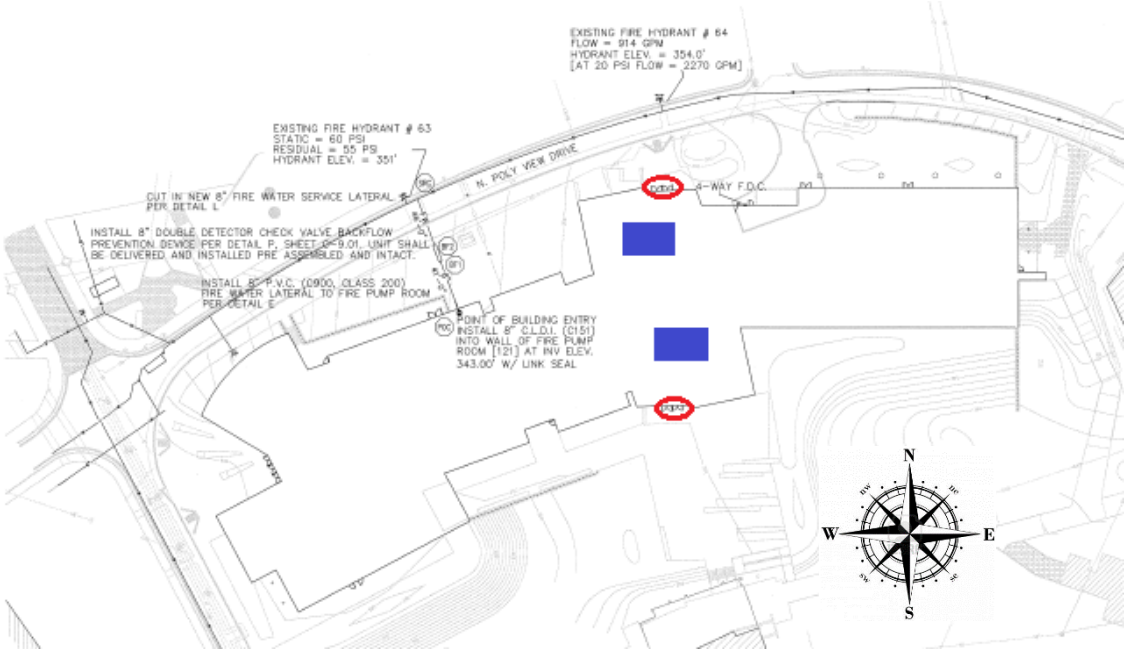


Figure 24 Makeup Air and Smoke Exhaust Vent Locations

North Atrium Opening **South Atrium Opening**

Figure 25 Atrium Openings

Fire Alarm System Signals

The type of system in this building is a Fire Emergency Voice Alarm Communication System (EVACS) and Mass Notification System (MNS) combination. The system is a protected premises system with a supervisory station which falls under the requirements of Chapter 26.4.6 in NFPA 72 -2016. In the case of an alarm, supervisory, or trouble signal the Cal Poly dispatch center is notified. In the case that a retransmission of the signal must be done it is retransmitted by a Digital Alarm Communicator Transmitter (DACT).

Alarm signals initiated by manual fire alarm boxes, automatic fire detectors, water flow from the automatic sprinkler system, or actuation of other fire suppression system(s) or equipment shall be treated as fire alarm signals. Fire alarm signals received at the supervising station by a zone or zones shall be retransmitted by zone to the communications center. Fire alarm signals received at the supervising station that are identified as an individual point or points shall be retransmitted by point identifier to the communications center.

Alarm Signals

Upon receipt of an alarm signal, the proprietary supervising station operator shall initiate action to perform the following:
(1) Notify the communications center, the emergency response team, and such other parties as the authority having jurisdiction requires in accordance with 26.2.1
(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

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 jurisdictions 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

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 to ascertain a 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 to the nature of the signal, time of occurrence, and restoration of service

Emergency Communication System

The in-building fire emergency voice/alarm communications system (EVACS) shall be used to provide an automatic response to the receipt of a signal indicative of a fire alarm or other emergency. When the monitoring location is constantly attended by trained operators, and operator acknowledgment of receipt of a fire alarm or other emergency signal is received within 30 seconds, automatic response shall not be required. (NFPA 72-2016 24.4) This building contains 172 speakers that communicate in the case of a fire alarm.

Audible signal tones for alert or evacuation shall meet the audibility requirements of either 18.4.3 (public mode audible requirements), 18.4.4 (private mode audible requirements), 18.4.5.1 and 18.4.5.2 (sleeping area requirements), or 18.4.6 (narrow band tone signaling for exceeding masked thresholds), as applicable.

Inspecting, Testing, and Maintenance

The inspection, testing, and maintenance of systems, initiating devices, and notification appliances shall comply with the requirements in Chapter 14 of NFPA 72-2016.

Inspection

Unless otherwise permitted, visual inspections shall be performed in accordance with the schedules in Table 14 or more often if required by the authority having jurisdiction. Devices or equipment that is inaccessible for safety considerations (e.g., continuous process operations, energized electrical equipment, radiation, and excessive height) shall be permitted to be inspected during scheduled shutdowns if approved by the authority having jurisdiction.

Table 14 Inspection Requirements for Alarm and Notification System

Table 14.3.1 Visual Inspection

	Component	Initial Acceptance	Periodic Frequency	Method	Reference
1.	All equipment	X	Annual	Ensure there are no changes that affect equipment performance. Inspect for building modifications, occupancy changes, changes in environmental conditions, device location, physical obstructions, device orientation, physical damage, and degree of cleanliness.	14.3.4
2.	Control equipment:				
	(a) Fire alarm systems monitored for alarm, supervisory, and trouble signals			Verify a system normal condition.	
	(1) Fuses	X	Annual		
	(2) Interfaced equipment	X	Annual		
	(3) Lamps and LEDs	X	Annual		
	(4) Primary (main) power supply	X	Annual		
	(5) Trouble signals	X	Semiannual		
	(b) Fire alarm systems unmonitored for alarm, supervisory, and trouble signals			Verify a system normal condition.	
	(1) Fuses	X	Weekly		
	(2) Interfaced equipment	X	Weekly		
	(3) Lamps and LEDs	X	Weekly		
	(4) Primary (main) power supply	X	Weekly		
	(5) Trouble signals	X	Weekly		
3.	Reserved				
4.	Supervising station alarm systems — transmitters			Verify location, physical condition, and a system normal condition.	
	(a) Digital alarm communicator transmitter (DACT)	X	Annual		
	(b) Digital alarm radio transmitter (DART)	X	Annual		
	(c) McCulloh	X	Annual		
	(d) Radio alarm transmitter (RAT)	X	Annual		
	(e) All other types of communicators	X	Annual		
5.	In-building fire emergency voice/alarm communications equipment	X	Semiannual	Verify location and condition.	
6.	Reserved				
7.	Reserved				
8.	Reserved				
9.	Batteries			Inspect for corrosion or leakage. Verify tightness of connections. Verify marking of the month/year of manufacture (all types).	10.6.10
	(a) Lead-acid	X	Monthly	Visually inspect electrolyte level.	
	(b) Nickel-cadmium	X	Semiannual		
	(c) Primary (dry cell)	X	Monthly		
	(d) Sealed lead-acid	X	Semiannual		
10.	Reserved				

(continues)

Table 14.3.1 *Continued*

	Component	Initial Acceptance	Periodic Frequency	Method	Reference
11.	Remote annunciators	X	Semiannual	Verify location and condition.	
12.	Notification appliance circuit power extenders	X	Annual	Verify proper fuse ratings, if any. Verify that lamps and LEDs indicate normal operating status of the equipment.	10.6
13.	Remote power supplies	X	Annual	Verify proper fuse ratings, if any. Verify that lamps and LEDs indicate normal operating status of the equipment.	10.6
14.	Transient suppressors	X	Semiannual	Verify location and condition.	
15.	Reserved				
16.	Fiber-optic cable connections	X	Annual	Verify location and condition.	
17.	Initiating devices			Verify location and condition (all devices).	
	(a) Air sampling				
	(1) General	X	Semiannual	Verify that in-line filters, if any, are clean.	17.7.3.6
	(2) Sampling system piping and sampling ports	X		Verify that sampling system piping and fittings are installed properly, appear airtight, and are permanently fixed. Confirm that sampling pipe is conspicuously identified. Verify that sample ports or points are not obstructed.	17.7.3.6
	(b) Duct detectors				
	(1) General	X	Semiannual	Verify that detector is rigidly mounted. Confirm that no penetrations in a return air duct exist in the vicinity of the detector. Confirm the detector is installed so as to sample the airstream at the proper location in the duct.	17.7.5.5
	(2) Sampling tube	X		Verify proper orientation. Confirm the sampling tube protrudes into the duct in accordance with system design.	17.7.5.5
	(c) Electromechanical releasing devices	X	Semiannual		
	(d) Fire extinguishing system(s) or suppression system(s) switches	X	Semiannual		
	(e) Manual fire alarm boxes	X	Semiannual		
	(f) Heat detectors	X	Semiannual		
	(g) Radiant energy fire detectors	X	Quarterly	Verify no point requiring detection is obstructed or outside the detector's field of view.	17.8
	(h) Video image smoke and fire detectors	X	Quarterly	Verify no point requiring detection is obstructed or outside the detector's field of view.	17.7.7; 17.11.5
	(i) Smoke detectors (excluding one- and two-family dwellings)	X	Semiannual		
	(j) Projected beam smoke detectors	X	Semiannual	Verify beam path is unobstructed.	
	(k) Supervisory signal devices	X	Quarterly		
	(l) Waterflow devices	X	Quarterly		
18.	Reserved				

Table 14.3.1 *Continued*

	Component	Initial Acceptance	Periodic Frequency	Method	Reference
19.	Combination systems			Verify location and condition (all types).	
	(a) Fire extinguisher electronic monitoring device/systems	X	Semiannual		
	(b) Carbon monoxide detectors/systems	X	Semiannual		
20.	Fire alarm control interface and emergency control function interface	X	Semiannual	Verify location and condition.	
21.	Guard's tour equipment	X	Semiannual	Verify location and condition.	
22.	Notification appliances			Verify location and condition (all appliances).	
	(a) Audible appliances	X	Semiannual		
	(b) Audible textual notification appliances	X	Semiannual		
	(c) Visible appliances				
	(1) General	X	Semiannual		18.5.5
	(2) Candela rating	X		Verify that the candela rating marking agrees with the approved drawings.	18.5.5
23.	Exit marking audible notification appliances	X	Semiannual	Verify location and condition.	
24.	Reserved				
25.	Area of refuge two-way communication system	X	Annual	Verify location and condition.	
26.	Reserved				
27.	Supervising station alarm systems — receivers				
	(a) Signal receipt	X	Daily	Verify receipt of signal.	
	(b) Receivers	X	Annual	Verify location and normal condition.	
28.	Public emergency alarm reporting system transmission equipment			Verify location and condition.	
	(a) Publicly accessible alarm box	X	Semiannual		
	(b) Auxiliary box	X	Annual		
	(c) Master box				
	(1) Manual operation	X	Semiannual		
	(2) Auxiliary operation	X	Annual		
29.	Reserved				
30.	Mass notification system				
	(a) Monitored for integrity			Verify a system normal condition.	
	(1) Control equipment				
	(i) Fuses	X	Annual		
	(ii) Interfaces	X	Annual		
	(iii) Lamps/LED	X	Annual		
	(iv) Primary (main) power supply	X	Annual		
	(2) Secondary power batteries	X	Annual		
	(3) Initiating devices	X	Annual		
	(4) Notification appliances	X	Annual		

(continues)

Table 14.3.1 *Continued*

	Component	Initial Acceptance	Periodic Frequency	Method	Reference
30.	Mass notification system *(continued)*				
	(b) Not monitored for integrity; installed prior to adoption of the 2010 edition			Verify a system normal condition.	
	(1) Control equipment				
	(i) Fuses	X	Semiannual		
	(ii) Interfaces	X	Semiannual		
	(iii) Lamps/LED	X	Semiannual		
	(iv) Primary (main) power supply	X	Semiannual		
	(2) Secondary power batteries	X	Semiannual		
	(3) Initiating devices	X	Semiannual		
	(4) Notification appliances	X	Semiannual		
	(c) Antenna	X	Annual	Verify location and condition.	
	(d) Transceivers	X	Annual	Verify location and condition.	

Testing

At the request of the authority having jurisdiction, the central station facility installation shall be inspected for complete information regarding the central station system, including specifications, wiring diagrams, and floor plans that have been submitted for approval prior to installation of equipment and wiring. Systems and associated equipment shall be tested per Table 15. Records shall be retained until the next test and for one year thereafter.

Table 15 Testing Requirements for Alarm and Notification Systems

Table 14.4.3.2 Testing

	Component	Initial Acceptance	Periodic Frequency	Method
1.	All equipment	X		See Table 14.3.1.
2.	Control equipment and transponder			
	(a) Functions	X	Annually	Verify correct receipt of alarm, supervisory, and trouble signals (inputs); operation of evacuation signals and auxiliary functions (outputs); circuit supervision, including detection of open circuits and ground faults; and power supply supervision for detection of loss of ac power and disconnection of secondary batteries.
	(b) Fuses	X	Annually	Verify rating and supervision.
	(c) Interfaced equipment	X	Annually	Verify integrity of single or multiple circuits providing interface between two or more control units. Test interfaced equipment connections by operating or simulating operation of the equipment being supervised. Verify signals required to be transmitted at the control unit.
	(d) Lamps and LEDs	X	Annually	Illuminate lamps and LEDs.
	(e) Primary (main) power supply	X	Annually	Disconnect and test all secondary (standby) power under maximum load, including all alarm appliances requiring simultaneous operation. Reconnect all secondary (standby) power at end of test. Test redundant power supplies separately.
3.	Fire alarm control unit trouble signals			
	(a) Audible and visual	X	Annually	Verify operation of control unit trouble signals. Verify ring-back feature for systems using a trouble-silencing switch that requires resetting.
	(b) Disconnect switches	X	Annually	If control unit has disconnect or isolating switches, verify performance of intended function of each switch. Verify receipt of trouble signal when a supervised function is disconnected.
	(c) Ground-fault monitoring circuit	X	Annually	If the system has a ground detection feature, verify the occurrence of ground-fault indication whenever any installation conductor is grounded.
	(d) Transmission of signals to off-premises location	X	Annually	Actuate an initiating device and verify receipt of alarm signal at the off-premises location. Create a trouble condition and verify receipt of a trouble signal at the off-premises location. Actuate a supervisory device and verify receipt of a supervisory signal at the off-premises location. If a transmission carrier is capable of operation under a single- or multiple-fault condition, activate an initiating device during such fault condition and verify receipt of an alarm signal and a trouble signal at the off-premises location.
4.	Supervising station alarm systems — transmission Equipment			
	(a) All equipment	X	Annually	[a]Test all system functions and features in accordance with the equipment manufacturer's published instructions for correct operation in conformance with the applicable sections of Chapter 26. Except for DACT, actuate initiating device and verify receipt of the correct initiating device signal at the supervising station within 90 seconds. Upon completion of the test, restore the system to its functional operating condition. If test jacks are used, conduct the first and last tests without the use of the test jack.
	(b) Digital alarm communicator transmitter (DACT)	X	Annually	Except for DACTs installed prior to adoption of the 2013 edition of NFPA 72 that are connected to a telephone line (number) that is also supervised for adverse conditions by a derived local channel, ensure connection of the DACT to two separate means of transmission. Test DACT for line seizure capability by initiating a signal while using the telephone line (primary line for DACTs using two telephone lines) for a telephone call. Ensure that the call is interrupted and that the communicator connects to the digital alarm receiver. Verify receipt of the correct signal at the supervising station. Verify each transmission attempt is completed within 90 seconds from going off-hook to on-hook.

(continues)

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
4. Supervising station alarm systems — transmission Equipment			
(b) Digital alarm communicator transmitter (DACT) *(continued)*			Disconnect the telephone line (primary line for DACTs using two telephone lines) from the DACT. Verify indication of the DACT trouble signal occurs at the premises fire alarm control unit within 4 minutes of detection of the fault. Verify receipt of the telephone line trouble signal at the supervising station. Restore the telephone line (primary line for DACTs using two telephone lines), reset the fire alarm control unit, and verify that the telephone line fault trouble signal returns to normal. Verify that the supervising station receives the restoral signal from the DACT. Disconnect the secondary means of transmission from the DACT. Verify indication of the DACT trouble signal occurs at the premises fire alarm control unit within 4 minutes of detection of the fault. Verify receipt of the secondarey means trouble signal at the supervising station. Restore the secondary means of transmission, reset the fire alarm control unit, and verify that the trouble signal returns to normal. Verify that the supervising station receives the restoral signal from the secondary transmitter. Cause the DACT to transmit a signal to the DACR while a fault in the telephone line (number) (primary line for DACTs using two telephone lines) is simulated. Verify utilization of the secondary communication path by the DACT to complete the transmission to the DACR.
(c) Digital alarm radio transmitter (DART)	X	Annually	Disconnect the primary telephone line. Verify transmission of a trouble signal to the supervising station by the DART occurs within 4 minutes.
(d) McCulloh transmitter	X	Annually	Actuate initiating device. Verify production of not less than three complete rounds of not less than three signal impulses each by the McCulloh transmitter. If end-to-end metallic continuity is present and with a balanced circuit, cause each of the following four transmission channel fault conditions in turn, and verify receipt of correct signals at the supervising station: (1) Open (2) Ground (3) Wire-to-wire short (4) Open and ground If end-to-end metallic continuity is not present and with a properly balanced circuit, cause each of the following three transmission channel fault conditions in turn, and verify receipt of correct signals at the supervising station: (1) Open (2) Ground (3) Wire-to-wire short
(e) Radio alarm transmitter (RAT)	X	Annually	Cause a fault between elements of the transmitting equipment. Verify indication of the fault at the protected premises, or transmission of trouble signal to the supervising station.
(f) Performance-based technologies	X	Annually	Perform tests to ensure the monitoring of integrity of the transmission technology and technology path. Where a single communications path is used, disconnect the communication path. Manually initiate an alarm signal transmission or allow the check-in (handshake) signal to be transmitted automatically.[b] Verify the premises unit annunciates the failure within 200 seconds of the transmission failure. Restore the communication path. Where multiple communication paths are used, disconnect both communication paths. Manually initiate an alarm signal transmission. Verify the premises control unit annunciates the failure within 200 seconds of the transmission failure. Restore both communication paths.
5. Emergency communications equipment			
(a) Amplifier/tone generators	X	Annually	Verify correct switching and operation of backup equipment.
(b) Call-in signal silence	X	Annually	Operate/function and verify receipt of correct visual and audible signals at control unit.
(c) Off-hook indicator (ring down)	X	Annually	Install phone set or remove phone from hook and verify receipt of signal at control unit.
(d) Phone jacks	X	Annually	Visually inspect phone jack and initiate communications path through jack.

Table 14.4.3.2 *Continued*

	Component	Initial Acceptance	Periodic Frequency	Method
	(e) Phone set	X	Annually	Activate each phone set and verify correct operation.
	(f) System performance	X	Annually	Operate the system with a minimum of any five handsets simultaneously. Verify voice quality and clarity.
6.	Engine-driven generator	X	Monthly	If an engine-driven generator dedicated to the system is used as a required power source, verify operation of the generator in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*, by the building owner.
7.	Secondary (standby) power supply[c]	X	Annually	Disconnect all primary (main) power supplies and verify the occurrence of required trouble indication for loss of primary power. Measure or verify the system's standby and alarm current demand and verify the ability of batteries to meet standby and alarm requirements using manufacturer's data. Operate general alarm systems a minimum of 5 minutes and emergency voice communications systems for a minimum of 15 minutes. Reconnect primary (main) power supply at end of test.
8.	Uninterruptible power supply (UPS)	X	Annually	If a UPS system dedicated to the system is used as a required power source, verify by the building owner operation of the UPS system in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*.
9.	Battery tests			Prior to conducting any battery testing, verify by the person conducting the test, that all system software stored in volatile memory is protected from loss.
	(a) Lead-acid type			
	(1) Battery replacement	X	Annually	Replace batteries in accordance with the recommendations of the alarm equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations.
	(2) Charger test	X	Annually	With the batteries fully charged and connected to the charger, measure the voltage across the batteries with a voltmeter. Verify the voltage is 2.30 volts per cell ±0.02 volts at 77°F (25°C) or as specified by the equipment manufacturer.
	(3) Discharge test	X	Annually	With the battery charger disconnected, load test the batteries following the manufacturer's recommendations. Verify the voltage level does not fall below the levels specified. Load testing can be by means of an artificial load equal to the full fire alarm load connected to the battery.
	(4) Load voltage test	X	Semiannually	With the battery charger disconnected, load test the batteries following the manufacturer's recommendations. Verify the voltage level does not fall below the levels specified. Load testing can be by means of an artificial load equal to the full fire alarm load connected to the battery. Verify the battery does not fall below 2.05 volts per cell under load.
	(5) Specific gravity	X	Semiannually	Measure as required the specific gravity of the liquid in the pilot cell or all of the cells. Verify the specific gravity is within the range specified by the manufacturer. Although the specified specific gravity varies from manufacturer to manufacturer, a range of 1.205–1.220 is typical for regular lead-acid batteries, while 1.240–1.260 is typical for high-performance batteries. Do not use a hydrometer that shows only a pass or fail condition of the battery and does not indicate the specific gravity, because such a reading does not give a true indication of the battery condition.
	(b) Nickel-cadmium type			
	(1) Battery replacement	X	Annually	Replace batteries in accordance with the recommendations of the alarm equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations.
	(2) Charger test[d]	X	Annually	With the batteries fully charged and connected to the charger, place an ampere meter in series with the battery under charge. Verify the charging current is in accordance with the manufacturer's recommendations for the type of battery used. In the absence of specific information, use 1/10 to 1/15 of the battery rating.
	(3) Discharge test	X	Annually	With the battery charger disconnected, load test the batteries following the manufacturer's recommendations. Verify the voltage level does not fall below the levels specified. Load testing can be by means of an artificial load equal to the full fire alarm load connected to the battery.
	(4) Load voltage test	X	Semiannually	With the battery charger disconnected, load test the batteries following the manufacturer's recommendations. Verify the voltage level does not fall below the levels specified. Load testing can be by means of an artificial load equal to the full fire alarm load connected to the battery. Verify the float voltage for the entire battery is 1.42 volts per cell, nominal, under load. If possible, measure cells individually.

(continues)

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
9. Battery tests *(continued)*			
(c) Sealed lead-acid type			
(1) Battery replacement	X	Annually	Replace batteries in accordance with the recommendations of the alarm equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations.
(2) Charger test	X	Annually	With the batteries fully charged and connected to the charger, measure the voltage across the batteries with a voltmeter. Verify the voltage is 2.30 volts per cell ±0.02 volts at 77°F (25°C) or as specified by the equipment manufacturer.
(3) Discharge test	X	Annually	With the battery charger disconnected, load test the batteries following the manufacturer's recommendations. Verify the voltage level does not fall below the levels specified. Load testing can be by means of an artificial load equal to the full fire alarm load connected to the battery.
(4) Load voltage test	X	Semiannually	Verify the battery performs under load, in accordance with the battery manufacturer's specifications.
10. Public emergency alarm reporting system — wired system	X	Daily	Manual tests of the power supply for public reporting circuits shall be made and recorded at least once during each 24-hour period. Such tests shall include the following: (1) Current strength of each circuit. Changes in current of any circuit exceeding 10 percent shall be investigated immediately. (2) Voltage across terminals of each circuit inside of terminals of protective devices. Changes in voltage of any circuit exceeding 10 percent shall be investigated immediately. (3)[e] Voltage between ground and circuits. If this test shows a reading in excess of 50 percent of that shown in the test specified in (2), the trouble shall be immediately located and cleared. Readings in excess of 25 percent shall be given early attention. These readings shall be taken with a calibrated voltmeter of not more than 100 ohms resistance per volt. Systems in which each circuit is supplied by an independent current source (Forms 3 and 4) require tests between ground and each side of each circuit. Common current source systems (Form 2) require voltage tests between ground and each terminal of each battery and other current source. (4) Ground current reading shall be permitted in lieu of (3). If this method of testing is used, all grounds showing a current reading in excess of 5 percent of the supplied line current shall be given immediate attention. (5) Voltage across terminals of common battery on switchboard side of fuses. (6) Voltage between common battery terminals and ground. Abnormal ground readings shall be investigated immediately. Tests specified in (5) and (6) shall apply only to those systems using a common battery. If more than one common battery is used, each common battery shall be tested.
11. Remote annunciators	X	Annually	Verify the correct operation and identification of annunciators. If provided, verify the correct operation of annunciator under a fault condition.
12. Reserved			
13. Reserved			
14. Reserved			
15. Conductors — metallic			
(a) Stray voltage	X	N/A	Test all installation conductors with a volt/ohmmeter to verify that there are no stray (unwanted) voltages between installation conductors or between installation conductors and ground. Verify the maximum allowable stray voltage does not exceed 1 volt ac/dc, unless a different threshold is specified in the published manufacturer's instructions for the installed equipment.
(b) Ground faults	X	N/A	Test all installation conductors, other than those intentionally and permanently grounded, for isolation from ground per the installed equipment manufacturer's published instructions.
(c) Short-circuit faults	X	N/A	Test all installation conductors, other than those intentionally connected together, for conductor-to-conductor isolation per the published manufacturer's instructions for the installed equipment. Also test these same circuits conductor-to-ground.

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
(d) Loop resistance	X	N/A	With each initiating and indicating circuit installation conductor pair short-circuited at the far end, measure and record the resistance of each circuit. Verify that the loop resistance does not exceed the limits specified in the published manufacturer's instructions for the installed equipment.
(e) Circuit integrity	X	N/A	For initial and reacceptance testing, confirm the introduction of a fault in any circuit monitored for integrity results in a trouble indication at the fire alarm control unit. Open one connection at not less than 10 percent of the initiating devices, notification appliances and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit. Confirm all circuits perform as indicated in Sections 23.5, 23.6, and 23.7.
	N/A	Annually	For periodic testing, test each initiating device circuit, notification appliance circuit, and signaling line circuit for correct indication at the control unit. Confirm all circuits perform as indicated in Sections 23.5, 23.6, and 23.7.
16. Conductors — nonmetallic			
(a) Fiber optics	X	N/A	Test the fiber-optic transmission line by the use of an optical power meter or by an optical time domain reflectometer used to measure the relative power loss of the line. Test result data must meet or exceed ANSI/TIA 568-C.3, *Optical Fiber Cabling Components Standard*, related to fiber-optic lines and connection/splice losses and the control unit manufacturer's published specifications.
(b) Circuit integrity	X	N/A	For initial and reacceptance testing, confirm the introduction of a fault in any circuit monitored for integrity results in a trouble indication at the fire alarm control unit. Open one connection at not less than 10 percent of the initiating devices, notification appliances, and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit. Confirm all circuits perform as indicated in Sections 23.5, 23.6, and 23.7.
	N/A	Annually	For periodic testing, test each initiating device circuit, notification appliance circuit, and signaling line circuit for correct indication at the control unit. Confirm all circuits perform as indicated in Sections 23.5, 23.6, and 23.7.
17. Initiating devices[f]			
(a) Electromechanical releasing device			
(1) Nonrestorable-type link	X	Annually	Verify correct operation by removal of the fusible link and operation of the associated device. Lubricate any moving parts as necessary.
(2) Restorable-type link[g]	X	Annually	Verify correct operation by removal of the fusible link and operation of the associated device. Lubricate any moving parts as necessary.
(b) Fire extinguishing system(s) or suppression system(s) alarm switch	X	Annually	Operate the switch mechanically or electrically and verify receipt of signal by the fire alarm control unit.
(c) Fire–gas and other detectors	X	Annually	Test fire–gas detectors and other fire detectors as prescribed by the manufacturer and as necessary for the application.
(d) Heat detectors			
(1) Fixed-temperature, rate-of-rise, rate of compensation, restorable line, spot type (excluding pneumatic tube type)	X	Annually (see 14.4.4.5)	Perform heat test with a listed and labeled heat source or in accordance with the manufacturer's published instructions. Assure that the test method for the installed equipment does not damage the nonrestorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element detector.
(2) Fixed-temperature, nonrestorable line type	X	Annually	Do not perform heat test. Test functionality mechanically and electrically. Measure and record loop resistance. Investigate changes from acceptance test.
(3) Fixed-temperature, nonrestorable spot type	X	See Method	After 15 years from initial installation, replace all devices or have 2 detectors per 100 laboratory tested. Replace the 2 detectors with new devices. If a failure occurs on any of the detectors removed, remove and test additional detectors to determine either a general problem involving faulty detectors or a localized problem involving 1 or 2 defective detectors. If detectors are tested instead of replaced, repeat tests at intervals of 5 years.
(4) Nonrestorable (general)	X	Annually	Do not perform heat tests. Test functionality mechanically and electrically.
(5) Restorable line type, pneumatic tube only	X	Annually	Perform heat tests (where test chambers are in circuit), with a listed and labeled heat source or in accordance with the manufacturer's published instructions of the detector or conduct a test with pressure pump.

(continues)

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
17. Initiating devices[f]			
(d) Heat detectors *(continued)*			
(6) Single- and multiple-station heat alarms	X	Annually	Conduct functional tests according to manufacturer's published instructions. Do not test nonrestorable heat detectors with heat.
(e) Manual fire alarm boxes	X	Annually	Operate manual fire alarm boxes per the manufacturer's published instructions. Test both key-operated presignal and general alarm manual fire alarm boxes.
(f) Radiant energy fire detectors	X	Semiannually	Test flame detectors and spark/ember detectors in accordance with the manufacturer's published instructions to determine that each detector is operative. Determine flame detector and spark/ember detector sensitivity using any of the following: (1) Calibrated test method (2) Manufacturer's calibrated sensitivity test instrument (3) Listed control unit arranged for the purpose (4) Other approved calibrated sensitivity test method that is directly proportional to the input signal from a fire, consistent with the detector listing or approval If designed to be field adjustable, replace detectors found to be outside of the approved range of sensitivity or adjust to bring them into the approved range. Do not determine flame detector and spark/ember detector sensitivity using a light source that administers an unmeasured quantity of radiation at an undefined distance from the detector.
(g) Smoke detectors — functional test			
(1) In other than one- and two-family dwellings, system detectors	X	Annually	[b]Test smoke detectors in place to ensure smoke entry into the sensing chamber and an alarm response. Use smoke or a listed and labeled product acceptable to the manufacturer or in accordance with their published instructions. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber can be used.
(2) Single- and multiple-station smoke alarms connected to protected premises systems	X	Annually	Perform a functional test on all single- and multiple-station smoke alarms connected to a protected premises fire alarm system by putting the smoke alarm into an alarm condition and verifying that the protected premises system receives a supervisory signal and does not cause a fire alarm signal.
(3) System smoke detectors used in one- and two-family dwellings	X	Annually	Conduct functional tests according to manufacturer's published instructions.
(4) Air sampling	X	Annually	Test with smoke or a listed and labeled product acceptable to the manufacturer or in accordance with their published instructions. Test from the end sampling port or point on each pipe run. Verify airflow through all other ports or points.
(5) Duct type	X	Annually	In addition to the testing required in Table 14.4.3.2(g)(1) and Table 14.4.3.2(h), test duct smoke detectors that use sampling tubes to ensure that they will properly sample the airstream in the duct using a method acceptable to the manufacturer or in accordance with their published instructions.
(6) Projected beam type	X	Annually	Test the detector by introducing smoke, other aerosol, or an optical filter into the beam path.
(7) Smoke detector with built-in thermal element	X	Annually	Operate both portions of the detector independently as described for the respective devices.
(8) Smoke detectors with control output functions	X	Annually	Verify that the control capability remains operable even if all of the initiating devices connected to the same initiating device circuit or signaling line circuit are in an alarm state.
(h) Smoke detectors — sensitivity testing			
In other than one- and two-family dwellings, system detectors	N/A	See 14.4.4.3	[b]Perform any of the following tests to ensure that each smoke detector is within its listed and marked sensitivity range: (1) Calibrated test method (2) Manufacturer's calibrated sensitivity test instrument (3) Listed control equipment arranged for the purpose

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
			(4) Smoke detector/control unit arrangement whereby the detector causes a signal at the control unit when its sensitivity is outside its listed sensitivity range (5) Other calibrated sensitivity test method approved by the authority having jurisdiction
(i) Carbon monoxide detectors/carbon monoxide alarms for the purposes of fire detection	X	Annually	Test the devices in place to ensure CO entry to the sensing chamber by introduction through the vents, to the sensing chamber of listed and labeled product acceptable to the manufacturer or in accordance with their published instructions.
(j) Initiating devices, supervisory			
(1) Control valve switch	X	Annually	Operate valve and verify signal receipt to be within the first two revolutions of the handwheel or within one-fifth of the travel distance, or per the manufacturer's published instructions.
(2) High- or low-air pressure switch	X	Annually	Operate switch and verify receipt of signal is obtained where the required pressure is increased or decreased a maximum 10 psi (70 kPa) from the required pressure level.
(3) Room temperature switch	X	Annually	Operate switch and verify receipt of signal to indicate the decrease in room temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C).
(4) Water level switch	X	Annually	Operate switch and verify receipt of signal indicating the water level raised or lowered a maximum 3 in. (70 mm) from the required level within a pressure tank, or a maximum 12 in. (300 mm) from the required level of a nonpressure tank. Also verify its restoral to required level.
(5) Water temperature switch	X	Annually	Operate switch and verify receipt of signal to indicate the decrease in water temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C).
(k) Mechanical, electrosonic, or pressure-type waterflow device	X	Semiannually	Water shall be flowed through an inspector's test connection indicating the flow of water equal to that from a single sprinkler of the smallest orifice size installed in the system for wet-pipe systems, or an alarm test bypass connection for dry-pipe, pre-action, or deluge systems in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*
(l) Multi-sensor fire detector or multi-criteria fire detector or combination fire detector	X	Annually	Test each of the detection principles present within the detector (e.g., smoke/heat/CO, etc.) independently for the specific detection principle, regardless of the configuration status at the time of testing. Also test each detector in accordance with the published manufacturer's instructions. Test individual sensors together if the technology allows individual sensor responses to be verified. Perform tests as described for the respective devices by introduction of the physical phenomena to the sensing chamber of element, and an electronic check (magnets, analogue values, etc.) is not sufficient to comply with this requirement. Confirm the result of each sensor test through indication at the detector or control unit. Where individual sensors cannot be tested individually, test the primary sensor.[j] Record all tests and results.
18. Special hazard equipment			
(a) Abort switch (dead-man type)	X	Annually	Operate abort switch and verify correct sequence and operation.
(b) Abort switch (recycle type)	X	Annually	Operate abort switch and verify development of correct matrix with each sensor operated.
(c) Abort switch (special type)	X	Annually	Operate abort switch and verify correct sequence and operation in accordance with authority having jurisdiction. Observe sequencing as specified on as-built drawings or in system owner's manual.
(d) Cross-zone detection circuit	X	Annually	Operate one sensor or detector on each zone. Verify occurrence of correct sequence with operation of first zone and then with operation of second zone.
(e) Matrix-type circuit	X	Annually	Operate all sensors in system. Verify development of correct matrix with each sensor operated.
(f) Release solenoid circuit[k]	X	Annually	Verify operation of solenoid.
(g) Squibb release circuit	X	Annually	Use AGI flashbulb or other test light approved by the manufacturer. Verify operation of flashbulb or light.
(h) Verified, sequential, or counting zone circuit	X	Annually	Operate required sensors at a minimum of four locations in circuit. Verify correct sequence with both the first and second detector in alarm.
(i) All above devices or circuits or combinations thereof	X	Annually	Verify supervision of circuits by creating an open circuit.

(continues)

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
19. Combination systems			
(a) Fire extinguisher electronic monitoring device/system	X	Annually	Test communication between the device connecting the fire extinguisher electronic monitoring device/system and the fire alarm control unit to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.
(b) Carbon monoxide[l] device/system	X	Annually	Test communication between the device connecting the carbon monoxide device/system and the fire alarm control unit to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.
20. Interface equipment[m]	X	See 14.4.4.4	Test interface equipment connections by operating or simulating the equipment being supervised. Verify signals required to be transmitted are received at the control unit. Test frequency for interface equipment is the same as the frequency required by the applicable NFPA standard(s) for the equipment being supervised.
21. Guard's tour equipment	X	Annually	Test the device in accordance with the manufacturer's published instructions.
22. Alarm notification appliances			
(a) Audible[n]	X	N/A	For initial and reacceptance testing, measure sound pressure levels for signals with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters*, Type 2 requirements. Measure sound pressure levels throughout the protected area to confirm that they are in compliance with Chapter 18. Set the sound level meter in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal*, using the time-weighted characteristic F (FAST).
	N/A	Annually	[o]For periodic testing, verify the operation of the notification appliances.
(b) Audible textual notification appliances (speakers and other appliances to convey voice messages)	X	N/A	For initial and reacceptance testing, measure sound pressure levels for signals with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters*, Type 2 requirements. Measure sound pressure levels throughout the protected area to confirm that they are in compliance with Chapter 18. Set the sound level meter in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal*, using the time-weighted characteristic F (FAST). Verify audible information to be distinguishable and understandable and in compliance with 14.4.11.
	N/A	Annually	[o]For periodic testing, verify the operation of the notification appliances.
(c) Visible	X	N/A	Perform initial and reacceptance testing in accordance with the manufacturer's published instructions. Verify appliance locations to be per approved layout and confirm that no floor plan changes affect the approved layout. Verify that the candela rating marking agrees with the approved drawing. Confirm that each appliance flashes.
	N/A	Annually	For periodic testing, verify that each appliance flashes.
23. Exit marking audible notification appliance	X	Annually	Perform tests in accordance with manufacturer's published instructions.
24. Emergency control functions[p]	X	Annually	For initial, reacceptance, and periodic testing, verify emergency control function interface device activation. Where an emergency control function interface device is disabled or disconnected during initiating device testing, verify that the disabled or disconnected emergency control function interface device has been properly restored. [
25. Area of refuge two-way communication system	X	Annually	At a minimum, test the two-way communication system to verify operation and receipt of visual and audible signals at the transmitting and receiving unit respectively. Operate systems with more than five stations with a minimum of five stations operating simultaneously. Verify voice quality and clarity.
26. Special procedures			
(a) Alarm verification	X	Annually	Verify time delay and alarm response for smoke detector circuits identified as having alarm verification.
(b) Multiplex systems	X	Annually	Verify communications between sending and receiving units under both primary and secondary power. Verify communications between sending and receiving units under open-circuit and short-circuit trouble conditions.

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
			Verify communications between sending and receiving units in all directions where multiple communications pathways are provided. If redundant central control equipment is provided, verify switchover and all required functions and operations of secondary control equipment. Verify all system functions and features in accordance with manufacturer's published instructions.
27. Supervising station alarm systems — receiving equipment			
(a) All equipment	X	Monthly	Perform tests on all system functions and features in accordance with the equipment manufacturer's published instructions for correct operation in conformance with the applicable sections of Chapter 26. Actuate initiating device and verify receipt of the correct initiating device signal at the supervising station within 90 seconds. Upon completion of the test, restore the system to its functional operating condition. If test jacks are used, perform the first and last tests without the use of the test jack.
(b) Digital alarm communicator receiver (DACR)	X	Monthly	Disconnect each transmission means in turn from the DACR, and verify audible and visual annunciation of a trouble signal in the supervising station. Cause a signal to be transmitted on each individual incoming DACR line (path) at least once every 6 hours (24 hours for DACTs installed prior to adoption of the 2013 edition of *NFPA 72*). Verify receipt of these signals.
(c) Digital alarm radio receiver (DARR)	X	Monthly	Cause the following conditions of all DARRs on all subsidiary and repeater station receiving equipment. Verify receipt at the supervising station of correct signals for each of the following conditions: (1) AC power failure of the radio equipment (2) Receiver malfunction (3) Antenna and interconnecting cable failure (4) Indication of automatic switchover of the DARR (5) Data transmission line failure between the DARR and the supervising or subsidiary station
(d) McCulloh systems	X	Monthly	Test and record the current on each circuit at each supervising and subsidiary station under the following conditions: (1) During functional operation (2) On each side of the circuit with the receiving equipment conditioned for an open circuit Cause a single break or ground condition on each transmission channel. If such a fault prevents the functioning of the circuit, verify receipt of a trouble signal. Cause each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment; verify receipt of correct signals at the supervising station: (1) RF transmitter in use (radiating) (2) AC power failure supplying the radio equipment (3) RF receiver malfunction (4) Indication of automatic switchover
(e) Radio alarm supervising station receiver (RASSR) and radio alarm repeater station receiver (RARSR)	X	Monthly	Cause each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment; verify receipt of correct signals at the supervising station: (1) AC power failure supplying the radio equipment (2) RF receiver malfunction (3) Indication of automatic switchover, if applicable
(f) Private microwave radio systems	X	Monthly	Cause each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment; verify receipt of correct signals at the supervising station: (1) RF transmitter in use (radiating) (2) AC power failure supplying the radio equipment (3) RF receiver malfunction (4) Indication of automatic switchover

(continues)

Table 14.4.3.2 ***Continued***

Component	Initial Acceptance	Periodic Frequency	Method
27. Supervising station alarm systems — receiving equipment *(continued)*			
(g) Performance-based technologies	X	Monthly	Perform tests to ensure the monitoring of integrity of the transmission technology and technology path. Where a single communications path is used, disconnect the communication path. Verify that failure of the path is annunciated at the supervising station within 60 minutes of the failure (within 5 minutes for communication equipment installed prior to adoption of the 2013 edition of *NFPA 72*). Restore the communication path. Where multiple communication paths are used, disconnect both communication paths and confirm that failure of the path is annunciated at the supervising station within not more than 6 hours of the failure (within 24 hours for communication equipment installed prior to adoption of the 2013 edition of *NFPA 72*). Restore both communication paths.
28. Public emergency alarm reporting system transmission equipment			
(a) Publicly accessible alarm box	X	Semiannually	Actuate publicly accessible initiating device(s) and verify receipt of not less than three complete rounds of signal impulses. Perform this test under normal circuit conditions. If the device is equipped for open circuit operation (ground return), test it in this condition as one of the semiannual tests.
(b) Auxiliary box	X	Annually	Test each initiating circuit of the auxiliary box by actuation of a protected premises initiating device connected to that circuit. Verify receipt of not less than three complete rounds of signal impulses.
(c) Master box			
(1) Manual operation	X	Semiannually	Perform the tests prescribed for 28(a).
(2) Auxiliary operation	X	Annually	Perform the tests prescribed for 28(b).
29. Low-power radio (wireless systems)	X	N/A	The following procedures describe additional acceptance and reacceptance test methods to verify wireless protection system operation: (1) Use the manufacturer's published instructions and the as-built drawings provided by the system supplier to verify correct operation after the initial testing phase has been performed by the supplier or by the supplier's designated representative. (2) Starting from the functional operating condition, initialize the system in accordance with the manufacturer's published instructions. Confirm the alternative communications path exists between the wireless control unit and peripheral devices used to establish initiation, indication, control, and annunciation. Test the system for both alarm and trouble conditions. (3) Check batteries for all components in the system monthly unless the control unit checks all batteries and all components daily.
30. Mass notification systems			
(a) Functions	X	Annually	At a minimum, test control equipment to verify correct receipt of alarm, supervisory, and trouble signals (inputs); operation of evacuation signals and auxiliary functions (outputs); circuit supervision, including detection of open circuits and ground faults; and power supply supervision for detection of loss of ac power and disconnection of secondary batteries.
(b) Fuses	X	Annually	Verify the rating and supervision.
(c) Interfaced equipment	X	Annually	Verify integrity of single or multiple circuits providing interface between two or more control units. Test interfaced equipment connections by operating or simulating operation of the equipment being supervised. Verify signals required to be transmitted at the control unit.
(d) Lamps and LEDs	X	Annually	Illuminate lamps and LEDs.
(e) Primary (main) power supply	X	Annually	Disconnect all secondary (standby) power and test under maximum load, including all alarm appliances requiring simultaneous operation. Reconnect all secondary (standby) power at end of test. For redundant power supplies, test each separately.
(f) Audible textual notification appliances (speakers and other appliances to convey voice messages)	X	Annually	Measure sound pressure level with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters*, Type 2 requirements. Measure and record levels throughout protected area. Set the sound level meter in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal*, using the time-weighted characteristic F (FAST). Record the maximum output when the audible emergency evacuation signal is on. Verify audible information to be distinguishable and understandable.

Table 14.4.3.2 *Continued*

Component	Initial Acceptance	Periodic Frequency	Method
(g) Visible	X	Annually	Perform test in accordance with manufacturer's published instructions. Verify appliance locations to be per approved layout and confirm that no floor plan changes affect the approved layout. Verify that the candela rating marking agrees with the approved drawing. Confirm that each appliance flashes.
(h) Control unit functions and no diagnostic failures are indicated	X	Annually	Review event log file and verify that the correct events were logged. Review system diagnostic log file; correct deficiencies noted in file. Delete unneeded log files. Delete unneeded error files. Verify that sufficient free disk space is available. Verify unobstructed flow of cooling air is available. Change/clean filters, cooling fans, and intake vents.
(i) Control unit reset	X	Annually	Power down the central control unit computer and restart it.
(j) Control unit security	X	Annually	If remote control software is loaded onto the system, verify that it is disabled to prevent unauthorized system access.
(k) Audible/visible functional test	X	Annually	Send out an alert to a diverse set of predesignated receiving devices and confirm receipt. Include at least one of each type of receiving device.
(l) Software backup	X	Annually	Make full system software backup. Rotate backups based on accepted practice at site.
(m) Secondary power test	X	Annually	Disconnect ac power. Verify the ac power failure alarm status on central control equipment. With ac power disconnected, verify battery voltage under load.
(n) Wireless signals	X	Annually	Check forward/reflected radio power is within specifications.
(o) Antenna	X	Annually	Check forward/reflected radio power is within specifications. Verify solid electrical connections with no observable corrosion.
(p) Transceivers	X	Annually	Verify proper operation and mounting is not compromised.

[a]Some transmission equipment (such as but not limited to cable modems, fiber-optic interface nodes, and VoIP interfaces) are typically powered by the building's electrical system using a standby power supply that does not meet the requirements of this Code. This is intended to ensure that the testing authority verifies full standby power as required by Chapter 10. Additionally, refer to Table 14.4.3.2, Items 7 through 9 for secondary power supply testing.

[b]The automatic transmission of the check-in (handshake) signal can take up to 60 minutes to occur.

[c]See Table 14.4.3.2, Item 4(a) for the testing of transmission equipment.

[d]Example: 4000 mAh × ½₂₀ = 160 mA charging current at 77°F (25°C).

[e]The voltmeter sensitivity has been changed from 1000 ohms per volt to 100 ohms per volt so that the false ground readings (caused by induced voltages) are minimized.

[f]Initiating devices such as smoke detectors used for elevator recall, closing dampers, or releasing doors held in the open position that are permitted by the Code *(see* NFPA *101, Life Safety Code, 9.6.3)* to initiate supervisory signals at the fire alarm control unit (FACU) should be tested at the same frequency (annual) as those devices when they are generating an alarm signal. They are not supervisory devices, but they initiate a supervisory signal at the FACU.

[g]Fusible thermal link detectors are commonly used to close fire doors and fire dampers. They are actuated by the presence of external heat, which causes a solder element in the link to fuse, or by an electric thermal device, which, when energized, generates heat within the body of the link, causing the link to fuse and separate.

[h]Note, it is customary for the manufacturer of the smoke detector to test a particular product from an aerosol provider to determine acceptability for use in smoke entry testing of their smoke detector/ smoke alarm. Magnets are not acceptable for smoke entry tests.

[i] There are some detectors that use magnets as a manufacturer's calibrated sensitivity test instrument.

[j]For example, it might not be possible to individually test the heat sensor in a thermally enhanced smoke detector.

[k]Manufacturer's instructions should be consulted to ensure a proper operational test. No suppression gas or agent is expected to be discharged during the test of the solenoid. See Test Plan of 14.2.10.

[l]Testing of CO device should be done to the requirements of NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment.*

[m]A monitor module installed on an interface device is not considered a supervisory device and therefore not subject to the quarterly testing frequency requirement. Test frequencies for interface devices should be in accordance with the applicable standard. For example, fire pump controller alarms such as phase reversal are required to be tested annually. If a monitor module is installed to identify phase reversal on the fire alarm control panel, it is not necessary to test for phase reversal four times a year.

[n]Chapter 18 would require 15 dB over average ambient sound for public mode spaces. Sometimes the ambient sound levels are different from what the design was based upon. Private operating mode would require 10 dB over average ambient at the location of the device.

[o]Where building, system, or occupancy changes have been observed, the owner should be notified of the changes. New devices might need to be installed and tested per the initial acceptance testing criteria.

[p]See A.14.4.3.2, and Table 14.4.3.2, Item 24.

Maintenance

System equipment shall be maintained in accordance with the manufacturer's published instructions. The frequency of maintenance of system equipment shall depend on the type of equipment and the local ambient conditions.

Summary

In summary, the fire alarm system used in Warren J Baker Center for Science and Mathematics meets the requirements of NFPA 72 2013. The fire alarm system, all initiating/detection devices, and notification devices are spaced and located appropriately. The visual and sounding requirements necessary for proper evacuation of the building are met by use of appropriate notification devices. The next section discusses the performance requirements used to evaluate the building.

Performance Based Analysis

The following sections cover the performance based analysis. This analysis covers typical fire scenarios present in this building and analysis of the atrium. Each section is a summary of the results and assumptions used to evaluate the building. The performance based sections are listed below.

- Fire Scenario Selections
- Atrium

These performance based sections using current codes and standards listed below.

- International Building Code (IBC) 2015
- NFPA 101 Life Safety Code Handbook (LSC) 2015
- NFPA 72 National Fire Alarm and Signaling Code 2013
- SFPE Handbook of Fire Protection Engineering, 5th edition

Performance Criteria

In the event of a fire any occupant who is not intimate with ignition shall not be exposed to untenable conditions whether instantaneous or cumulative. The primary objective is to meet specific tenability criteria to limit exposures to occupants. (NFPA 101 LSC 2015 Chapter 5) There are methods used to evaluate and limit untenable conditions that occupants may be exposed too. The method used to evaluate was method 1 where the design team can set detailed performance criteria to ensure that occupants are not incapacitated by fire effects.

Design Fires Scenarios

The LSC also gives a series of design fire criteria that can be used to evaluate the building. The scenarios used to evaluate this building are design fire scenario 6 and design fire scenario 8. The design fire scenario 6 states that “It is the most severe fire resulting from the largest possible fuel load characteristic of the normal operation of the building and it addresses the concern regarding a rapidly developing fire with occupants present”. The design fire scenario 8 states that “it is a fire origination in ordinary combustibles in a room or area with each passive or active fire protection system independently rendered ineffective. It addresses concerns regarding the unreliability or unavailability of each fire protection system or fire protection feature, considered individually."

Design Fire 1

This design fire is based on scenario 6 from the LSC 2015. The fire is located on the second floor in a seating area within the atrium. The area is fully sprinkled and is the largest fuel area that would affect the most floors if there was a fire. The fire will become sprinkler controlled at some point during the fire and there will be activation of the smoke management system. Figure 26 indicates the location of the design fire scenario 1.

Figure 26 Three Seat Chair for Fire Scenario 1

Design Fire 2

This design fire is based on scenario 8 from the LSC 2015. The fire is located on the second floor in the atrium opening. This fire will not be sprinkler controlled but activation of the smoke management system will occur. The fire detection system will activate but there will be no suppression of the fire. Figure 27 indicates the location of design fire scenario 2.

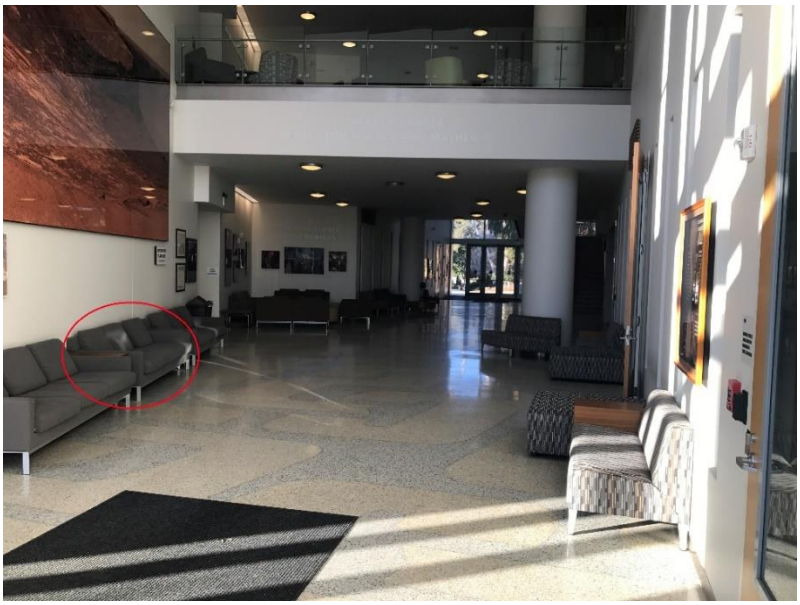


Figure 27 Three Seat Chair for Fire Scenario 2

Tenability Requirements

The available safe egress time has become fundamental in performance based analysis of life safety in the event of a fire. It is determined from the time of ignition of the fire to the point to which occupant's encounter an incapacitating dose from products of combustion and heat. These tenability requirements consist of visibility from smoke density, toxic products (CO), temperature, and heat flux from the fire. These criteria will be evaluated using fire dynamic simulator (FDS) to determine the tenable limits occupants will be exposed too. The values discussed below have been pulled from the SFPE Handbook 5th Edition.

Visibility

The visibility criteria are determined by the degree of familiarity with the inside of the building. There are two values for occupants that are familiar and unfamiliar with the building. When an occupant is familiar with the building a visibility limit of 4 meters is given, but in an event that occupants are not familiar with the building a visibility limit of 13 meters is given. These values can be seen in Table 16 taken from the SFPE Handbook 5th Edition. In Warren J. Baker Center for Science and Mathematics occupants are relatively familiar with the building. In this case a conservative value for visibility of 10 meters was used for the tenability criteria.

Table 16 Visibility Criteria

Table 61.3 Allowable smoke densities and visibility that permits safe escape

Degree of familiarity with inside of building	Smoke density (extinction coefficient)	Visibility
Unfamiliar	0.15 1/m	13 m
Familiar	0.5 1/m	4 m

Toxic Products

The toxic products criteria are determined by estimating the time to incapacitation for an exposure to carbon monoxide. When the concentrations in the space are high compared to the concentrations in the human body to cause incapacitation or death for short exposures to high CO concentrations. The uptake of CO is approximately linear. The results from CO exposure experiments in primates prove this. At a constant level of activity, the primates became unconscious when exposed to approximately27,000 ppm · min of CO at concentrations between 1000 to 8000 ppm. The concentration to incapacitation is then approximately 27,000 ppm-min for light activity. The occupants being exposed to products of combustion while exiting the building are doing light activity so if a concentration of carbon monoxide does not exceed 1000ppm then occupants can be exposed to this concentration for approximately 27 minutes. This does not consider if there are any occupants with respiratory issues or impairments. These occupants could succumb to fire effects quicker than other occupants without impairments. Table

63.9 from the SFPE Handbook gives similar values for incapacitation from toxic products. Table 17 below summarizes the findings for these incapacitating and fatal doses.

Table 17 CO Concentration Criteria

Table 63.9 $C \cdot t$ product exposure doses for incapacitation and death by CO for different species at rest and during light activity

	Incapacitation		Fatal	
	CO at rest ppm · min	CO light activity ppm · min	CO at rest ppm · min	CO light activity ppm · min
Human 70 kg	80,000–100,000	30,000–35,000	~110,000–240,000	~60,000–190,000
Baboon ~20 kg		34,000		
Macaque 3–4 kg	38,000–40,000	27,000		
Rat ~ 300 g	30,000–40,000	22,000–36,000	162,000	

Temperature and Heat Flux

The heat exposure from a fire can be defined by the temperature that is reached or the heat flux that is tolerable for an occupant over a period of minutes. Per the SFPE Handbook 5th Edition the limit for radiant heat flux is 2.5 kW/m^2. This exposure can be tolerated for 30 minutes, but above this heat flux there could be serous skin injury. The tenability limit for this analysis will be defined as 2.5 kW/m^2. The SFPE Handbook 5th Edition Figure 28 shows curves for tolerance time for convected heat for both dry and humid air. A temperature of 60 ℃ has been found to be the highest temperature at which 100% water saturated air can be tolerated. Figure 29 from the SFPE Handbook 5th Edition also shows a diagram at what temperatures skin damage can occur. The temperature within the atrium shall be kept below 60°C because a short exposure time at this temperature can be tolerated by most occupants. The temperatures within the atrium will be evaluated using FDS to ensure that occupants are not exposed to temperatures exceeding 60°C.

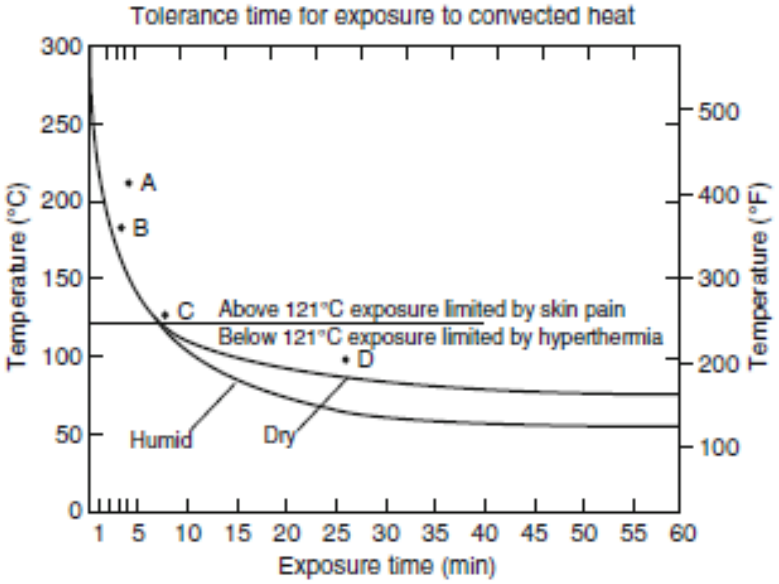


Figure 28 Breathable Air Temperature

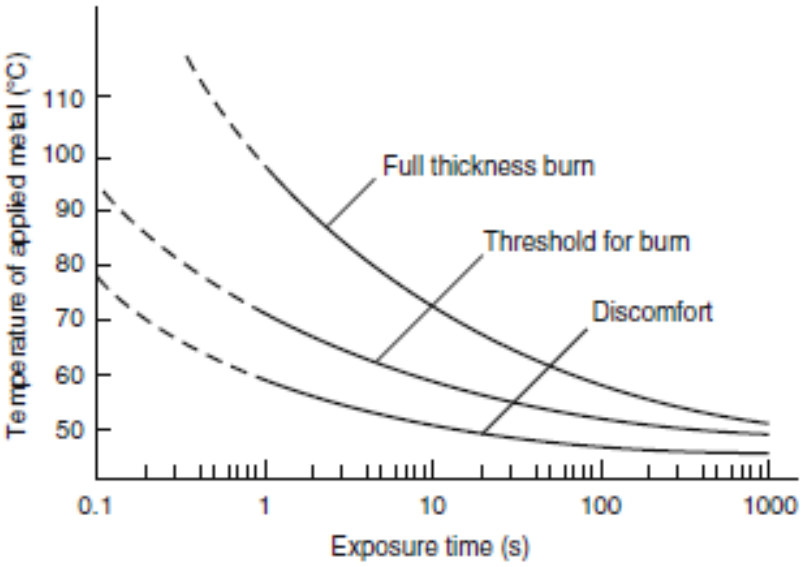


Figure 29 Skin Tolerance to Temperature

Evaluation Methods

In the NFPA Life Safety Code there are a series of methods used to evaluate what conditions occupants will be exposed to and how to limit these conditions. The method used to evaluate the Warren J. Baker Center for Science and Mathematics was Method 1. Method 1 from the LSC states that "The design team can set detailed performance criteria that ensure that occupants are not incapacitated by fire effects. The SFPE Engineering Guide to Performance-Based Fire Protection describes a process of establishing tenability limits." These limits are based on the visibility, toxic products, and temperature. These tenability criteria where discussed early and limited to a visibility of 10 meters, a concentration of CO within the space not exceed 1000ppm, and a temperature not exceeding 60℃.

Egress Analysis

For the performance analysis of this building only egress from the atrium was used. The reason for this assumption is in the event of a fire all floors would be directly affected. Also, the use of the horizontal exits will prevent smoke movement and products of fire from moving throughout the building and will section off the other parts of the building from the atrium in the event of a fire. Also, in the IBC Chapter 2, the definition of a horizontal exit is given as "an exit component consisting of fire resistance rated construction and opening protectives intended to compartmentalize the portion of a building thereby creating a refuge area that afford safety from the fire and smoke from the area of fire origin." Pathfinder was used to evaluate the egress time of the atrium. Figure 30 below is a visual representation of the atrium in Pathfinder that was used to evaluate the egress time.

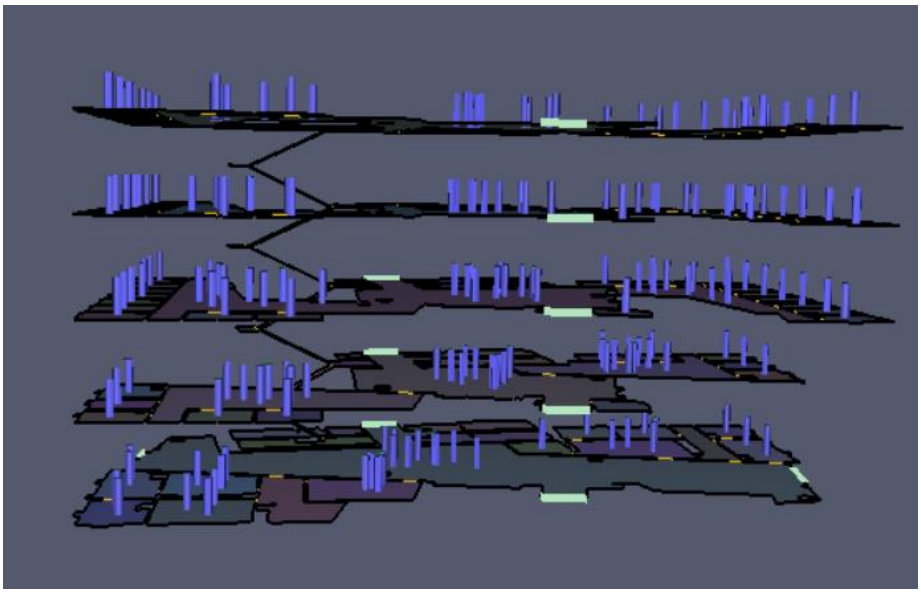


Figure 30 Pathfinder Snip of Atrium

The occupants in this model were the default setting within pathfinder. All occupants traveled at 3.9 ft/s, going to any exit or closest exit, and occupants can que within the simulation. This simulation did not consider that there may be some occupants that move slower or that may need assistance exiting the building. Occupants were assumed to be awake, alert, and oriented because of the use of the building. The simulation determined that it would take 45 seconds to evacuate the entire atrium with the use of the stairways, and horizontal exits.

ASET vs. RSET

For a performance-based analysis for a building the ASET and RSET values must be determined before setting performance criteria. The available safe egress time(ASET) is a fundamental aspect of performance-based analysis for life safety from fire. The life safety from fire is met if the required safe egress time (RSET) is shorter than the available safe egress time (RSET <ASET) for expected fire scenarios within a given building. The ASET value is the actual safe egress time that occupants must exit a building before untenable conditions exist. The RSET value is the required safe egress time that occupants need to exit the building. ASET can be used to determine the time to the onset of hazardous conditions for occupants. In all cases ASET must be greater than RSET because even though occupants may only need a short amount of time to exit the building (RSET) there should be adequate time for getting out of the building (ASET). The occupants should have adequate time to exit the building even passed the RSET because there are many unknown scenarios and or events that could occur which would attribute to a longer RSET value. With a significantly larger ASET value occupants would hopefully have plenty of time to exit the building in any given scenario that may present itself within the building.

RSET

The required safe egress time (RSET) is determined by the time to detection, time to notification, pre-movement time of occupants, and time to evacuation. The sum of these values give the total RSET value to be used when preforming the analysis.

t_d= time to detection
t_n=time to notification
t_{pm}=premovement time
t_e= evacuation time

RSET= $t_d + t_n + t_{pm} + t_e$

The time to detection was determined using FDS models that will be discussed later in this report. The time to detection was determined by one of the atrium beam detectors at about 54 seconds. These beam detectors activate at an obscuration of 30 percent. The National Fire Alarm Code specifies a maximum time of 10 seconds for fire alarm systems to actuate alarm notification appliances or voice communication after a detection device activates as stated in the SFPE Handbook 5th Edition and stated in NFPA 72 2013 section 10.12.1. The pre-movement time was based on a study done in the United Kingdom where Sharma evacuated a 6-story office building Table 18 of the SFPE Handbook 5th Edition, which is shown below. The video surveillance was used to determine the pre-movement of the occupants. The median time in seconds for an occupant to start moving was about 28 seconds. From the study, a range of times from 11 seconds to 55 seconds were found. To be conservative a value of 60 seconds was used for pre-movement of occupants within this performance design. The evacuation time was determined using the Pathfinder model discuss earlier in the Egress Analysis portion of the performance based design. That value was determined to be 45 seconds but a 60 second evacuation time will be used to be more conservative. The total RSET is as follows:

t_d= time to detection (52 seconds)
t_n=time to notification (10 seconds)
t_{pm}=premovement time (60 seconds)
t_e= evacuation time (60 seconds)
Safety Factor of 1.5

RSET = 182*1.5
The total RSET value was determined to be 273 seconds.

Table 18 Pre-Movement Information

Table 64.5 Pre-evacuation data—business occupancy

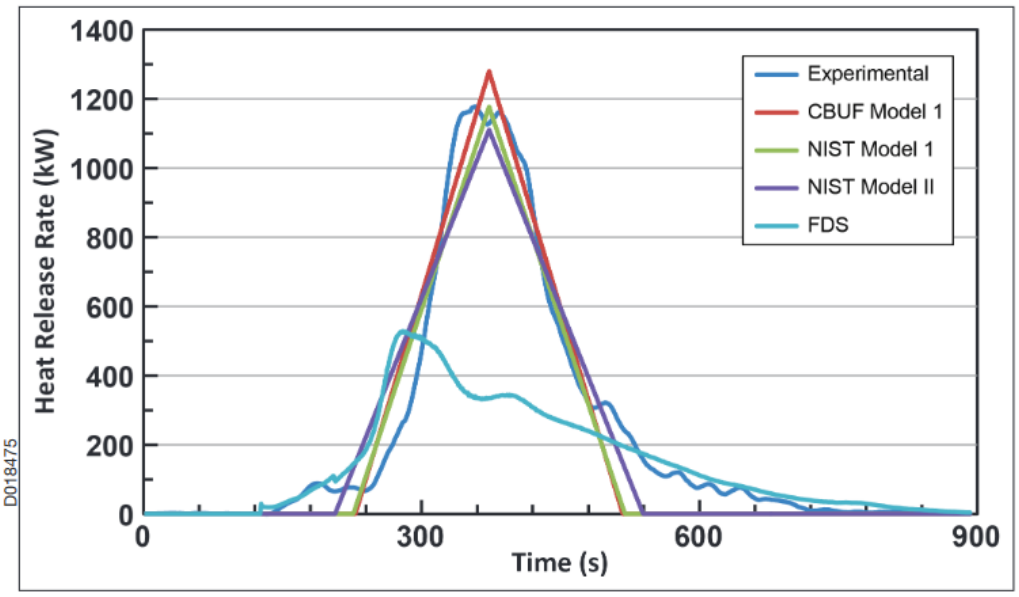
Occupancy	Source	Observational conditions (L: location, N: nature, SC: spatial configuration, P: participants, E: environment, V: variable)	Procedure			Sample		Results (sec)	Additional information
			Strategy	Staff (designated)	Technology	Collection method	Size	Mean S.D., range	
Business	Gwynne et al. [47]	L: USA N: UE1–2 SC: 14 floors P: 825 evacuees: 44 % F, 56 % M, 1 % impaired V: impact of procedure (UE1–2)	Phased UE1: local alarm UE2: general alarm	2–4/floor	AL, PV (duration 15–20s) to 3 floors followed by general alarm Tone alert	Video, observer	UE1: 132 UE2: 150	[74.0 –, 23–152][a] [–, 5–173][a]	[a]Times are arrive to stair door Raw data and frequency distributions Categorized by floor and collection method
	Sharma et al. [48]	L: UK N:UE, pre-2009 SC:6 floors P:- E:- V: performance	Full	–	–	Video, survey	19	28 [11, 10-55]	Paper gives raw data (to nearest 5 s)
	Christoffersen and Söderlind [49]	L: Denmark N: UE, pre-2009 SC: 12 floors P: V: performance given pre-recorded voice	Full	–	PV	Video, Observer	70	–[–, 12–105]	
	Proulx and Benichou [51]	L: Canada N: UE, 2006 SC: 3 floors, 6 stairwells (4 observed) P: 350 workers per floor—(18–64) E:PLM installations/reduced V: performance given alarm	Full	Floor emergency officers	AL	Video	1191	329	Bell alert used
	Purser [52]	L: UK N: UE SC: room within office P: 12 V: performance given voice alarm	Full	–	-V	Video	12	46 [–, 32–57]	

ASET

The actual safe egress time(ASET) was determine by the FDS models discussed later in this report but the models were ran for 10 minutes (600 seconds) to determine when conditions become untenable for occupants. The tenability requirements are based on visibility, toxic products, and temperatures within the enclosure that occupants are become exposed to. If the tenable criteria exceed the RSET value discussed above, then the analysis is successful.

Design Fire

The fire size and type used for evaluation within this building is based on the fuels that are available. There are large areas with furniture located relatively close together within the atrium of the building. These areas are used for studying and seating. The furniture in the atrium are all compliant with California Technical Bulleting 117 (TB 117). The TB 117 tests the smoldering effects of materials but does not restrict the heat release rate of the furniture. The size of furniture used was the three-seat sofa located in the seating area of the atrium. The SwRI research team did a series of tests on furniture that met the criteria under this technical bulletin back in 2012. Figure 31 below shows the predicted heat release rate per unit time using a series of models. This article determined the fire growth to be a medium growth fire because the chair took approximately 300 seconds to reach its peak heat release rate. In another article done in 2013, where Thomas Fabian did a series of experiments on upholstered furniture of different types. Thomas did a series of experiments, one of which was done on a chair like the one present in the atrium of Warren J Baker Center for Science and Mathematics. This chair was comprised of polyurethane foam with a polyester wrap and the heat release rate is show in Figure 32 below.



Comparison between the measured heat release rate as a function of time for a three-seat sofa mockup and corresponding heat release rate predictions from four different upholstered furniture burning rate models.

Figure 31 SwRI Research Team Results

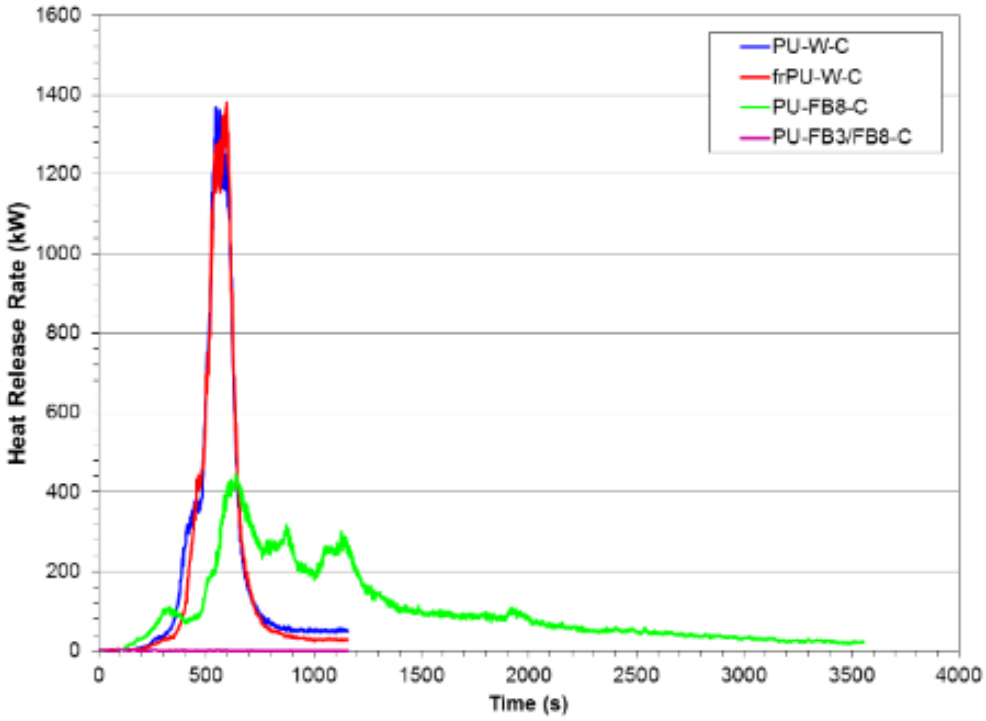


Figure 114: Heat release rate profiles for the four chair styles ignited at the back bottom.

Figure 32 Thomas Fabian Research Results

When deciding the fire growth rate for the design fires, Table 19 from the SFPE Handbook 5th Edition was used to determine that a fire is a medium growth fire. The furniture within the atrium is 90 percent polyurethane foam and 10 percent polyester. The soot yield and CO yield were pulled from the SFPE Handbook 5th Edition Table 20. The design fire criteria are summarized below was used for evaluating this building.

Table 19 t^2 Categories

Table 38.2 Categories of t^2 fires

Growth rate	t_{1000} (s)	Typical real fires
Slow	600	Densely packed wood products
Medium	300	Solid wood furniture (desks) Individual furniture items with small amounts of plastic
Fast	150	High stacked wood pallets Cartons on pallets Some upholstered furniture
Ultrafast	75	Upholstered furniture High stacked plastic materials Thin wood furniture (wardrobes)

Table 20 Soot and CO Yields for Polyurethane Foam

Table A.39 (continued)

Material	ΔH_T (kJ/g)	y_{CO_2} (g/g)	y_{CO} (g/g)	y_{ch} (g/g)	y_S (g/g)	ΔH_{ch} (kJ/g)	ΔH_{con} (kJ/g)	ΔH_{rad} (kJ/g)
Polyurethane (flexible) foams								
GM21	26.2	1.55	0.010	0.002	0.131	17.8	8.6	9.2
GM23	27.2	1.51	0.031	0.005	0.227	19.0	10.3	8.7
GM25	24.6	1.50	0.028	0.005	0.194	17.0	7.2	9.8
GM27	23.2	1.57	0.042	0.004	0.198	16.4	7.6	8.8

- Design Fire Criteria
  - Q = 1400kW
  - $\alpha = 0.012 kW/s^2$ medium fire growth coefficient (Kristopher Overholt)
  - $Q = \alpha t^2$
  - $\tau = 342s$
  - Soot yield 0.227g/g
  - CO yield 0.031g/g

FDS Model Details

FDS was used to determine if the tenable conditions within the space would be maintained in the design fire scenarios chosen above. A mesh of 0.25m (0.8ft.) was used to help in computational time as well as accuracy of data given within the atrium fires. There are about 707,000 cells within each simulation. Smoke detectors were placed at all elevator locations and beam detectors were placed in locations within the openings of the atrium. Sprinklers are spaced at equal distances from the fire source. The openings on the base of the model are then used as the makeup air vents for the smoke management system and each vent is based on two of the doors being open. At the top of the model the two openings in each atrium are the exhaust vents on the roof. Figure 33 is an example of what was used to evaluate the atrium.

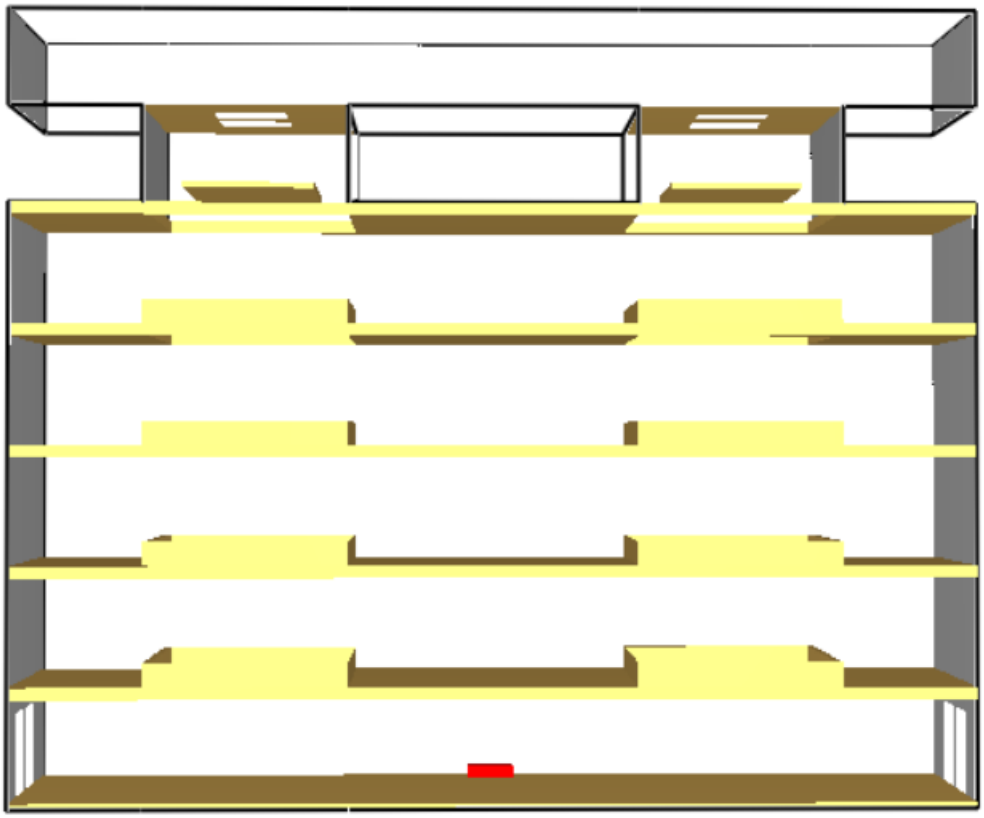


Figure 33 Example of FDS Model

Design Fire 1 Results

The fire was detected in 52 second by the beam detector within the atrium. The first sprinkler activated in 157 seconds and is the time at which the fire becomes sprinkler controlled. Throughout the duration of the fire, the temperature within the space does not exceed 30°C which is well below the tenable requirement and can be seen in Figure 35. The visibility of 10 meters is lost on the 3rd floor in 170 seconds and can be seen in Figure 34. The visibility is below

the RSET value which is a failure and alternative means should be found to maintain visibility within the space. The highest concentration within that space of carbon monoxide is 25ppm which is well below the tenable criteria set earlier and can be seen in Figure 36. Table 21 below show a summary of the results from this simulation. Table 22 indicates when visibility is lost on other floors, all other tenable requirements are maintained for the full 600 seconds (10 minutes).

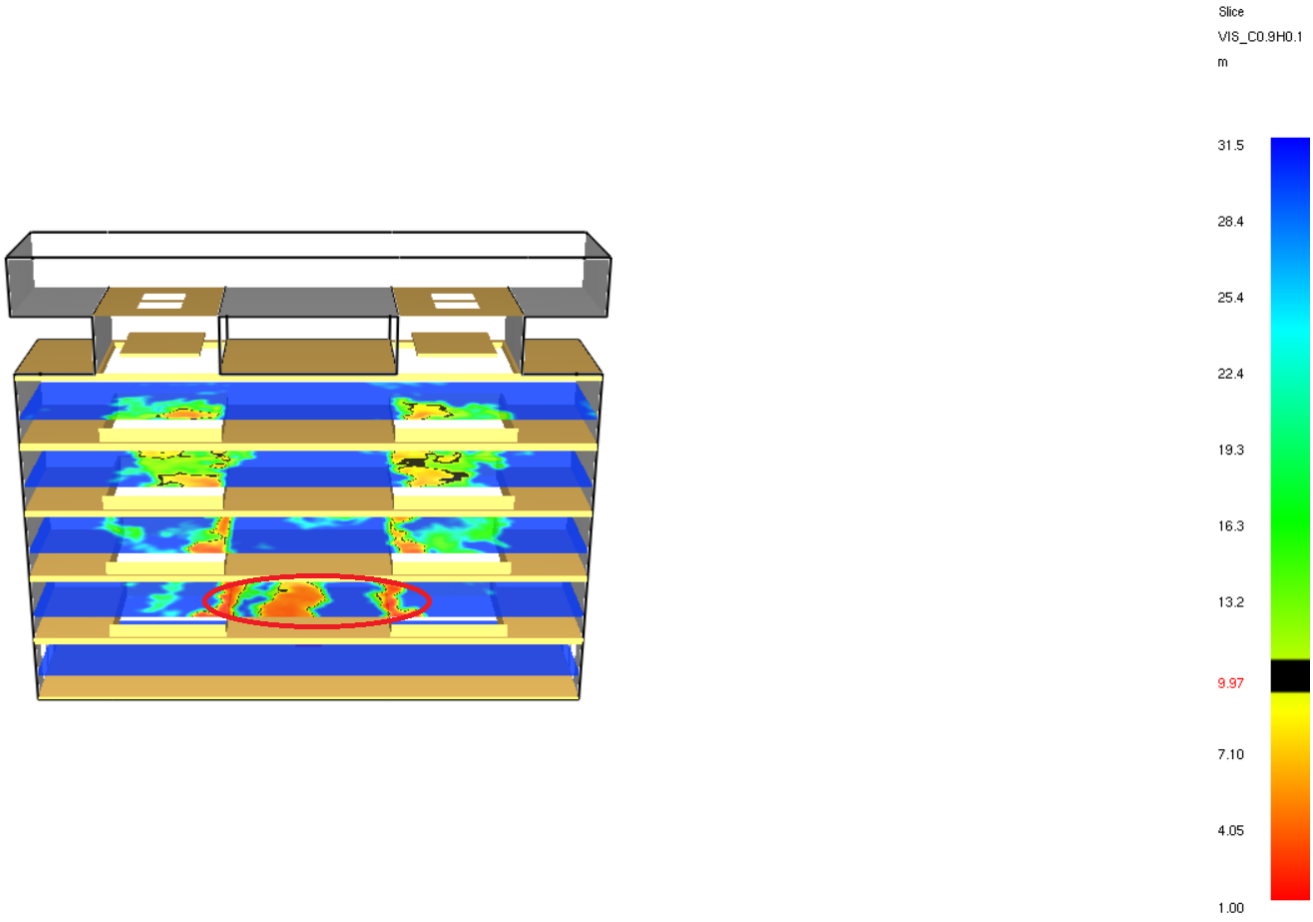


Figure 34 Visibility Below 10 meters 3rd Floor (170 seconds)

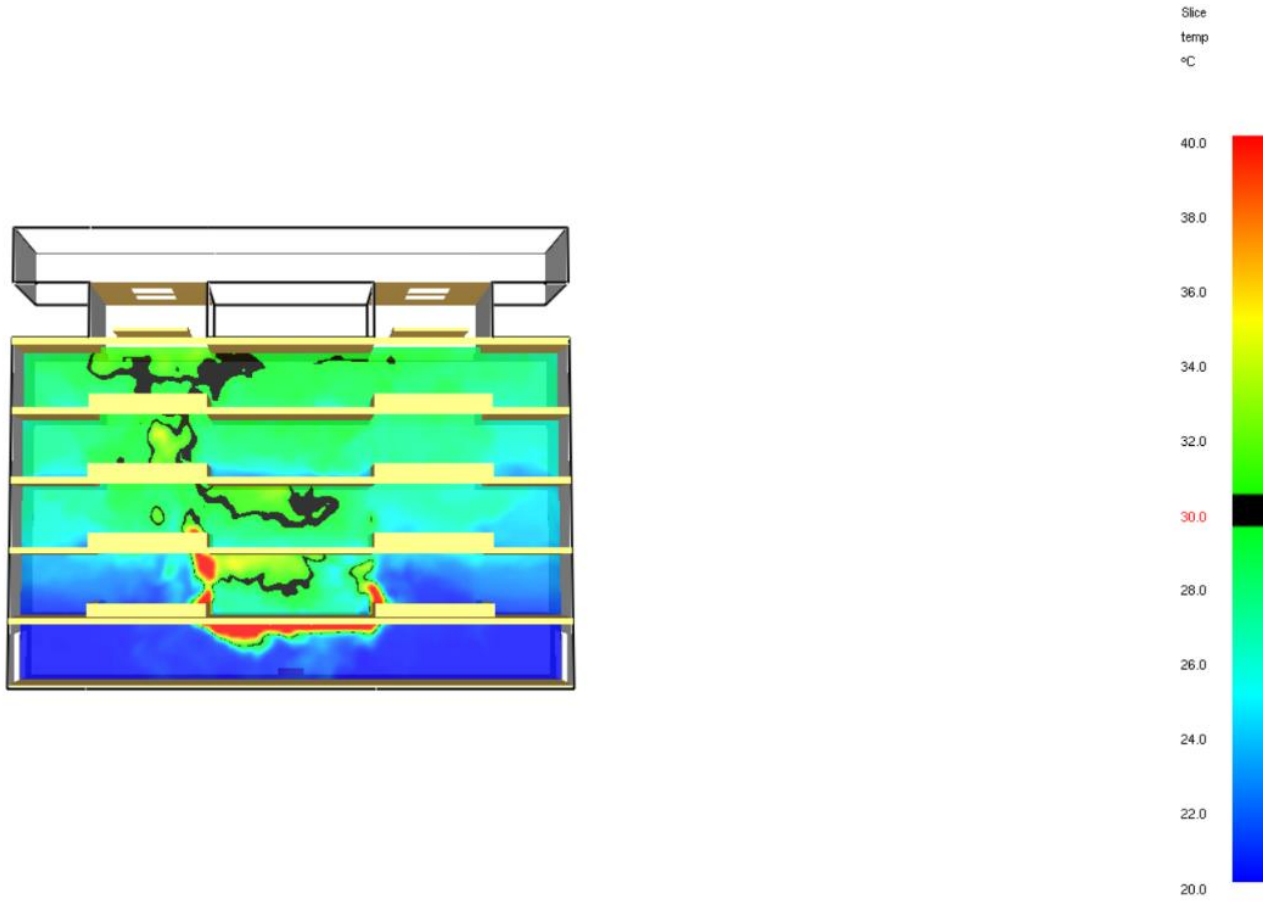


Figure 35 Temperature in Atrium (600 seconds)

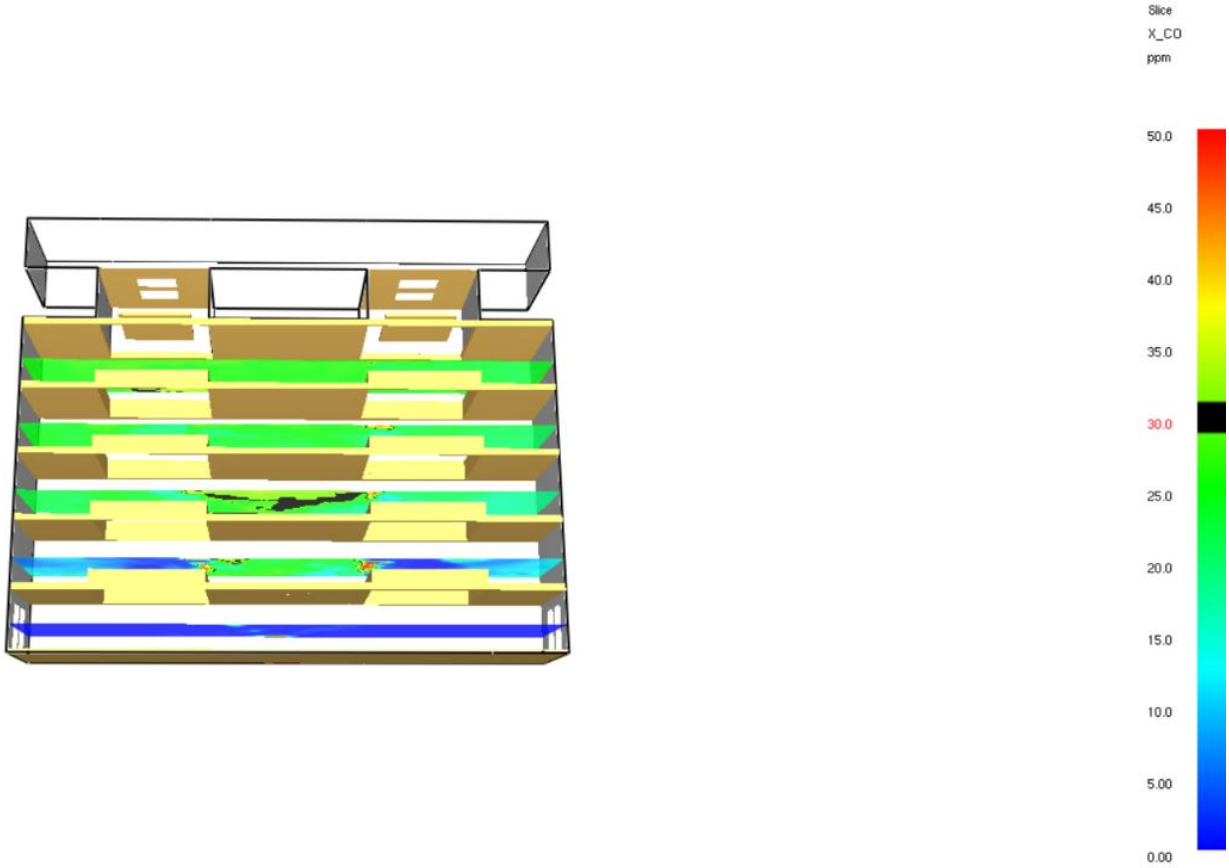


Figure 36 CO Concentrations (600 seconds)

Table 21 Results RSET vs. ASET Fire 1

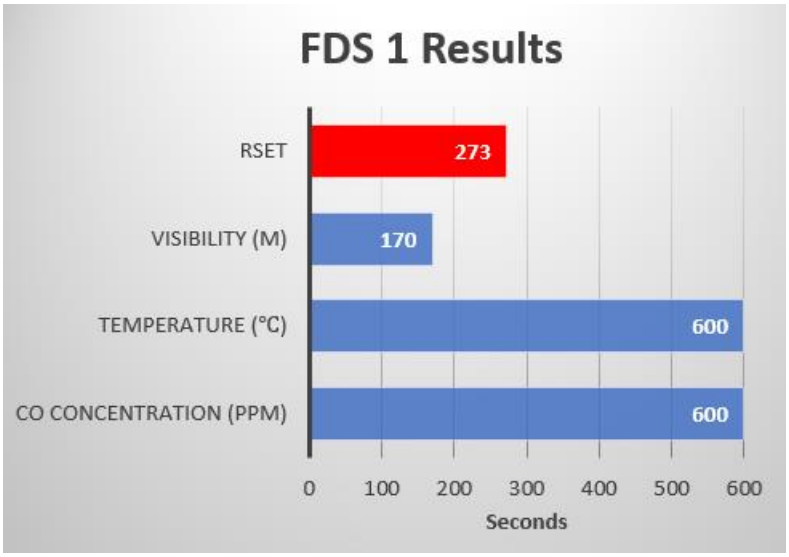


Table 22 Visibility Lost on Other Floors

FDS 1	
Floor	Visibility (seconds)
2	N/A
3	170
4	205
5	230
6	250

Design Fire 2 Results

The fire was detected in 62 seconds by the beam detector within the atrium. There is no sprinkler activated in this scenario and the fire does not become sprinkler controlled at any point within the simulation. Throughout the duration of the fire, the temperature within the space does not exceed 33°C which is well below the tenable requirement which can be seen in Figure 38. The visibility of 10 meters is lost on the 6th floor in 170 seconds and can be seen in Figure 37. The visibility is below the RSET value which is a failure and alternative means should be found to maintain visibility within the space. The highest concentration within that space of carbon monoxide is 28 ppm which is well below the tenable criteria set earlier which can be seen in Figure 39. Table 23 below shows a summary of the results from this simulation. Table 24 indicates when visibility is lost on other floors, all other tenable requirements are maintained for the full 600 seconds (10 minutes).

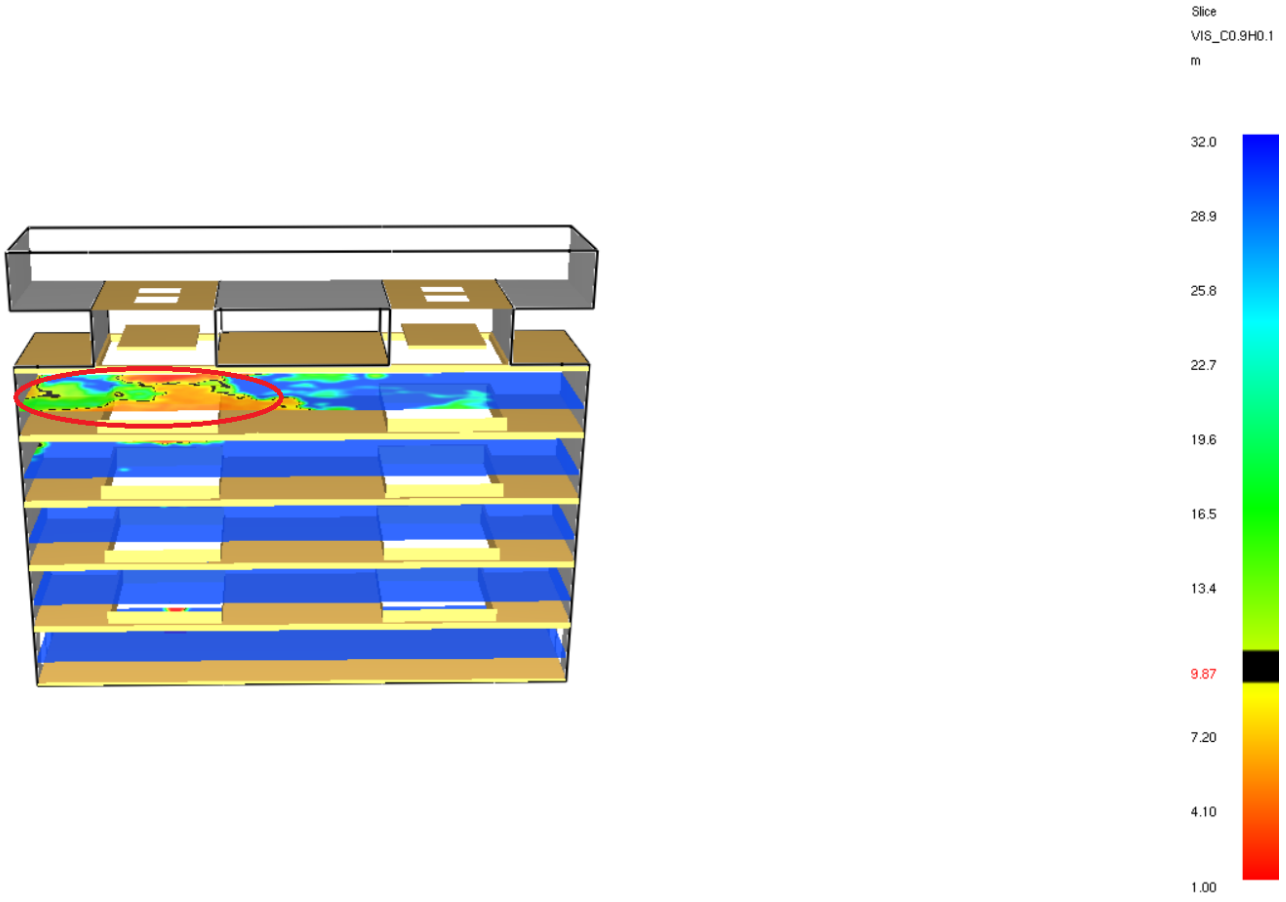


Figure 37 Visibility Below 10 meters 6th Floor (170 seconds)

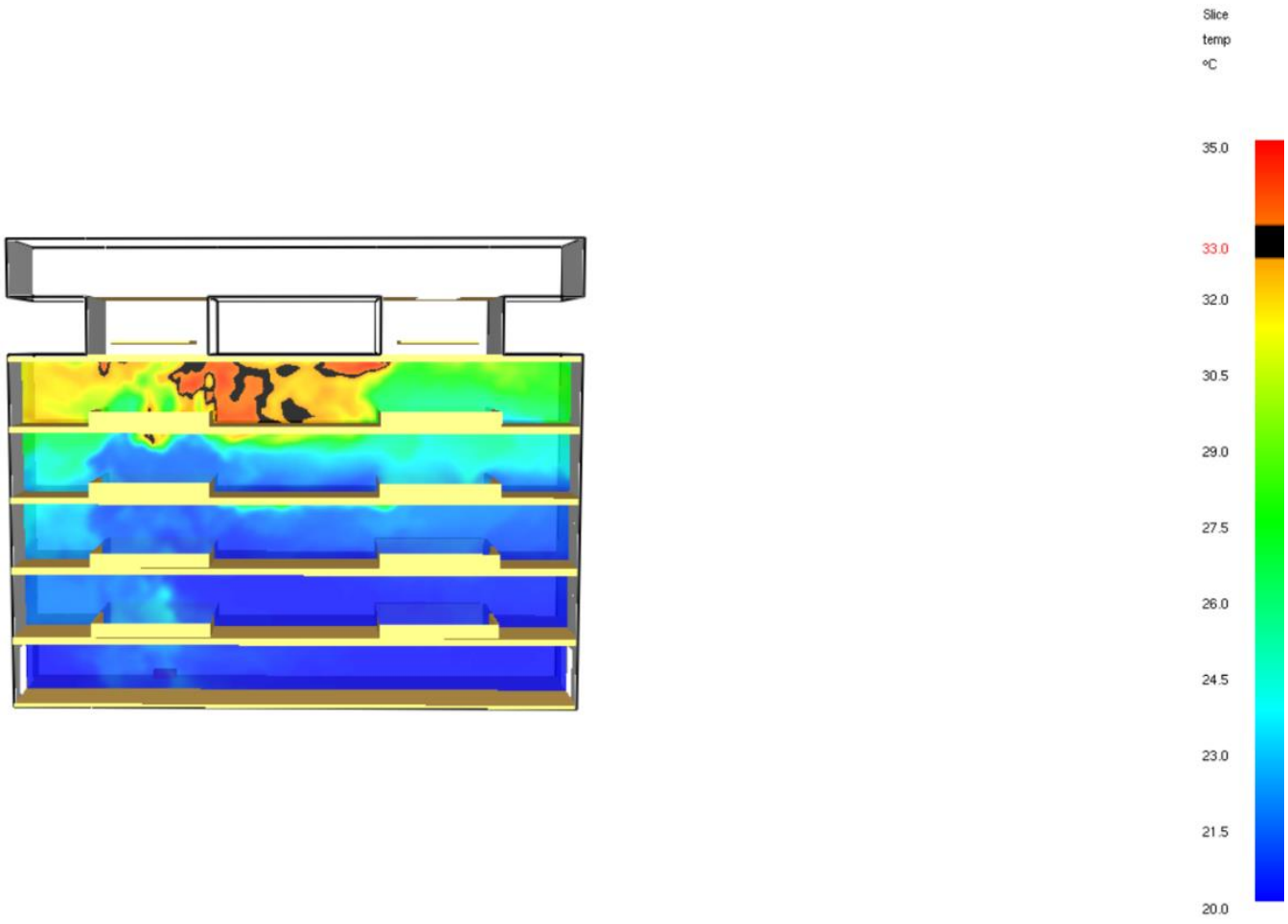


Figure 38 Temperature in Atrium (600 seconds)

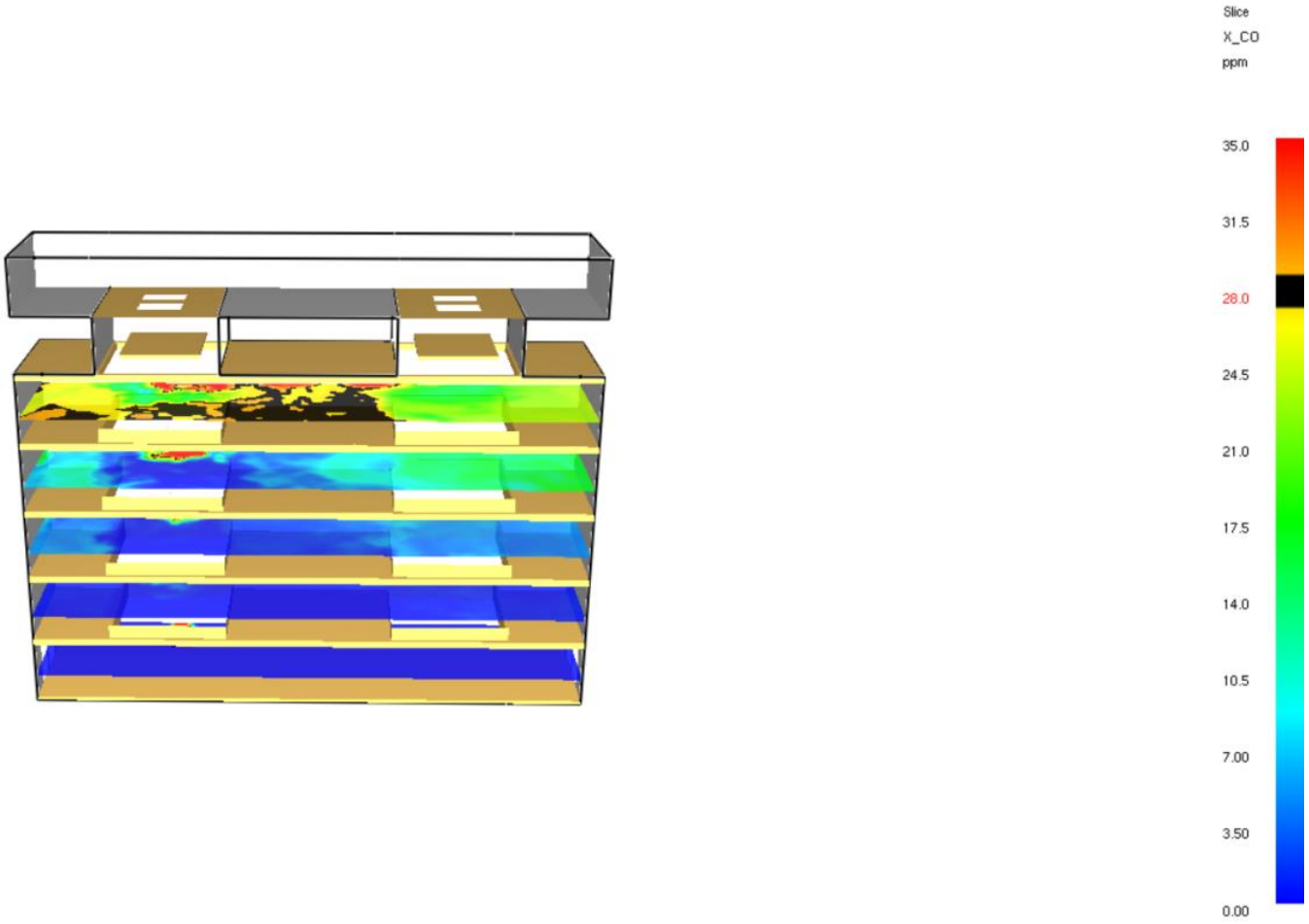


Figure 39 CO Concentrations (600 seconds)

Table 23 Results RSET vs. ASET Fire 2

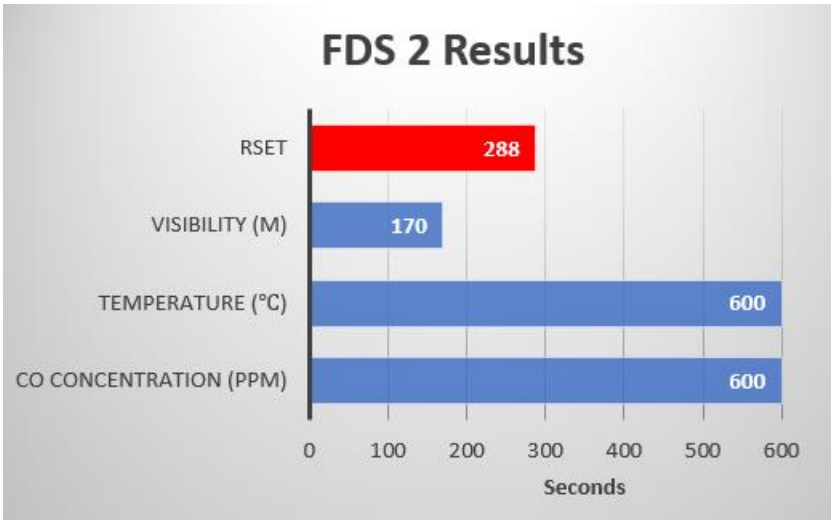


Table 24 Visibility Lost on Other Floors

FDS 2	
Floor	**Visibility (seconds)**
2	N/A
3	N/A
4	430
5	330
6	170

Conclusion

After analysis of Warren J. Baker Center for Science and Mathematics both prescriptive and performance based requirements are met. The prescriptive requirements for structural fire protection were met under the IBC and UL listings. The egress from the building met all requirements stated in the LSC. The fire suppression system met the requirements under NFPA 13 and the water supply and demand are adequate for this building with the use of the electric fire pump. The fire alarm and detection system meets the requirements of NFPA 72. All initiating and notification devices are spaced accordingly and meet the candela/sounding requirements. The visibility performance criteria that was discussed earlier due to smoke within the atrium was not met. All other criteria were met such as the temperature never exceeded the 60°C limit and the CO concentrations within the space did not reach the 1000 ppm.

Recommendations

The first recommendation is the use of a Mechanical Smoke Management System opposed to the Naturally Ventilated Smoke Management System. The reason behind this is due to the loss of visibility in both fire scenarios. In the first fire scenario where an upholstered chair is burning the visibility on the 3rd floor is lost after 170 seconds indicated in Figure 40. Also, in the second fire scenario where there is not suppression of the fire, the visibility on the 6th floor is lost in 170 seconds indicated in Figure 41. With the use of a mechanical ventilation system it may be possible to have better smoke movement and exhaust so that visibility within the atrium will be maintained for a longer period.

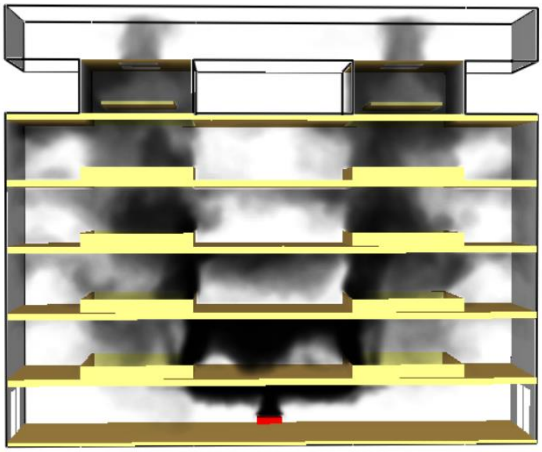


Figure 40 3rd Floor Loss of Visibility

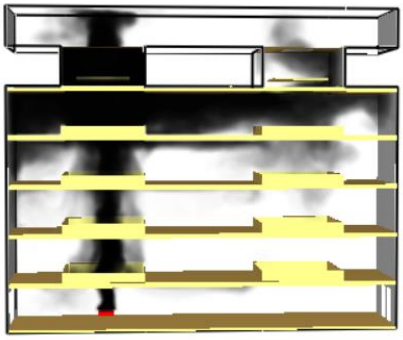


Figure 41 6th Floor Loss of Visibility

The second recommendation is the use of a phased evacuation plan for this building. It has not been determined if there is one in place by the owners of the building. The building is equipped with a voice communication system which can be utilized in coordinating and directing which occupants should evacuate and who should stay in place. The evaluation for the egress time from each wing was determined using Pathfinder. The occupants in this model used the default setting within Pathfinder. All occupants traveled at 3.9 ft./s, going to any exit or closest exit, and occupants can que within the simulation. This simulation did not consider that there may be some occupants that move slower or that may need assistance exiting the building. Occupants were assumed to be awake, alert, and oriented because of the use of the building. The results for evacuation time from each section of the building is shown below. Figure 42 shows how the building is compartmentalized by 2-hour fire rated horizontal exits. The blue indicates the west wing, the green indicates the 5-story atrium, and the red indicates the east wing of the building. Figure 43 is a screen shot of the east wing Pathfinder model where occupants can use the fire escapes, stairways, and horizontal exits. The total evacuation time for this section is 2 minutes and 40 seconds. Figure 44 represents the 5-story atrium where occupants can use the stairways and horizontal exits. The total evacuation of the atrium was determined to be 40 seconds. Lastly, Figure 45 represents the west wing of the building and all occupants can exit through doors, stairways, and horizontal exits within the simulation. The total evacuation of the west wing was determined to be 2 minutes and 50 seconds. In the event of a fire a phased evacuation plan for this building would be beneficial because trained personal could evacuate occupants intimate with the fire immediately before fire effects are significant. The compartmentalization of the building would allow the trained personal keep occupants in place that will not be affected by the fire and guide them to exit the building when the time is appropriate.

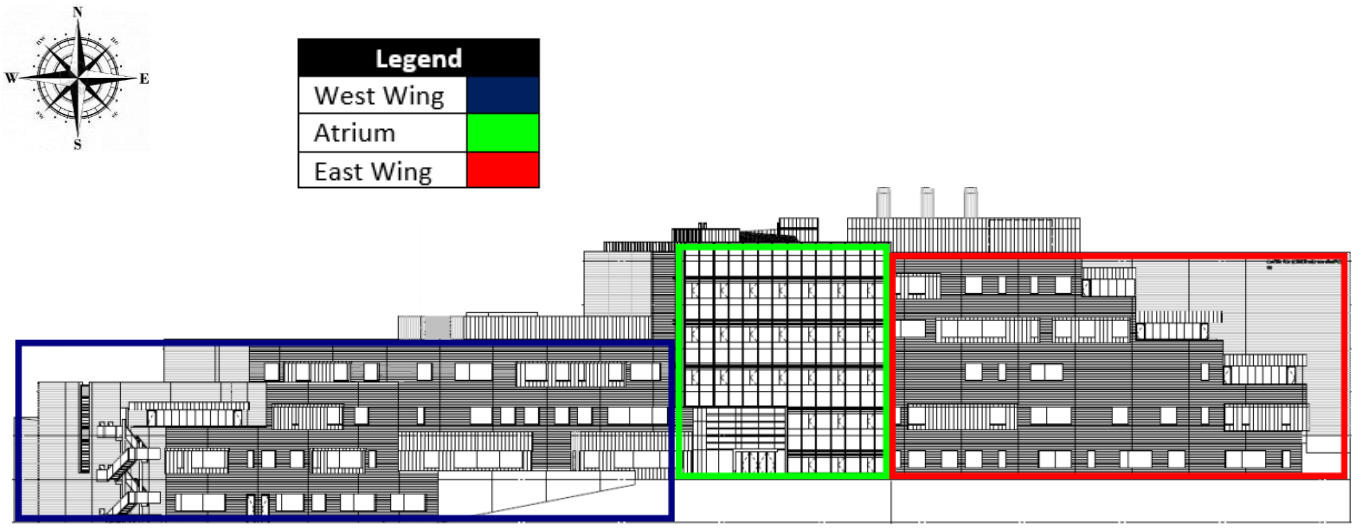


Figure 42 Phased Evacuation

Results:

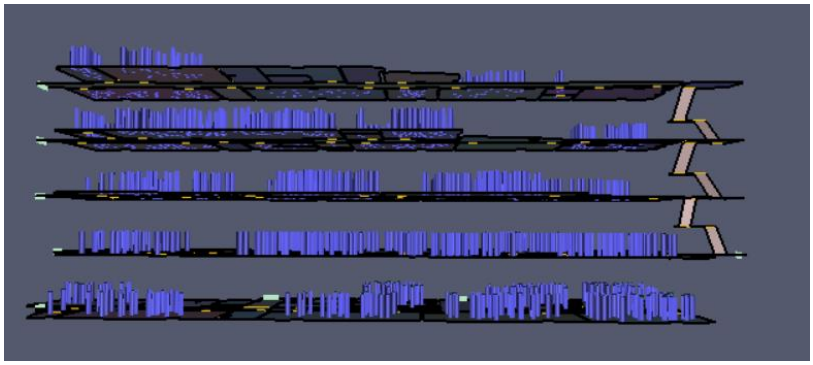


Figure 43 East wing: 2min 40sec

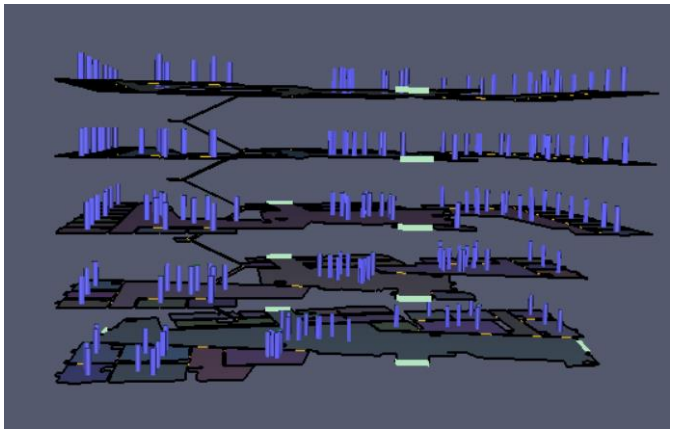


Figure 44 Atrium 40sec

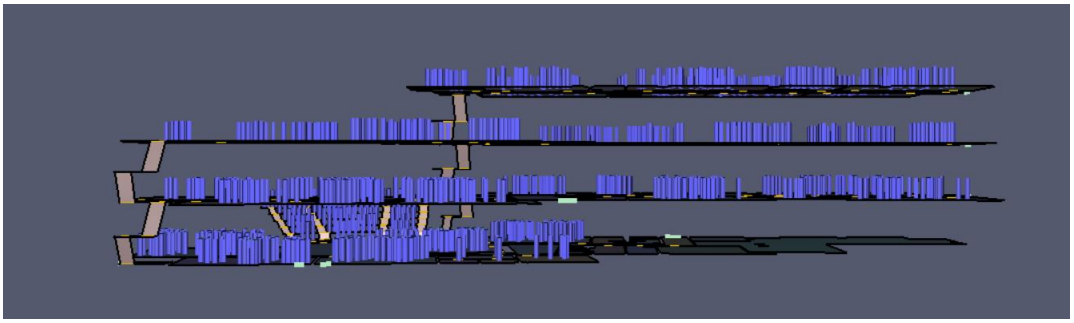


Figure 45 West wing: 2min 50sec

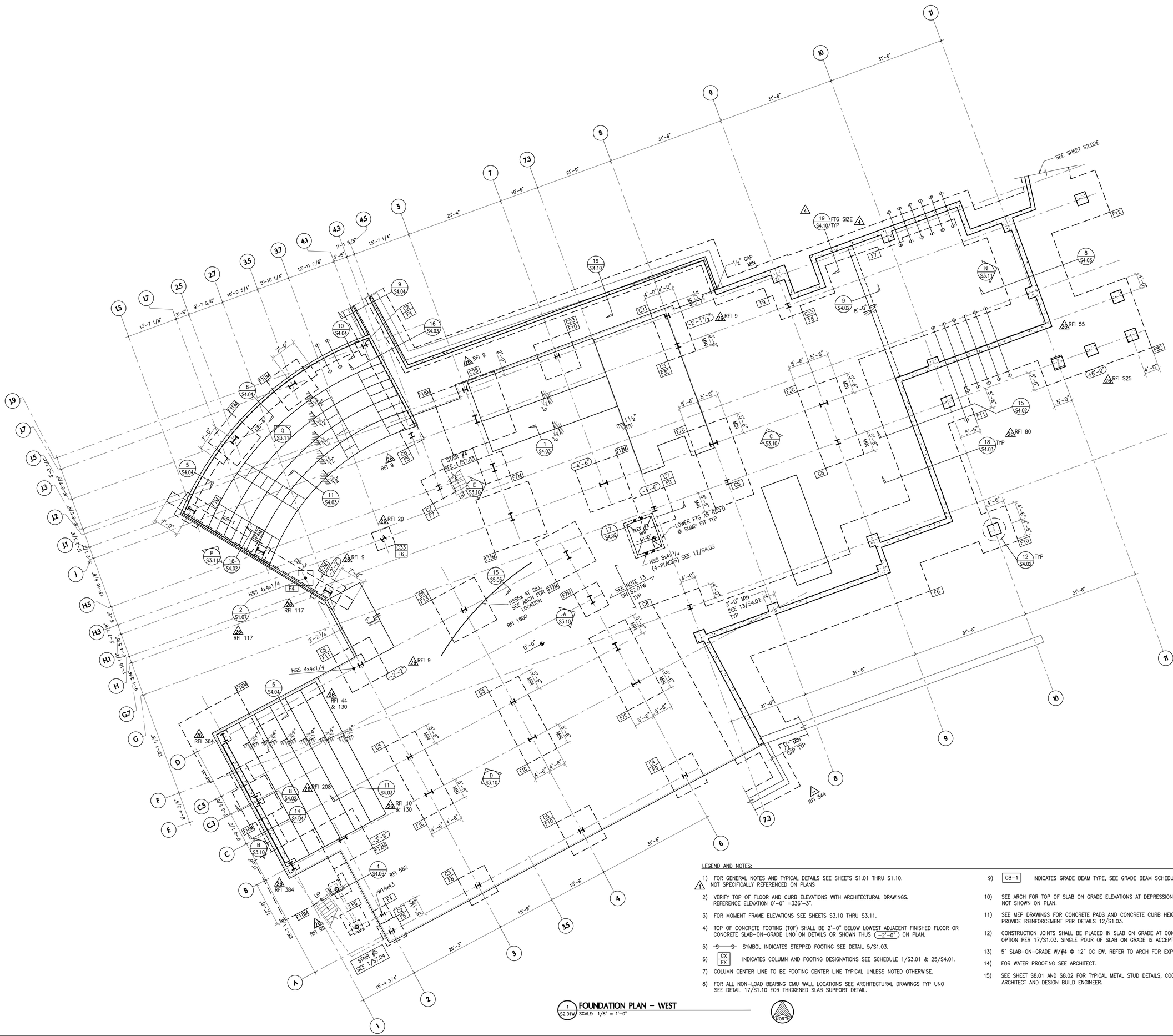
References

SWRI Research
http://www.swri.org/3pubs/ttoday/spring12/pdfs/BurningFurniture.pdf

Thomas Fabian Research
http://www.ul.com/global/documents/offerings/industries/buildingmaterials/fireservice/furniture/Upholstered%20Furniture%20Flammability%20report.pdf

APPENDIX A

Structural Drawings



LEGEND AND NOTES:

1) FOR GENERAL NOTES AND TYPICAL DETAILS SEE SHEETS S1.01 THRU S1.10.
⚠1 NOT SPECIFICALLY REFERENCED ON PLANS

2) VERIFY TOP OF FLOOR AND CURB ELEVATIONS WITH ARCHITECTURAL DRAWINGS. REFERENCE ELEVATION 0'-0" =336'-3".

3) FOR MOMENT FRAME ELEVATIONS SEE SHEETS S3.10 THRU S3.11.

4) TOP OF CONCRETE FOOTING (TOF) SHALL BE 2'-0" BELOW LOWEST ADJACENT FINISHED FLOOR OR CONCRETE SLAB-ON-GRADE UNO ON DETAILS OR SHOWN THUS (-2'-0") ON PLAN.

5) ~~S S~~ SYMBOL INDICATES STEPPED FOOTING SEE DETAIL 5/S1.03.

6) CX / FX INDICATES COLUMN AND FOOTING DESIGNATIONS SEE SCHEDULE 1/S3.01 & 25/S4.01.

7) COLUMN CENTER LINE TO BE FOOTING CENTER LINE TYPICAL UNLESS NOTED OTHERWISE.

8) FOR ALL NON-LOAD BEARING CMU WALL LOCATIONS SEE ARCHITECTURAL DRAWINGS TYP UNO SEE DETAIL 17/S1.10 FOR THICKENED SLAB SUPPORT DETAIL.

9) GB-1 INDICATES GRADE BEAM TYPE, SEE GRADE BEAM SCHEDULE 27/S4.01.

10) SEE ARCH FOR TOP OF SLAB ON GRADE ELEVATIONS AT DEPRESSIONS, PITS SLOPE, ETC NOT SHOWN ON PLAN.

11) SEE MEP DRAWINGS FOR CONCRETE PADS AND CONCRETE CURB HEIGHTS AND LOCATIONS. PROVIDE REINFORCEMENT PER DETAILS 12/S1.03.

12) CONSTRUCTION JOINTS SHALL BE PLACED IN SLAB ON GRADE AT CONTRACTOR'S OPTION PER 17/S1.03. SINGLE POUR OF SLAB ON GRADE IS ACCEPTABLE.

13) 5" SLAB-ON-GRADE W/#4 @ 12" OC EW. REFER TO ARCH FOR EXPOSED SLAB ON GRADE.

14) FOR WATER PROOFING SEE ARCHITECT.

15) SEE SHEET S8.01 AND S8.02 FOR TYPICAL METAL STUD DETAILS, COORDINATE WITH ARCHITECT AND DESIGN BUILD ENGINEER.

1 S2.01W **FOUNDATION PLAN - WEST**
SCALE: 1/8" = 1'-0"

NORTH

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28	ASI #12	04/29/11

RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title
FIRST LEVEL FOUNDATION PLAN - WEST

Date: OCTOBER 23, 2009
Job No: 1.40302.05
Drawn By:
Checked By:

Drawing No.
S2.01W

File: G:\Job11000\J1117 Cal Poly\Drafting\Structural\S2-01W_J1117.dwg
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MATCHLINE
SEE SHEET S2.01W
FOR CONTINUATION

RFI 30
RFI 28
RFI 29
RFI 80
RFI 83
RFI 14
RFI 352
RFI 386
RFI 138
RFI 137
RFI 75
RFI 209
RFI 260

LIGHT POLE AND SUPPORT SEE 16 S4.04

STAIR #2 SEE 1/S7.02

STAIR #3 SEE 5/S7.01

W14x43 COL

ELEV GUIDRAIL SUPPORT HSS 8x4x1/4 TYP

ELEV #1 PIT

ELEV #2 PIT

HSS 8x4x1/2

LOWER FTG AS REQ'D @ SUMP PIT

3'-0"ø CONC ENCASED UP TO 6" BELOW BOTTOM OF BEAM

15 S4.03 TYP @ SCREEN WALL

16 S1.06 TYP LINE 'R' UNO

SEE NOTE 13 ON S2.01W

PROVIDE CONC PEDESTAL TYP 2 PLACES

PIPE EL=-1'-4" BEL FF, COORD w/PLUMB DWGS

SEE NOTE 19 ON S2.02W

1 S2.02E SECOND LEVEL FRAMING PLAN – EAST
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.01W.

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RECORD DRAWINGS

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SAN LUIS OBISPO, CA

Drawing Title
SECOND LEVEL FRAMING PLAN – EAST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.
S2.02E

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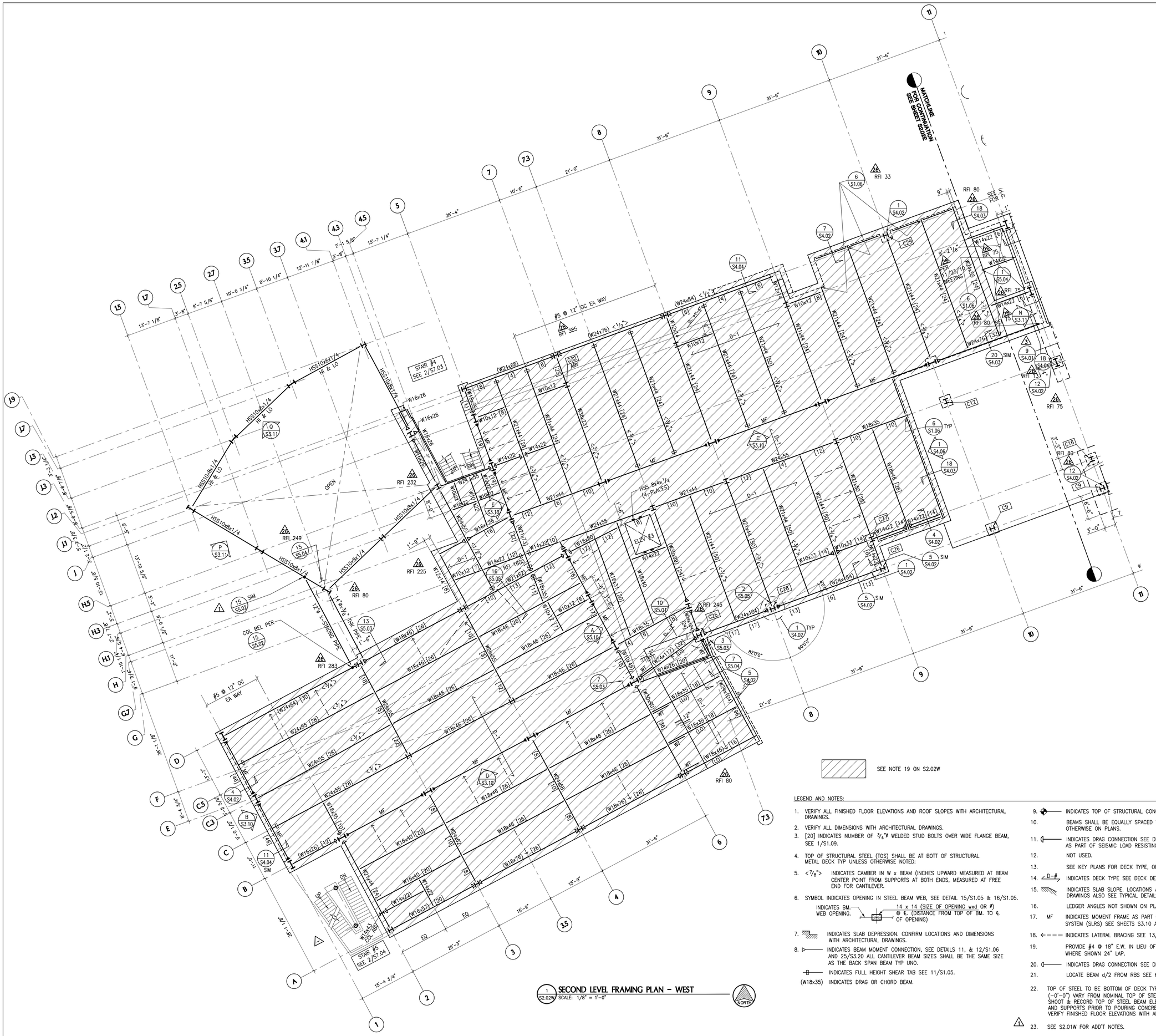

1 S2.02W **SECOND LEVEL FRAMING PLAN – WEST**
SCALE: 1/8" = 1'-0"

LEGEND AND NOTES:

1. VERIFY ALL FINISHED FLOOR ELEVATIONS AND ROOF SLOPES WITH ARCHITECTURAL DRAWINGS.
2. VERIFY ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS.
3. [20] INDICATES NUMBER OF 3/4"ø WELDED STUD BOLTS OVER WIDE FLANGE BEAM, SEE 1/S1.09.
4. TOP OF STRUCTURAL STEEL (TOS) SHALL BE AT BOTT OF STRUCTURAL METAL DECK TYP UNLESS OTHERWISE NOTED:
5. <3/8"> INDICATES CAMBER IN W x BEAM (INCHES UPWARD MEASURED AT BEAM CENTER POINT FROM SUPPORTS AT BOTH ENDS, MEASURED AT FREE END FOR CANTILEVER.
6. SYMBOL INDICATES OPENING IN STEEL BEAM WEB, SEE DETAIL 15/S1.05 & 16/S1.05.
   INDICATES BM. WEB OPENING. 14 x 14 (SIZE OF OPENING wxd OR ø) @ ℄. (DISTANCE FROM TOP OF BM. TO ℄. OF OPENING)
7. INDICATES SLAB DEPRESSION. CONFIRM LOCATIONS AND DIMENSIONS WITH ARCHITECTURAL DRAWINGS.
8. INDICATES BEAM MOMENT CONNECTION, SEE DETAILS 11, & 12/S1.06 AND 25/S3.20 ALL CANTILEVER BEAM SIZES SHALL BE THE SAME SIZE AS THE BACK SPAN BEAM TYP UNO.
   INDICATES FULL HEIGHT SHEAR TAB SEE 11/S1.05.
   (W18x35) INDICATES DRAG OR CHORD BEAM.
9. INDICATES TOP OF STRUCTURAL CONCRETE SLAB (TOC) ELEVATION.
10. BEAMS SHALL BE EQUALLY SPACED WITHIN BAY UNLESS SHOWN OTHERWISE ON PLANS.
11. INDICATES DRAG CONNECTION SEE DETAILS 3, 11, & 12/S1.06. AS PART OF SEISMIC LOAD RESISTING SYSTEM (SLRS).
12. NOT USED.
13. SEE KEY PLANS FOR DECK TYPE, ORIENTATION AND EXTENTS.
14. <D–#> INDICATES DECK TYPE SEE DECK DETAILS & SCHEDULE 6/S1.08.
15. INDICATES SLAB SLOPE. LOCATIONS & SLOPE SEE ARCHITECTURAL DRAWINGS ALSO SEE TYPICAL DETAILS.
16. LEDGER ANGLES NOT SHOWN ON PLAN FOR CLARITY SEE 16/S1.08.
17. MF INDICATES MOMENT FRAME AS PART OF THE SEISMIC LOAD RESISTING SYSTEM (SLRS) SEE SHEETS S3.10 AND S3.11.
18. INDICATES LATERAL BRACING SEE 13/S1.07 AND 6/S3.20.
19. PROVIDE #4 @ 18" E.W. IN LIEU OF SCHEDULED DECK REINF. WHERE SHOWN 24" LAP.
20. INDICATES DRAG CONNECTION SEE DETAIL 3/S1.06.
21. LOCATE BEAM d/2 FROM RBS SEE 6/S3.20, TYP.
22. TOP OF STEEL TO BE BOTTOM OF DECK TYP UNO. BEAMS NOTED THUS (–0"–0") VARY FROM NOMINAL TOP OF STEEL BEAM ELEVATION. SHOOT & RECORD TOP OF STEEL BEAM ELEVATION AT MID SPAN AND SUPPORTS PRIOR TO POURING CONCRETE TOPPING. VERIFY FINISHED FLOOR ELEVATIONS WITH ARCHITECTURAL DRAWINGS.
23. SEE S2.01W FOR ADD'T NOTES.

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RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title
SECOND LEVEL FRAMING PLAN – WEST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.
S2.02W

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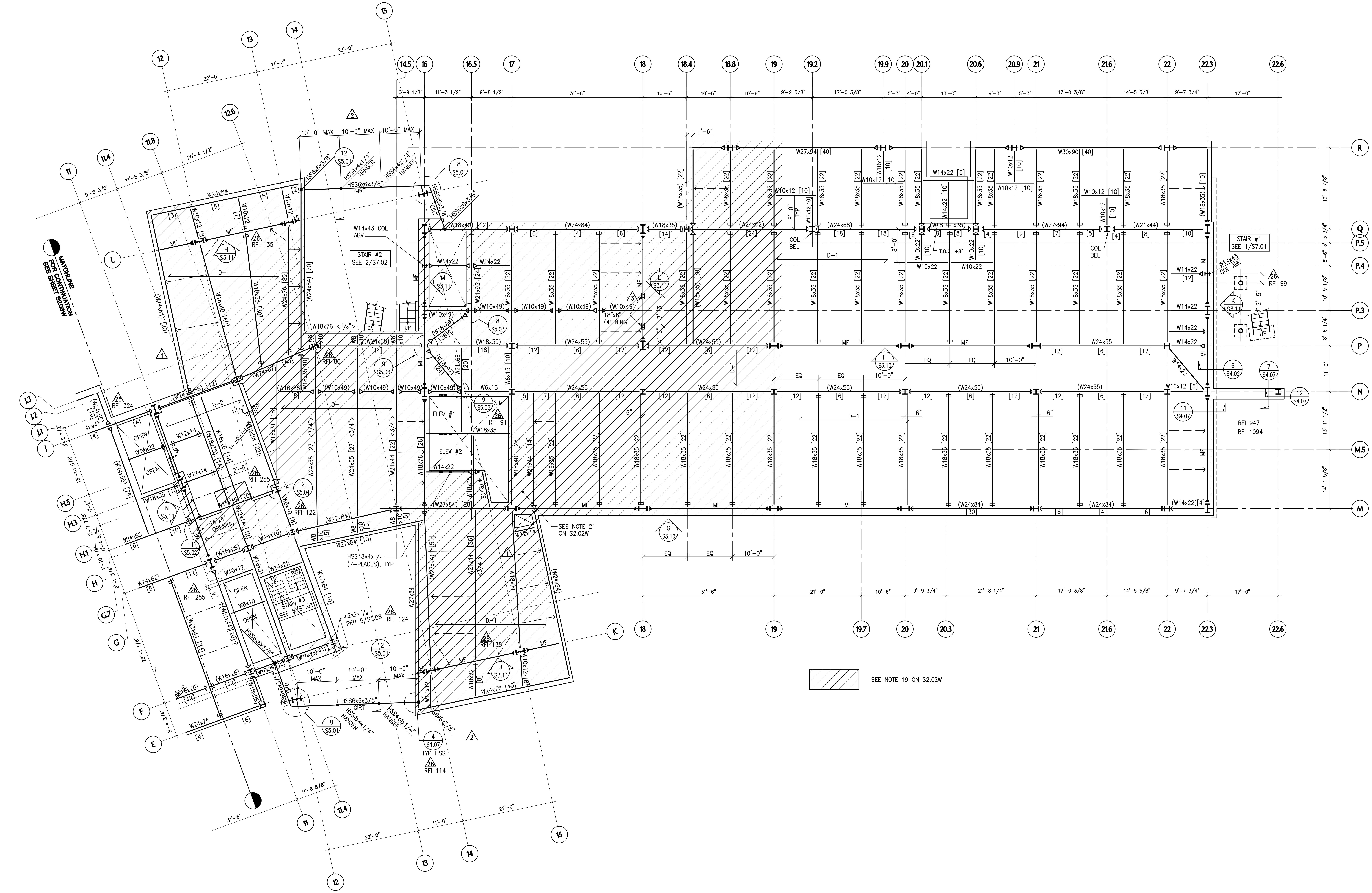

THIRD LEVEL FRAMING PLAN - EAST

1/S2.03E SCALE: 1/8" = 1'-0"

NORTH

NOTE:

1. SEE NOTES ON SHEET S2.02W.

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Drawing Title

THIRD LEVEL
FRAMING PLAN - EAST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.

S2.03E

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1 S2.03W THIRD LEVEL FRAMING PLAN – WEST
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.02W.

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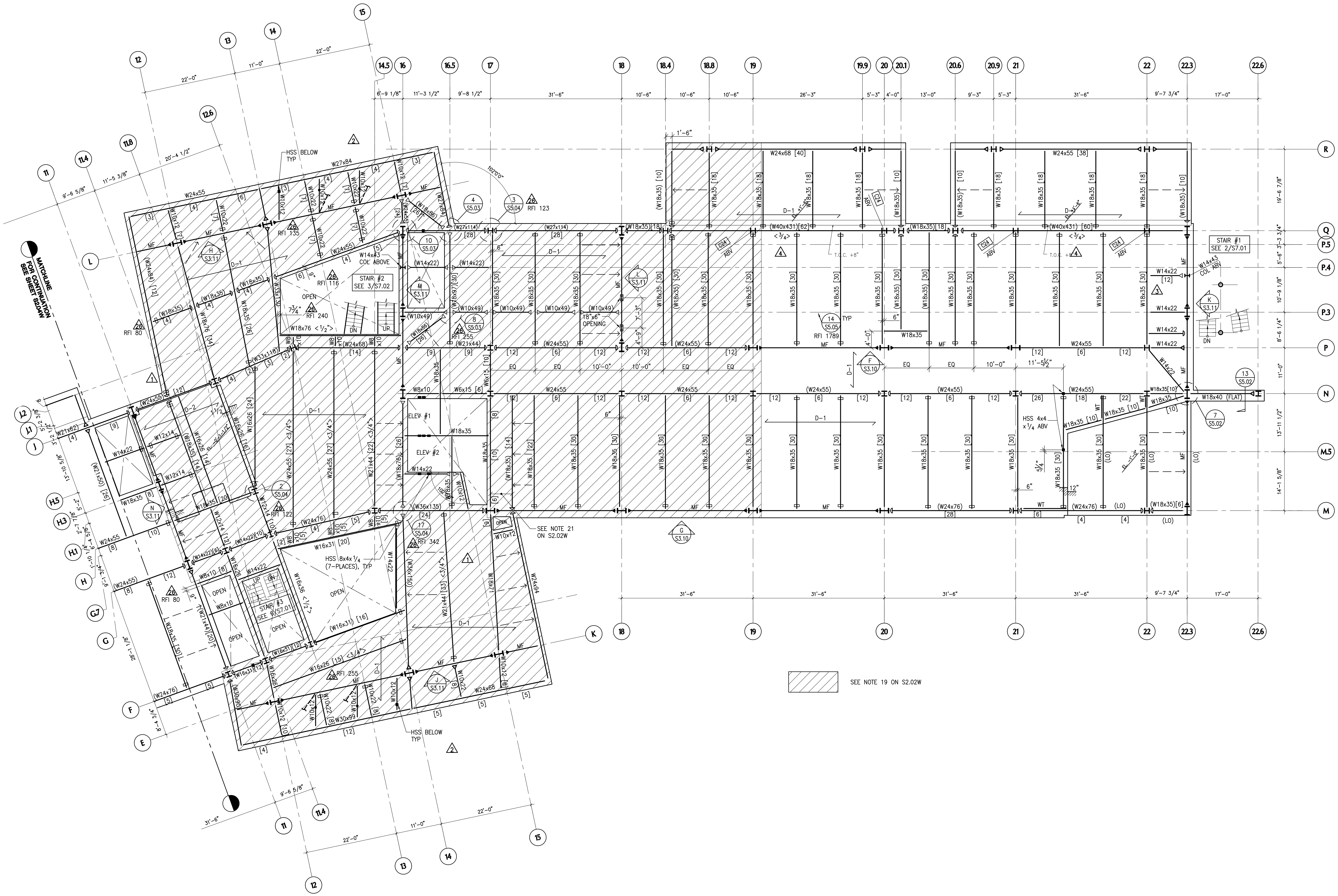
Drawing Title
THIRD LEVEL FRAMING PLAN – WEST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.
S2.03W



SEE NOTE 19 ON S2.02W

1/S2.04E FOURTH LEVEL FRAMING PLAN - EAST

SCALE: 1/8" = 1'-0"

NORTH

NOTE:

1. SEE NOTES ON SHEET S2.02W.

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4 ADDENDUM NO.3	06/30/10
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FOURTH LEVEL FRAMING PLAN - EAST

Date:	OCTOBER 23, 2009
Job No:	L40302.05
Drawn By:	
Checked By:	

Drawing No.

S2.04E

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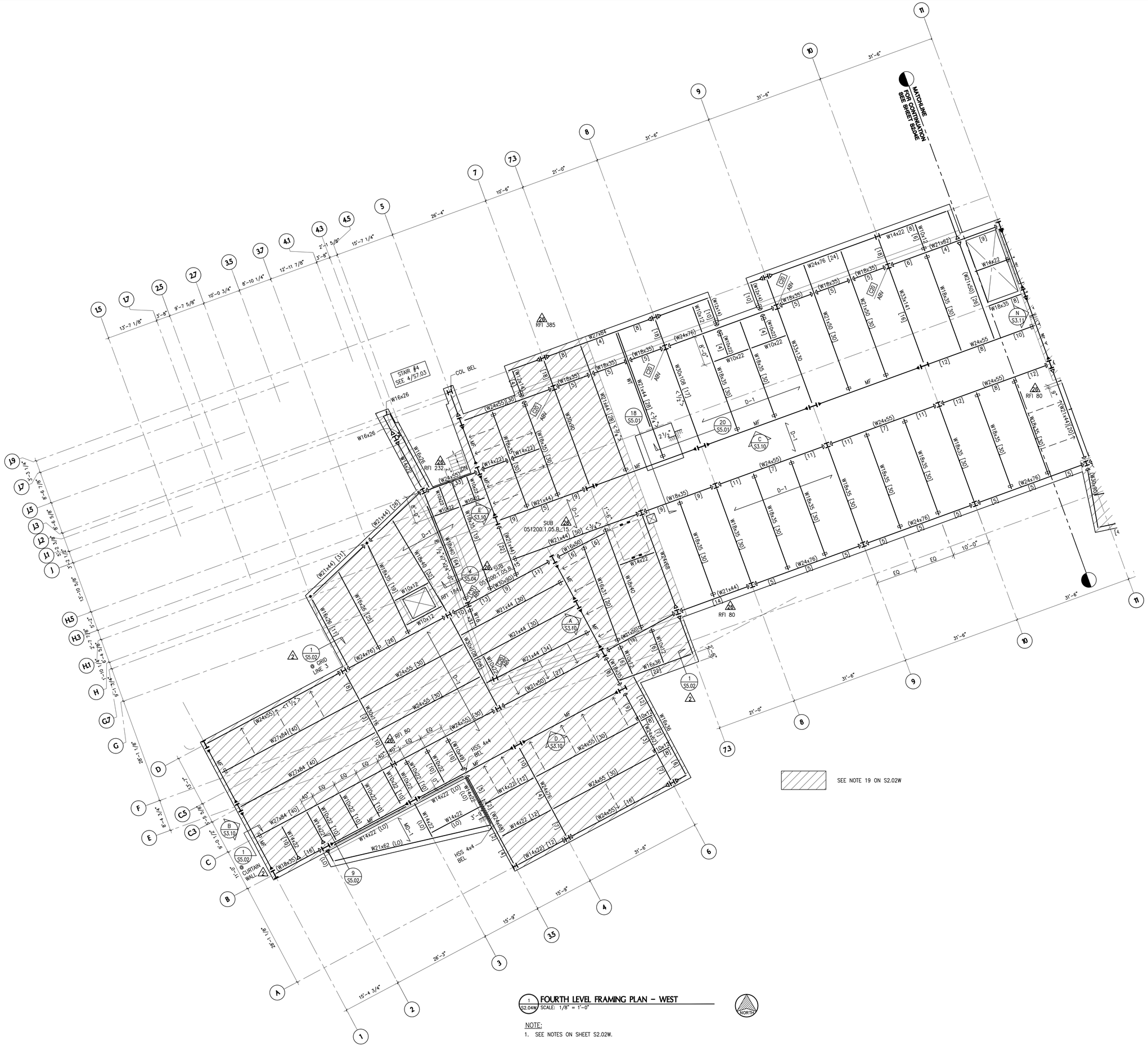

1 S2.04W FOURTH LEVEL FRAMING PLAN – WEST
SCALE: 1/8" = 1'-0"

NOTE:

1. SEE NOTES ON SHEET S2.02W.

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RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

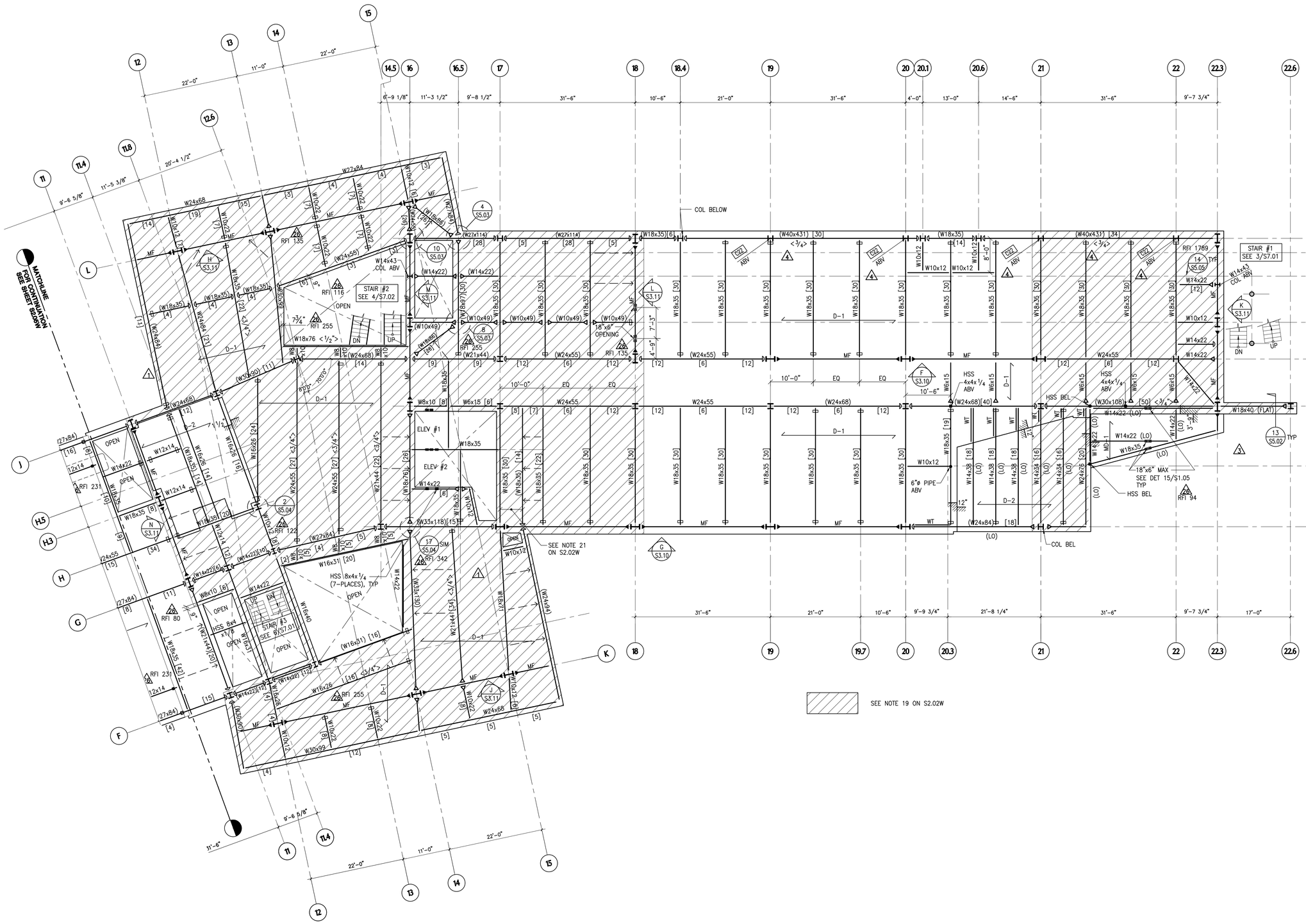
Drawing Title

FOURTH LEVEL FRAMING PLAN – WEST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.

S2.04W



1 S2.05E FIFTH LEVEL FRAMING PLAN – EAST
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.02W.

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San Diego, CA 92103-3107

LIGHTING DESIGN
David Nelson & Associates, LLC
P.O. Box 270254
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Reviewed by: Fire & Life Safety South
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DATE SEP 03 2009

Revisions

BID DOCUMENTS		10/23/09
1	PRE BID	01/10/10
2	ADDENDUM NO.2	06/23/10
4	ADDENDUM NO.3	06/30/10
26	ASI #12	04/29/11

RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

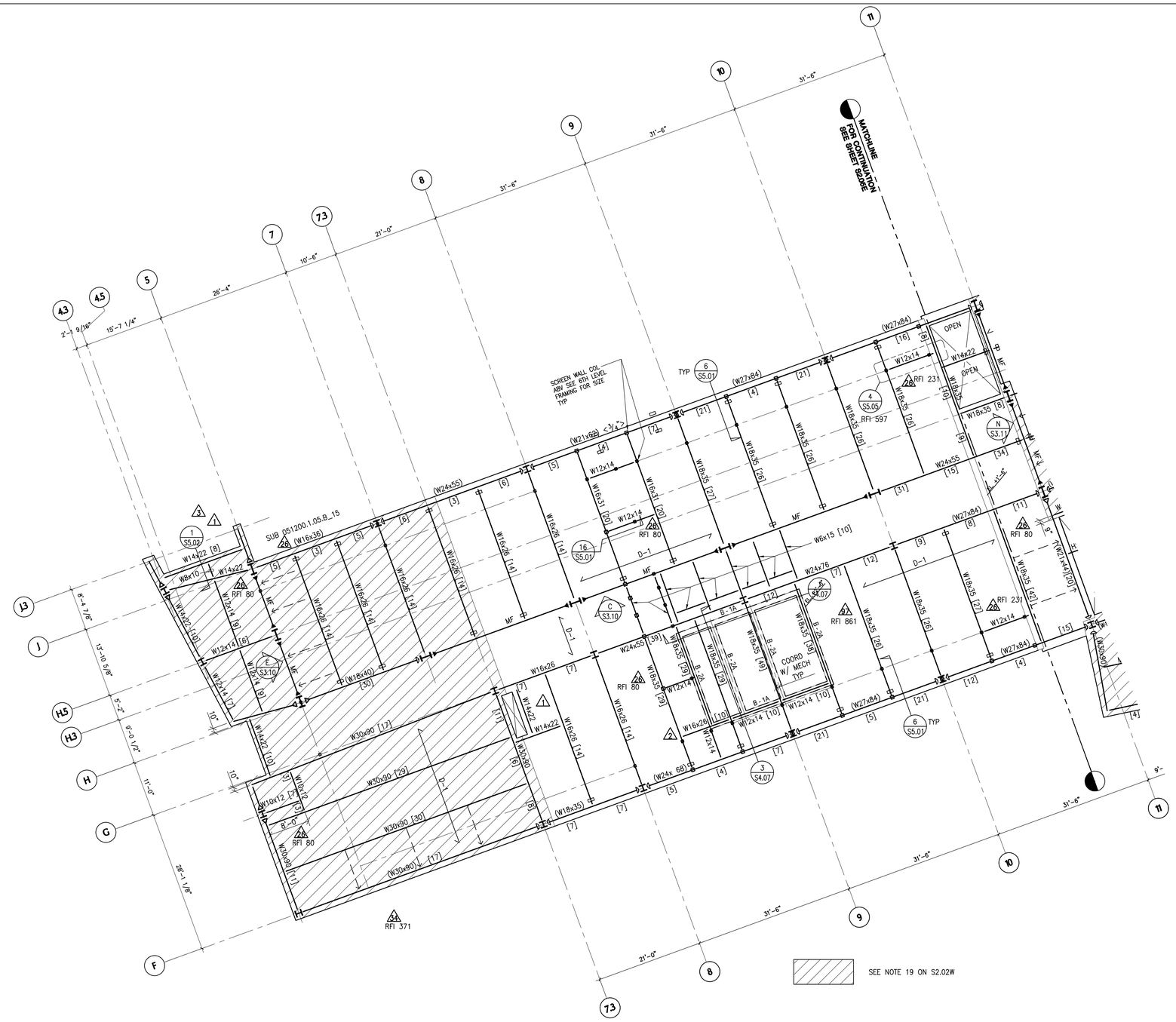
Drawing Title

FIFTH LEVEL FRAMING PLAN – EAST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.

S2.05E



1 S2.05W FIFTH LEVEL FRAMING PLAN - WEST
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.02W.

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3	ADDENDUM NO.2	06/23/10
28	ASI #12	04/29/11

RECORD DRAWINGS

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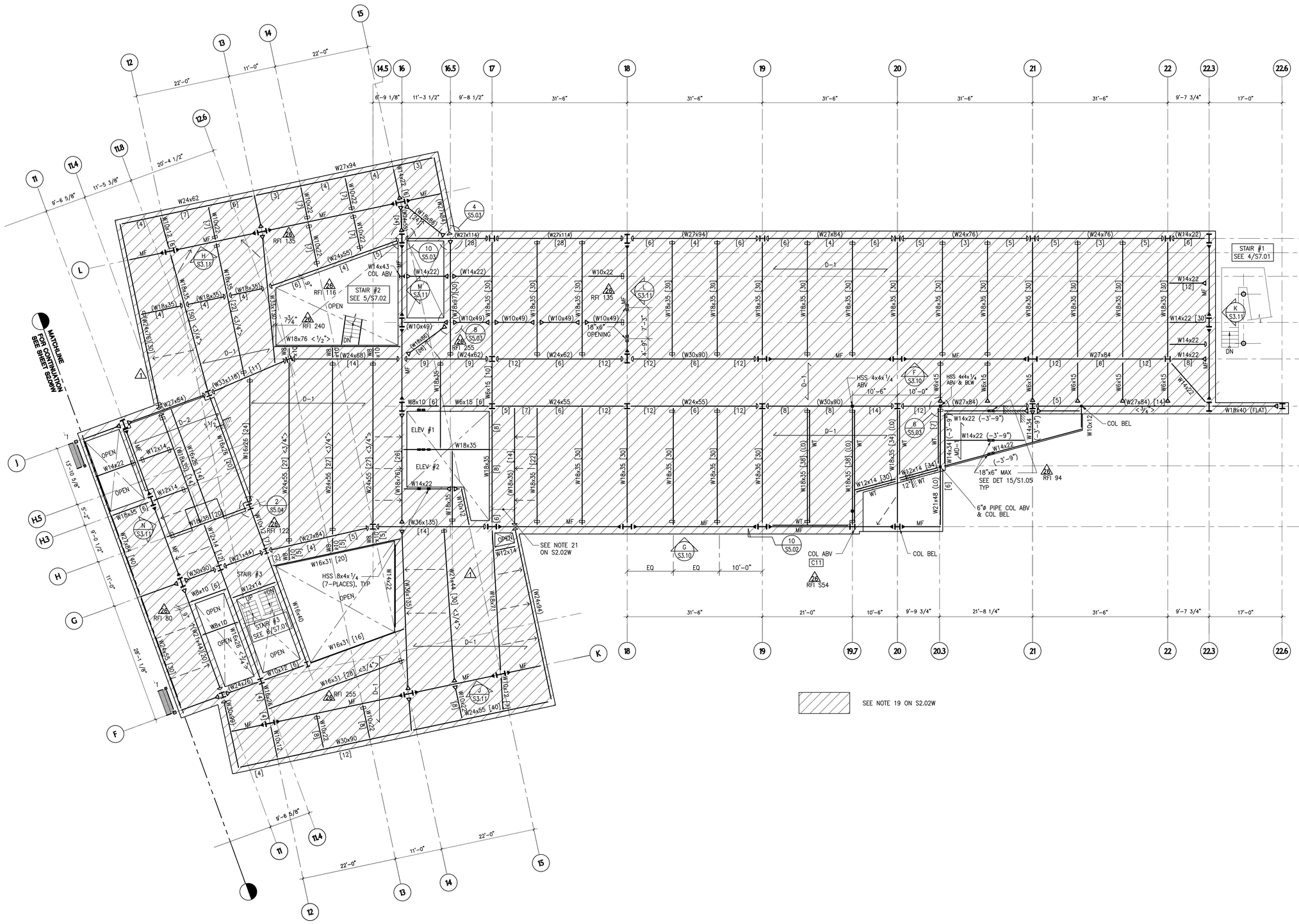
SAN LUIS OBISPO, CA

Drawing Title
FIFTH LEVEL
FRAMING PLAN - WEST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.
S2.05W



1 S2.06E SIXTH LEVEL FRAMING PLAN – EAST
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.02W.

File: G:\Job11000\u11717.Cal Poly\Drafting\Structural\S2-06E_11717.dwg
Plotted: 10/23/2009 2:35:38 PM By: (MP) Jeff Hall
XREFs: u11717_S2-06E_Plan.dwg g-6.dwg S_gr-8.dwg fp-6.dwg XS-AS 12 ANNO.dwg

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1	PRE BID	01/10/10
2	ASI #12	04/29/11

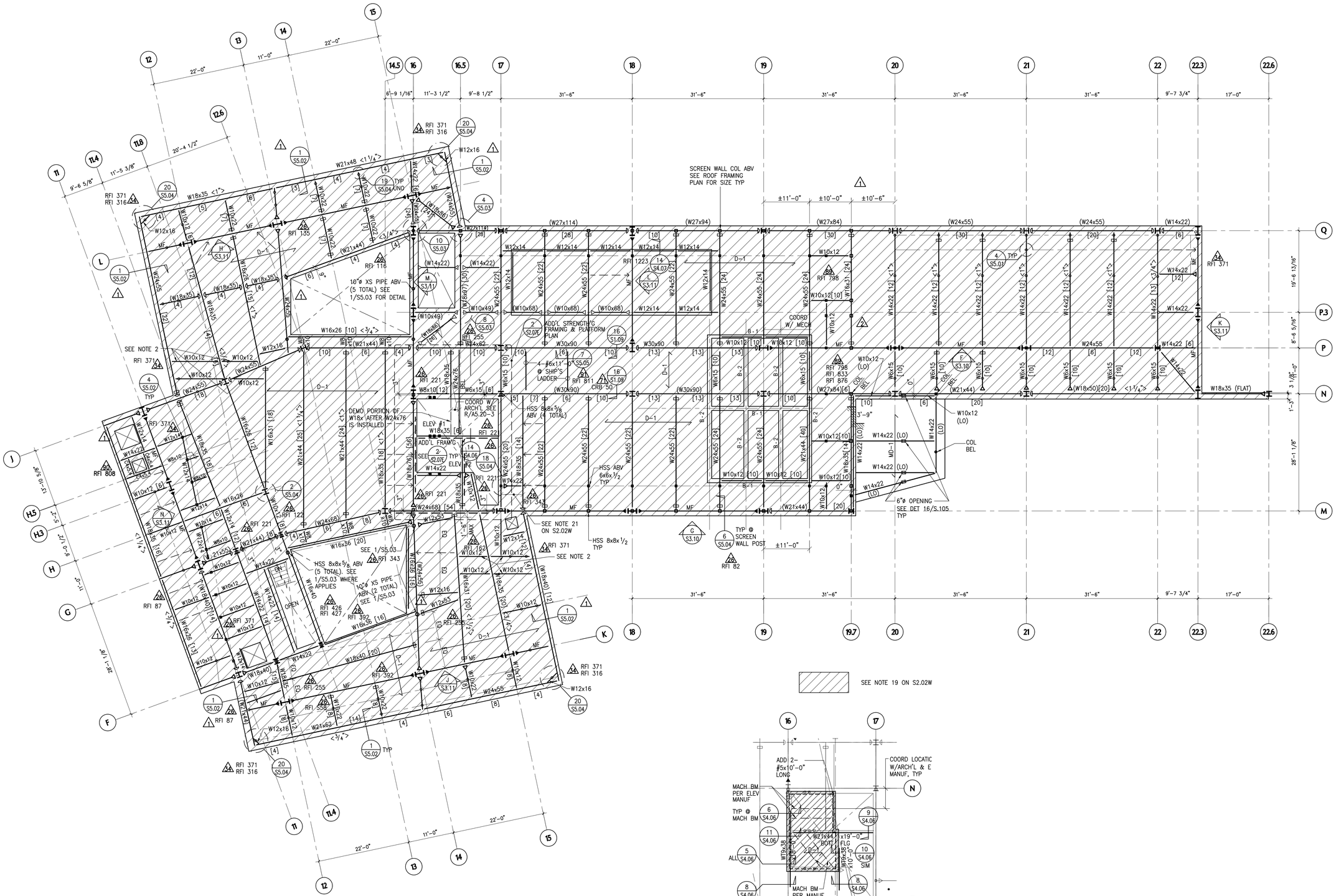
RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title
SIXTH LEVEL FRAMING PLAN – EAST

Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.
S2.06E



1 S2.07E **ROOF LEVEL FRAMING PLAN – EAST**
SCALE: 1/8" = 1'-0"

NOTE:
1. SEE NOTES ON SHEET S2.02W.
2. COORDINATE LOCATION WITH LADDER SUPPORTS.

CRB 7.1 — 2 S2.07E **ELEVATOR PLATFORM & ADD'L FRAMING PLAN**
SCALE: 1/8" = 1'-0"

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	BID DOCUMENTS	10/23/09
1	PRE BID	01/10/10
2	ADDENDUM NO.1	06/10/10
4A	RESPOND RFI 371	03/30/11
2B	ASI #12	04/29/11

RECORD DRAWINGS

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title

ROOF LEVEL FRAMING PLAN – EAST

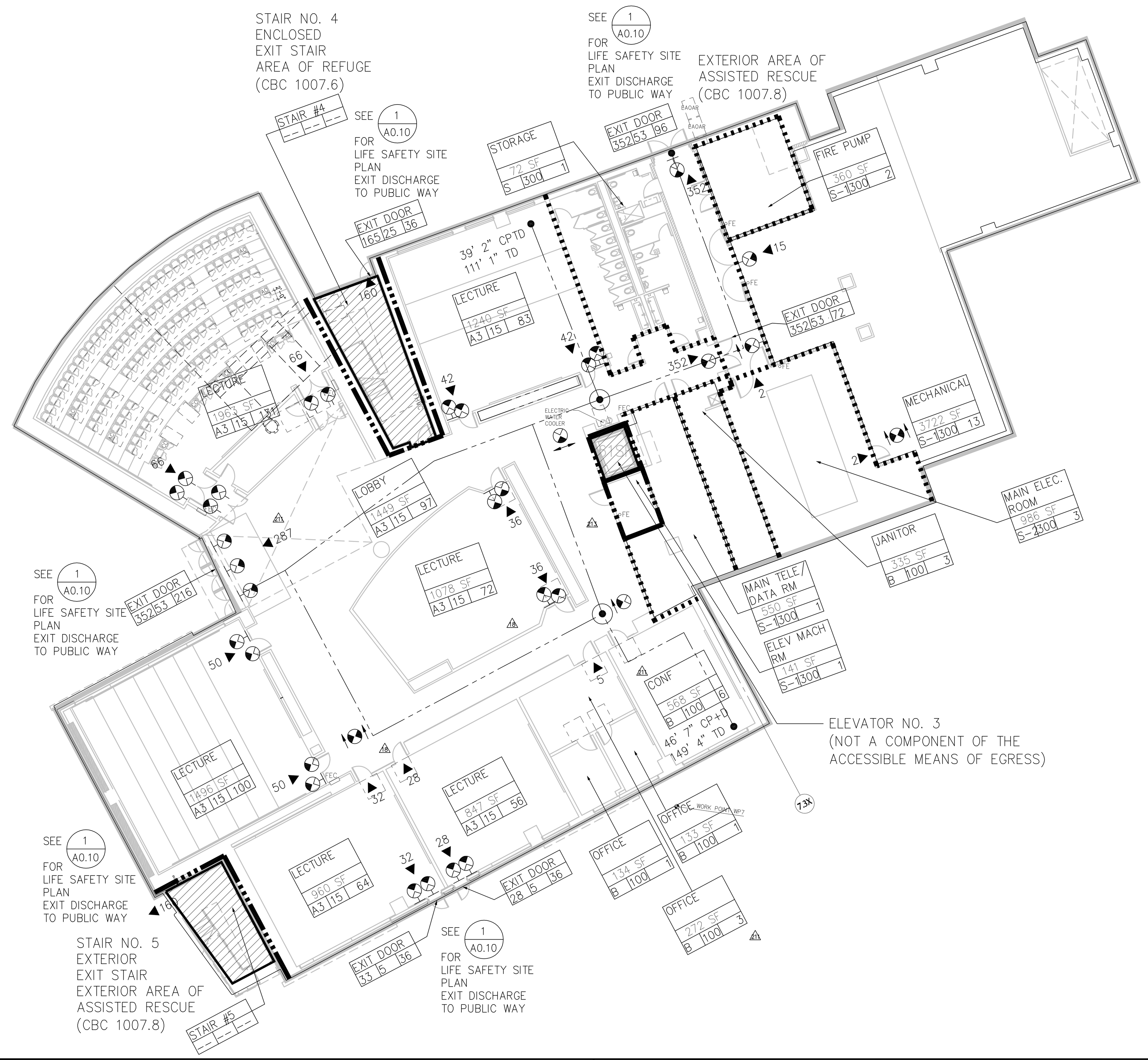
Date: OCTOBER 23, 2009
Job No: L40302.05
Drawn By:
Checked By:

Drawing No.

S2.07E

APPENDIX B

Occupancy Classification Drawings



STATE OF CALIFORNIA—THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

OFFICE OF THE STATE FIRE MARSHAL
Fire & Life Safety Division - South
602 East Huntington Drive, Suite A
Monrovia, CA 91016.

Office (626) 305-1908
Fax: (626) 962-1678
Web Site: www.fire.ca.gov

LOCAL FIRE AUTHORITY – ACCESS & WATER FLOW REVIEW

Project:

CSFM File Number:

Pursuant to Title 19, California Code of Regulations, Article 3, Section 3.05, Fire Department Access and Egress, we would appreciate your input relative to fire department access and water-flow for the above project. It is important to us, as the plan review authority, that these issues are addressed to your satisfaction.

Please return this form with all sections filled in completely. Without this form, California State Fire Marshal approval may be delayed. If you have any questions, please contact the California State Fire Marshal Plan Review Unit at (626) 305-1908.

The local fire authority is to consider the following items,

ACCEPTABLE	YES	NO
Location of fire department connection if provided.		
Number, location and size of fire hydrants.		
Fire department access.		

Local Fire Authority: ____________
Address: ____________
City/State/ZIP: ____________

Approval issued by: ____________
Rank/Title: ____________
Phone Number: ____________
Signature: ____________

CONSERVATION IS WISE— KEEP CALIFORNIA GREEN AND GOLDEN

TABLE 414.2.5(2)
MAXIMUM ALLOWABLE QUANTITY OF FLAMABLE AND COMBUSTIBLE LIQUIDS IN WHOLESALE AND RETAIL SALES OCCUPANCIES PER CONTROL AREA

TYPE OF LIQUID	Class:	Organic Store:	Vault Store:	Gen Chem:	Haz Waste/gen chem:	Haz waste/Organic:	MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA (gallons) Sprinklered
Class 1A							
Acetonitrile	1A	4	8	0			
Diethyl ether	1A	20	90	1			
Petroleum Ether	1A	20	60	0			
Subtotal (liters)		44	158	1			
Subtotal (gallons) (liter x 0.264)		12	42	0			60
Class 1B, IC, II AND IIIA							
Acetone	1B	40	100	2			
Butanol	1C	5	8	0			
Cyclohexane	1B	4	25	1			
Ethanol	1B	8	40	1			
Ethyl Acetate	1B	20	44	4			
Hexane	1B	20	44	0			
isopropanol	1B	10	24	2			
methanol	1B	20	28	0			
Tetrahydrofuran	1B	8	16	0			
Toluene	1B	20	20	0			
Xylenes	1C	4	28	0			
Heptane	1B	4	20	0			
Subtotal (liters)		163	397	10			
Subtotal (gallons) (liter x 0.264)		43	105	3			7,500
Class IIIB							
Other flammables:	IIIB	4	5	5	12 L	100	
Subtotal (liters)		4	5	5	12	20	
Subtotal (gallons) (liter x 0.264)		1	1	1	3	5	Unlimited

1 / A0.11 **LIFE SAFETY PLAN - FIRST FLOOR**
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- X DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / NAME — ROOM NAME; AREA — ROOM AREA; OG OLF OL — OCCUPANCY LOAD, OCCUPANCY LOAD FACTOR, OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME — EXIT COMPONENT; OL WR WP — WIDTH PROVIDED, WIDTH REQUIRED, OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'

EXIT ACCESS: INTERVENING SPACE, CORRIDOR, ATRIUM | EXIT: EXIT DOOR, INT. EXIT STAIR, EXT. EXIT STAIR | EXIT DISCHARGE

X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE
X' D — DISTANCE TO EXIT; EXIT; PUBLIC WAY; PATH OF TRAVEL; MOST REMOTE POINT

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50 — CBC 303.1
B MAIN OCCUPANCY — CBC 304.1
H-3 HAZARDOUS — CBC 307.1
S STORAGE ROOMS — CBC 311.1
S-1 MECHANICAL ROOMS — CBC 311.2
S-2 ELECTRICAL ROOMS — CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A-3	12,748 SF
LEVEL 4	33,307 SF	LEVEL 4	24,280 SF	H-3	985 SF
LEVEL 5	25,294 SF	LEVEL 5	14,836 SF	S	1,405 SF
LEVEL 6	19,958 SF	LEVEL 6	14,005 SF	S-1	6,456 SF
ROOF	20,236 SF	ROOF	0 SF	S-2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS. (CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA: GROUP A-3 + GROUP H-3 + GROUP S-2 + GROUP B = X < 1 (ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)

	GROUP A-3		GROUP H-3		GROUP S-2		GROUP B	= X	
LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	= .005	< 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	= .010	< 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	= .010	< 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	= .007	< 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	= .008	< 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	= .005	< 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	= .155	< 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200 30 30	0 7,750 963	0 259 67	MALE FEMALE	163 163	2	2 8	2 2	2	3 9	3 3
LEVEL TWO	200	31,624	159	MALE FEMALE	80 80	1	1 4	1 1	2	3 5	3 3
LEVEL THREE	200 30	29,143 2,757	145 32	MALE FEMALE	89 89	1	1 4	1 1	2	3 5	3 3
LEVEL FOUR	200 30	23,568 712	118 24	MALE FEMALE	71 71	1	1 4	1 1	2	3 5	3 3
LEVEL FIVE	200 30	14,097 739	71 25	MALE FEMALE	48 48	1	1 3	1 1	2	3 5	3 3
LEVEL SIX	200 30	13,813 192	70 7	MALE FEMALE	39 39	1	1 3	1 1	2	3 5	3 3
TOTAL				MALE FEMALE	516 516	8	7 30	8 8	12	18 34	18 18

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS — TABLE 1004.1.1
BUSINESS 100 GSF
ASSEMBLY 15 GSF

EGRESS WIDTH W/ SPRINKLER — TABLE 1005.1
A-3, B , S, S-1 AND S-2 OCCUPANCIES:
STAIRS 0.2"/OCCUPANT
OTHER 0.15"/OCCUPANT
H-3 OCCUPANCY:
STAIRS 0.2"/OCCUPANT
OTHER 0.15"/OCCUPANT

ACCESSIBLE MEANS OF EGRESS — CBC 1007

AMIN. EGRESS WIDTH
MIN. DOOR 34" — CBC 1008.1.1
MIN. STAIR 44" — CBC 1009.1.1
MIN. ACCESSIBLE STAIR 48" — CBC 1007.3
MIN. EXT. EXIT STAIR 48" — CBC 1007.8.2
MIN. CORRIDOR 44" — CBC 1017.2

AREA OF REFUGE — CBC 1007.6

EXTERIOR AREA OF ASSISTED RESCUE — CBC 1007.8

DOOR SWING — CBC 1008.1.2

DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY

RAMPS — CBC 1010

EGRESS THROUGH INTERVENING SPACES — CBC 1014.2 EXCEPTION 2

H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.

COMMON PATH OF TRAVEL — CBC 1014.3 EXCEPTION 1 & 2
MAX. DIST. 100'

EXIT AND EXIT ACCESS DOORWAYS — CBC 1015.2.1 EXCEPTION 2
SEPARATION OF EXITS 1/3 DIAGONAL

EXIT ACCESS TRAVEL DISTANCE IN ATRIUM — CBC 404.8
MAX. DIST. W/ SPRINKLER 200'

CORRIDOR RATING W/ SPRINKLER — CBC TABLE 1017.1
B OCCUPANCY (0) HOUR

DEAD ENDS — CBC TABLE 1017.3 EXCEPTION 2
MAX. DIST. W/ SPRINKLER 50'

EXIT DISCHARGE — CBC 1024.1 EXCEPTION 1

MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY 300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY 250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY 150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY 250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY 400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT — CBC 901.2

ADDITIONAL REQUIRED FIRE SUPPRESSION — TABLE 903.2.13
ATRIUM — CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I — CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS)
75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS)
50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS — CBC 907
ATRIUM — CBC 907.2.13

-EMERGENCY ALARM SYSTEMS — CBC 908
GROUP H OCCUPANCY — CBC 908.1
ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION — CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50 — CBC 303.1
B MAIN OCCUPANCY — CBC 304.1
H-3 HAZARDOUS — CBC 307.1
S STORAGE ROOMS — CBC 311.1
S-1 MECHANICAL ROOMS — CBC 311.2
S-2 ELECTRICAL ROOMS — CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION — CBC 404.3, TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS — CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200' — CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3: 1-HOUR
B TO H-3: 1-HOUR
B TO S-1: NO SEPARATION REQUIRED
B TO S-2: 1-HOUR
S-1 TO H-3: 1-HOUR
S-1 TO S-2: 1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME — 2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS — 2-HOUR
INTERIOR BEARING WALLS — 2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS — 1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS — NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS — 2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS — 1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS: NO LIMIT > 30'
PROTECTED OPENINGS: NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

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Revisions

	BID DOCUMENTS	10/23/09
5	POST BID ADD	07/14/10
	RECORD DRAWINGS	02/21/14

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Drawing Title
LIFE SAFETY PLAN - FIRST FLOOR

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.
A0.11

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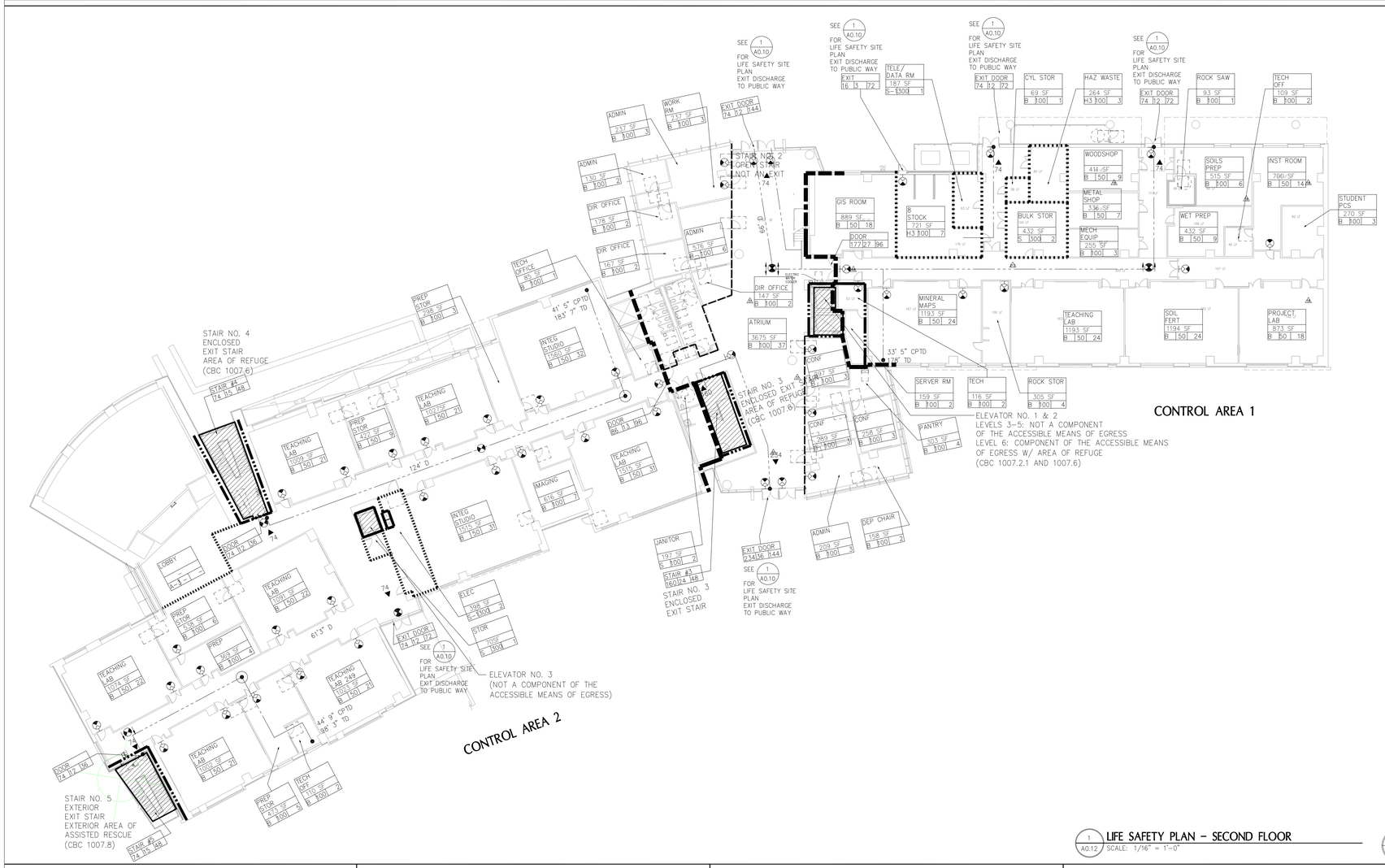
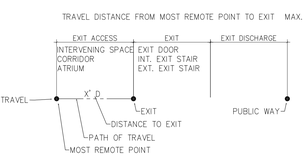


1 / A0.12 LIFE SAFETY PLAN – SECOND FLOOR
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / NAME / AREA / OC DLF OL — ROOM NAME, ROOM AREA, OCCUPANCY LOAD, OCCUPANCY LOAD FACTOR, OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME / OL WR WP — EXIT COMPONENT, WIDTH PROVIDED, WIDTH REQUIRED, OCCUPANT LOAD

MEANS OF EGRESS SYSTEM



CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH./OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A-3	12,748 SF
LEVEL 4	33,307 SF	LEVEL 4	24,280 SF	H-3	985 SF
LEVEL 5	25,294 SF	LEVEL 5	14,836 SF	S	1,405 SF
LEVEL 6	19,958 SF	LEVEL 6	14,005 SF	S-1	6,456 SF
ROOF	20,226 SF	ROOF	0 SF	S-2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0"; 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0"; TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA: GROUP A-3 + GROUP H-3 + GROUP S-2 + GROUP B = X < 1
(ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)

LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	= .005 < 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	= .010 < 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	= .010 < 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	= .007 < 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	= .008 < 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,087/UL	= .005 < 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	= .155 < 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS: BUSINESS 100 GSF; ASSEMBLY 15 GSF	TABLE 1004.1.1
EGRESS WIDTH W/ SPRINKLER: A-3, B , S, S-1 AND S-2 OCCUPANCIES: STAIRS 0.2"/OCCUPANT; OTHER 0.15"/OCCUPANT; H-3 OCCUPANCY: STAIRS 0.2"/OCCUPANT; OTHER 0.15"/OCCUPANT	TABLE 1005.1
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH: MIN. DOOR 34"	CBC 1008.1.1
MIN. STAIR 44"	CBC 1009.1.1
MIN. ACCESSIBLE STAIR 48"	CBC 1007.3
MIN. EXT. EXIT STAIR 48"	CBC 1007.8.2
MIN. CORRIDOR 44"	CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING	CBC 1008.1.2
DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES	CBC 1014.2 EXCEPTION 2
H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE	CBC 1024.1 EXCEPTION 1
MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS) 75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS) 50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS ATRIUM	CBC 907 CBC 907.2.13
-EMERGENCY ALARM SYSTEMS GROUP H OCCUPANCY	CBC 908 CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3:	1-HOUR
B TO H-3:	1-HOUR
B TO S-1:	NO SEPARATION REQUIRED
B TO S-2:	1-HOUR
S-1 TO H-3:	1-HOUR
S-1 TO S-2:	1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2-HOUR
INTERIOR BEARING WALLS	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

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Revisions

BID DOCUMENTS	10/23/09
5 POST BID ADD	07/14/10
RECORD DRAWINGS	02/21/14

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title

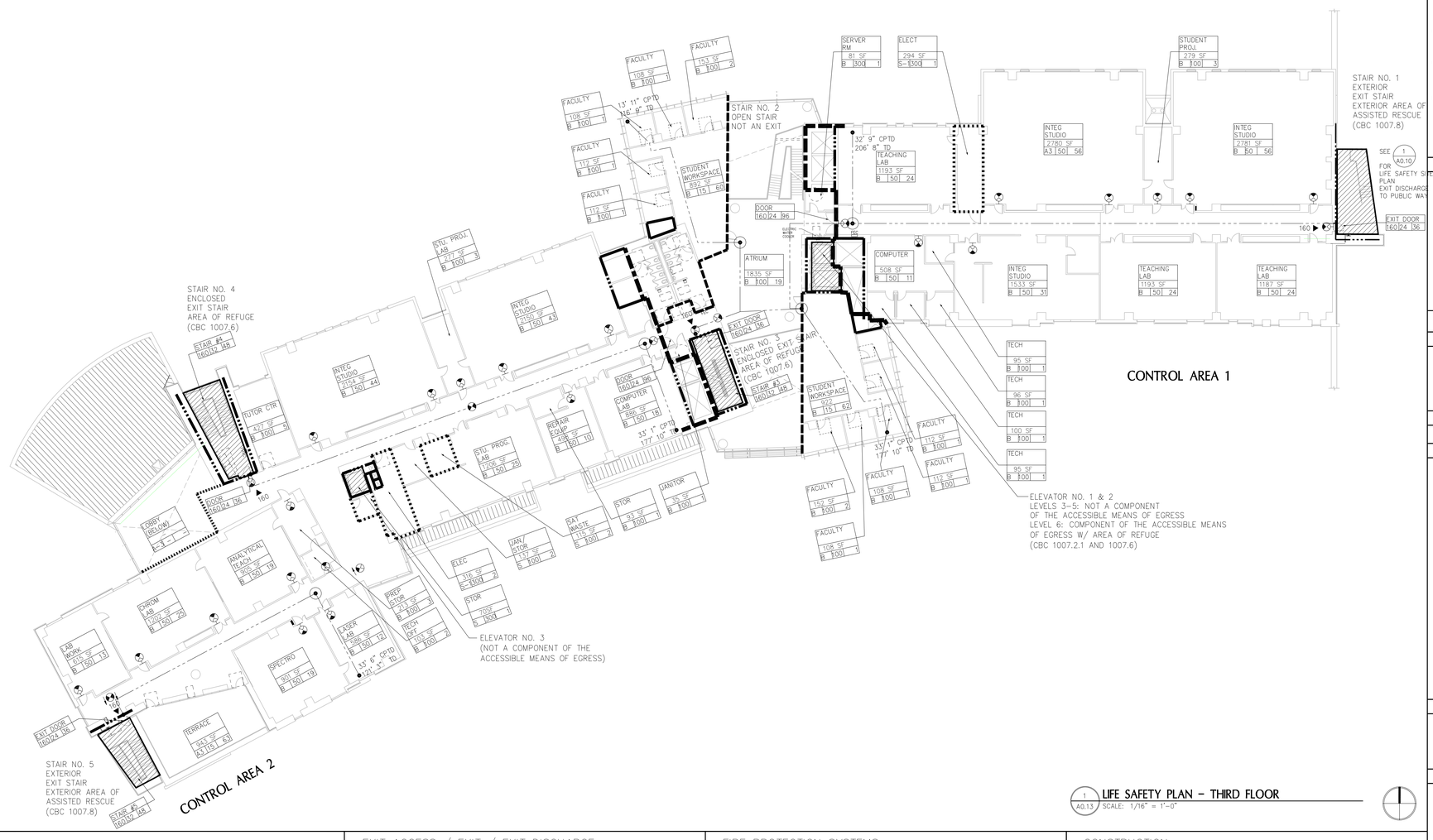
LIFE SAFETY PLAN – SECOND FLOOR

STATE OF CALIFORNIA ALAN MAN REGISTERED ARCHITECT

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.

A0.12



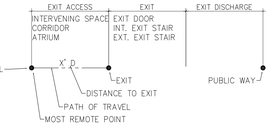
1 / A0.13 LIFE SAFETY PLAN - THIRD FLOOR
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / AREA / OCCUPANCY LOAD; OCCUPANCY LOAD FACTOR; OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME / WIDTH PROVIDED / WIDTH REQUIRED / OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'



X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)

LEVEL 1	23,146 SF
LEVEL 2	43,458 SF
LEVEL 3	43,209 SF
LEVEL 4	33,307 SF
LEVEL 5	25,294 SF
LEVEL 6	19,958 SF
ROOF	20,236 SF
TOTAL	208,608 SF

FLOOR AREA FIXTURE COUNT (CPC)

LEVEL 1	10,162 SF
LEVEL 2	31,624 SF
LEVEL 3	30,086 SF
LEVEL 4	24,280 SF
LEVEL 5	14,836 SF
LEVEL 6	14,005 SF
ROOF	0 SF
TOTAL	124,993 SF

FLOOR AREA BY OCCUPANCY (CBC)

B	108,281 SF
A-3	12,748 SF
H-3	985 SF
S	1,405 SF
S-1	6,456 SF
S-2	1,284 SF
TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA:	GROUP A-3 (ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)	+	GROUP H-3	+	GROUP S-2	+	GROUP B	=	X < 1
LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	=	.005 < 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	=	.010 < 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	=	.010 < 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	=	.007 < 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	=	.008 < 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	=	.005 <1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	=	.155 < 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS: BUSINESS 100 GSF; ASSEMBLY 15 GSF	TABLE 1004.1.1
EGRESS WIDTH W/ SPRINKLER: A-3, B , S, S-1 AND S-2 OCCUPANCIES: STAIRS 0.2"/OCCUPANT; OTHER 0.15"/OCCUPANT; H-3 OCCUPANCY: STAIRS 0.2"/OCCUPANT; OTHER 0.15"/OCCUPANT	TABLE 1005.1
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH: MIN. DOOR 34"	CBC 1008.1.1
MIN. STAIR 44"	CBC 1009.1.1
MIN. ACCESSIBLE STAIR 48"	CBC 1007.3
MIN. EXT. EXIT STAIR 48"	CBC 1007.8.2
MIN. CORRIDOR 44"	CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING: DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	CBC 1008.1.2
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES	CBC 1014.2 EXCEPTION 2
H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE	CBC 1024.1 EXCEPTION 1
MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS) 75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS) 50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS ATRIUM	CBC 907 CBC 907.2.13
-EMERGENCY ALARM SYSTEMS GROUP H OCCUPANCY	CBC 908 CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3:	1-HOUR
B TO H-3:	1-HOUR
B TO S-1:	NO SEPARATION REQUIRED
B TO S-2:	1-HOUR
S-1 TO H-3:	1-HOUR
S-1 TO S-2:	1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2-HOUR
INTERIOR BEARING WALLS	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

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Revisions

BID DOCUMENTS	10/23/09
2 POST BID ADD	07/14/10
RECORD DRAWINGS	02/21/14

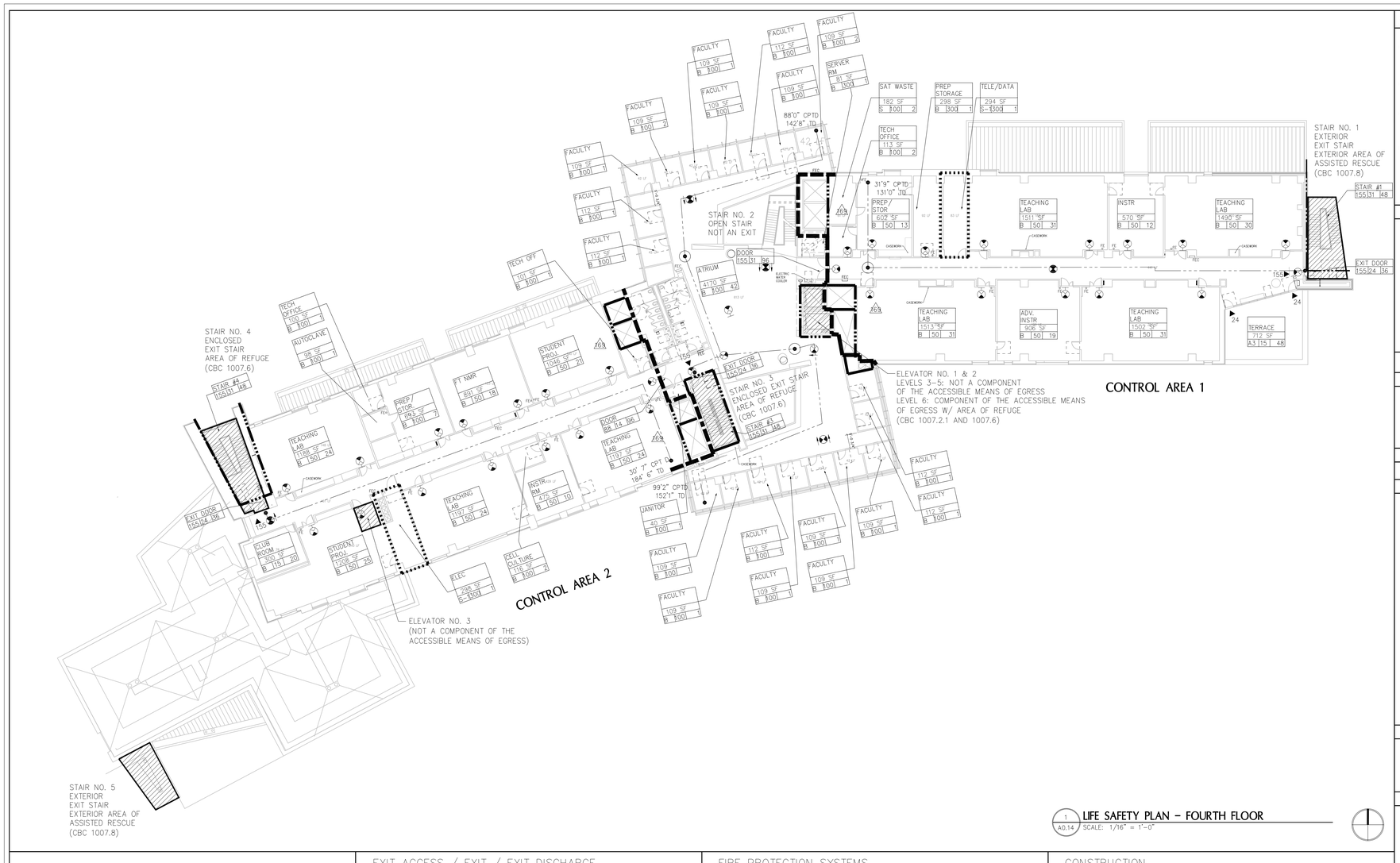
CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title
LIFE SAFETY PLAN - THIRD FLOOR

STATE OF CALIFORNIA ALAN HAN REGISTERED ARCHITECT

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.
A0.13



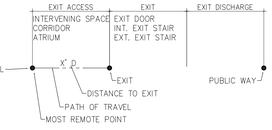
1 A0.14 **LIFE SAFETY PLAN - FOURTH FLOOR**
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / AREA / OC OLFI OL — ROOM NAME, ROOM AREA, OCCUPANCY LOAD, OCCUPANCY LOAD FACTOR, OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME / OL WR WP — EXIT COMPONENT, WIDTH PROVIDED, WIDTH REQUIRED, OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'



X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3	SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B	MAIN OCCUPANCY	CBC 304.1
H-3	HAZARDOUS	CBC 307.1
S	STORAGE ROOMS	CBC 311.1
S-1	MECHANICAL ROOMS	CBC 311.2
S-2	ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A-3	12,748 SF
LEVEL 4	33,307 SF	LEVEL 4	24,280 SF	H-3	985 SF
LEVEL 5	25,294 SF	LEVEL 5	14,836 SF	S	1,405 SF
LEVEL 6	19,958 SF	LEVEL 6	14,005 SF	S-1	6,456 SF
ROOF	20,236 SF	ROOF	0 SF	S-2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA:	GROUP A-3 (ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)	+	GROUP H-3	+	GROUP S-2	+	GROUP B	= X < 1
LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	= .005 < 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	= .010 < 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	= .010 < 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	= .007 < 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	= .008 < 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	= .005 < 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	= .155 < 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS	TABLE 1004.1.1
BUSINESS 100 GSF	
ASSEMBLY 15 GSF	
EGRESS WIDTH W/ SPRINKLER	TABLE 1005.1
A-3, B , S, S-1 AND S-2 OCCUPANCIES:	
STAIRS 0.2"/OCCUPANT	
OTHER 0.15"/OCCUPANT	
H-3 OCCUPANCY:	
STAIRS 0.2"/OCCUPANT	
OTHER 0.15"/OCCUPANT	
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH	
MIN. DOOR 34"	CBC 1008.1.1
MIN. STAIR 44"	CBC 1009.1.1
MIN. ACCESSIBLE STAIR 48"	CBC 1007.3
MIN. EXT. EXIT STAIR 48"	CBC 1007.8.2
MIN. CORRIDOR 44"	CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING	CBC 1008.1.2
DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES	CBC 1014.2 EXCEPTION 2
H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE	CBC 1024.1 EXCEPTION 1
MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS)
75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS)
50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS ATRIUM	CBC 907 CBC 907.2.13
-EMERGENCY ALARM SYSTEMS GROUP H OCCUPANCY	CBC 908 CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3	SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B	MAIN OCCUPANCY	CBC 304.1
H-3	HAZARDOUS	CBC 307.1
S	STORAGE ROOMS	CBC 311.1
S-1	MECHANICAL ROOMS	CBC 311.2
S-2	ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3:	1-HOUR
B TO H-3:	1-HOUR
B TO S-1:	NO SEPARATION REQUIRED
B TO S-2:	1-HOUR
S-1 TO H-3:	1-HOUR
S-1 TO S-2:	1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2-HOUR
INTERIOR BEARING WALLS	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

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Revisions

BID DOCUMENTS	10/23/09
2 POST BID ADD	07/14/10
RECORD DRAWINGS	02/21/14

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title

LIFE SAFETY PLAN - FOURTH FLOOR

STATE OF CALIFORNIA · ALAN MARTIN · REGISTERED ARCHITECT

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.

A0.14

File: Z:\LA\Projects\L40302.50\cad\Sheets\A0-14.dwg
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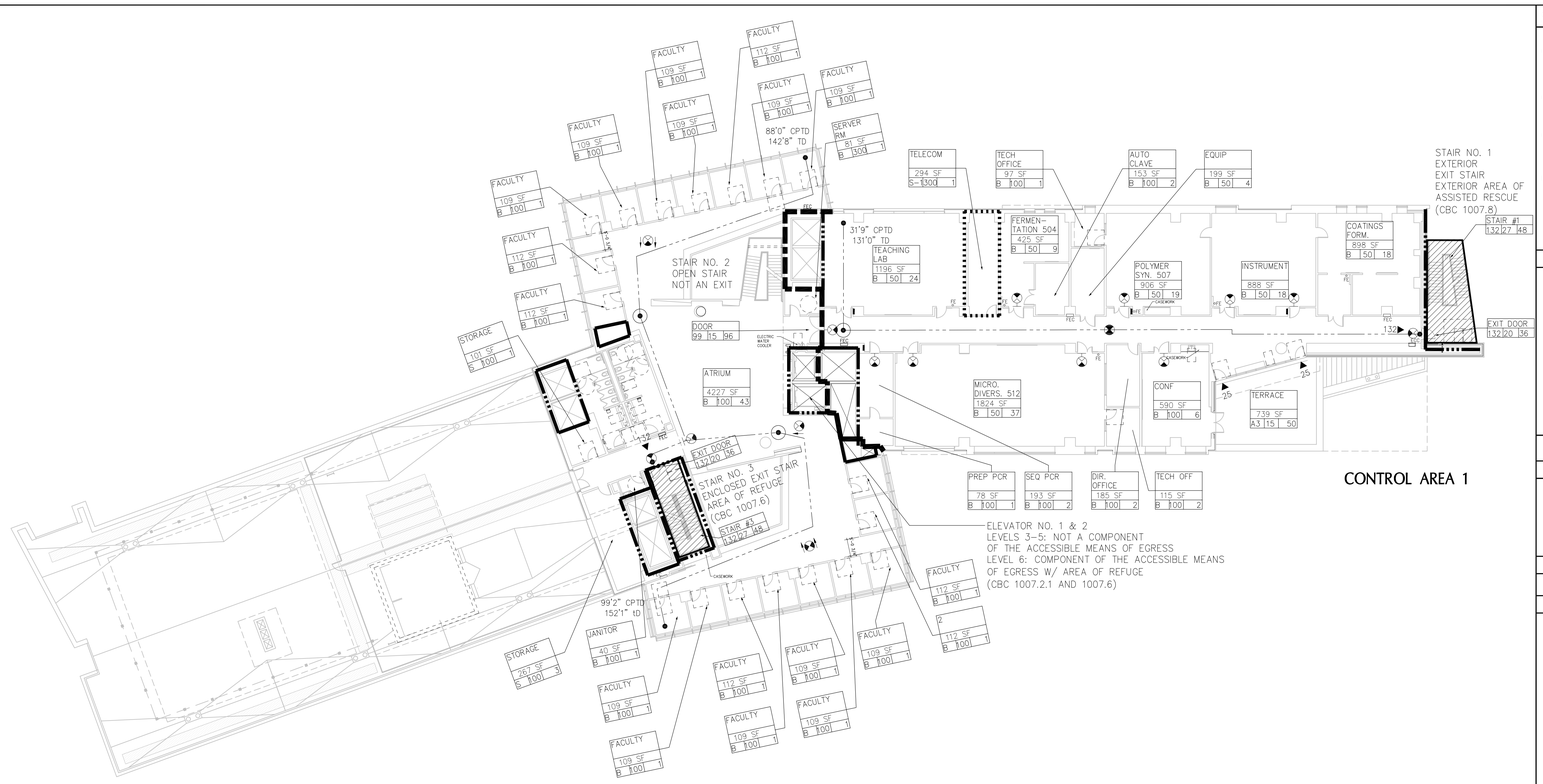


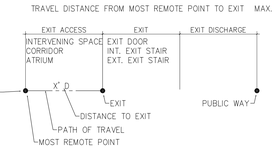
1 / A0.15 **LIFE SAFETY PLAN - FIFTH FLOOR**
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / NAME / AREA / OC LOAD FACTOR OL — ROOM NAME, ROOM AREA, OCCUPANCY LOAD, OCCUPANCY LOAD FACTOR, OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME / OL WR WP — EXIT COMPONENT, WIDTH PROVIDED, WIDTH REQUIRED, OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'



X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3	SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B	MAIN OCCUPANCY	CBC 304.1
H-3	HAZARDOUS	CBC 307.1
S	STORAGE ROOMS	CBC 311.1
S-1	MECHANICAL ROOMS	CBC 311.2
S-2	ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A-3	12,748 SF
LEVEL 4	33,307 SF	LEVEL 4	24,280 SF	H-3	985 SF
LEVEL 5	25,294 SF	LEVEL 5	14,836 SF	S	1,405 SF
LEVEL 6	19,958 SF	LEVEL 6	14,005 SF	S-1	6,456 SF
ROOF	20,236 SF	ROOF	0 SF	S-2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA:	GROUP A-3 (ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)	+	GROUP H-3	+	GROUP S-2	+	GROUP B	= X < 1
LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	= .005 < 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	= .010 < 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	= .010 < 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	= .007 < 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	= .008 < 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	= .005 < 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	= .155 < 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS BUSINESS 100 GSF ASSEMBLY 15 GSF	TABLE 1004.1.1
EGRESS WIDTH W/ SPRINKLER A-3, B , S, S-1 AND S-2 OCCUPANCIES: STAIRS 0.2"/OCCUPANT OTHER 0.15"/OCCUPANT H-3 OCCUPANCY; STAIRS 0.2"/OCCUPANT OTHER 0.15"/OCCUPANT	TABLE 1005.1
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH MIN. DOOR 34" MIN. STAIR 44" MIN. ACCESSIBLE STAIR 48" MIN. EXT. EXIT STAIR 48" MIN. CORRIDOR 44"	 CBC 1008.1.1 CBC 1009.1.1 CBC 1007.3 CBC 1007.8.2 CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING	CBC 1008.1.2
DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES	CBC 1014.2 EXCEPTION 2
H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE	CBC 1024.1 EXCEPTION 1
MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS)
75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS)
50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS ATRIUM	CBC 907 CBC 907.2.13
-EMERGENCY ALARM SYSTEMS GROUP H OCCUPANCY	CBC 908 CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3	SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B	MAIN OCCUPANCY	CBC 304.1
H-3	HAZARDOUS	CBC 307.1
S	STORAGE ROOMS	CBC 311.1
S-1	MECHANICAL ROOMS	CBC 311.2
S-2	ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3:	1-HOUR
B TO H-3:	1-HOUR
B TO S-1:	NO SEPARATION REQUIRED
B TO S-2:	1-HOUR
S-1 TO H-3:	1-HOUR
S-1 TO S-2:	1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2-HOUR
INTERIOR BEARING WALLS	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

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SAN LUIS OBISPO, CA

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LIFE SAFETY PLAN - FIFTH FLOOR

STATE OF CALIFORNIA ALAN MAN REGISTERED ARCHITECT

Date: FEBRUARY 21, 2014
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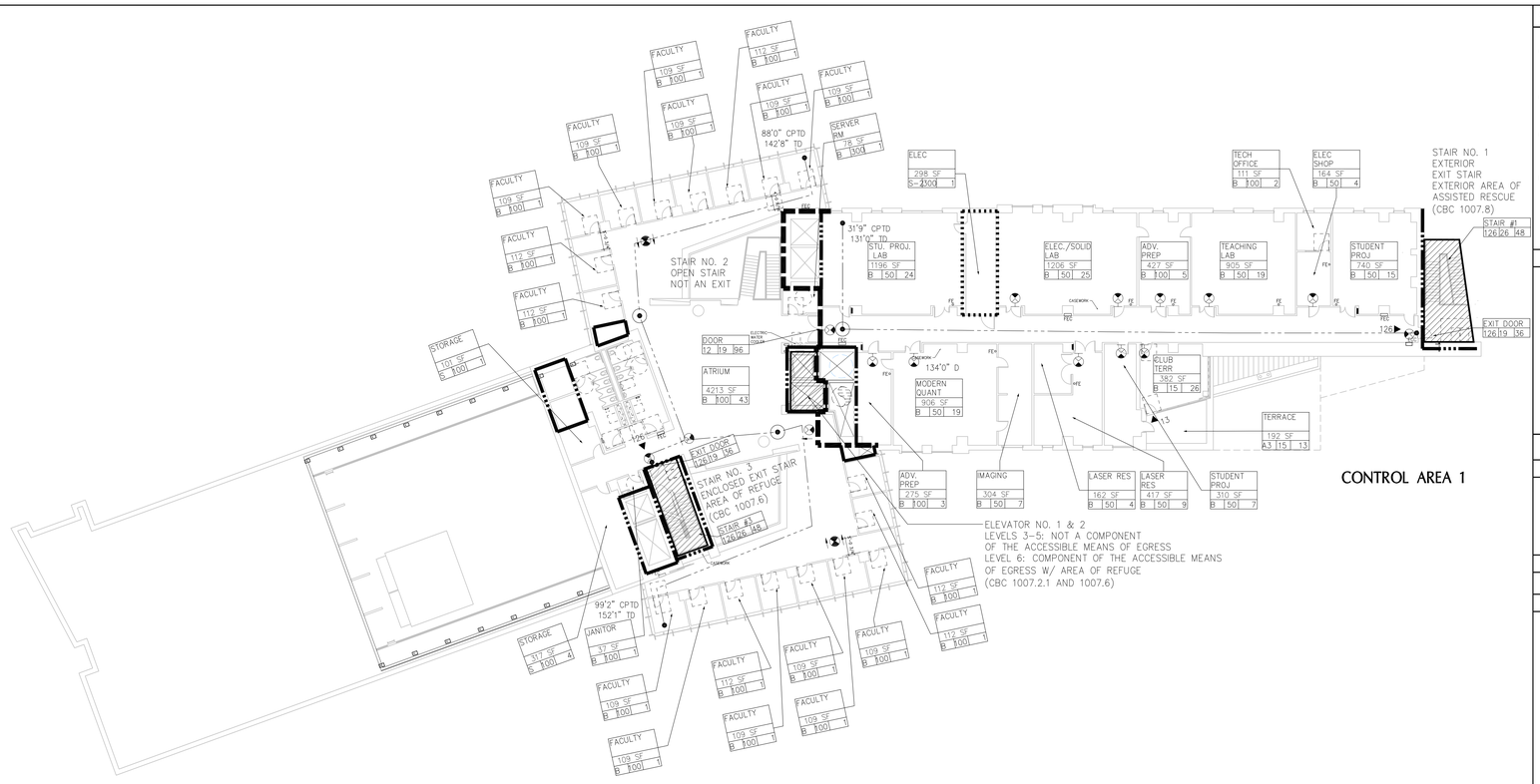


1 A0.16 **LIFE SAFETY PLAN - SIXTH FLOOR**
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

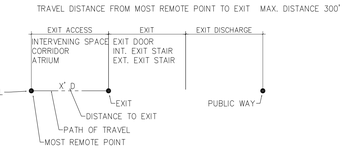
- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC

ROOM NAME TAG: NAME / NAME / AREA / OC LOLFI OL — ROOM NAME; ROOM AREA; OCCUPANCY LOAD; OCCUPANCY LOAD FACTOR; OCCUPANCY GROUP

EXIT COMPONENT TAG: NAME / OL WR MP — EXIT COMPONENT; WIDTH PROVIDED; WIDTH REQUIRED; OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'



X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A-3	12,748 SF
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ROOF	20,236 SF	ROOF	0 SF	S-2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH-RISE BUILDINGS (NON HIGH-RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON-HIGHRISE):
108'-0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON-HIGHRISE):
64'-0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON-SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S-1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'-0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA: GROUP A-3 + GROUP H-3 + GROUP S-2 + GROUP B = X < 1
(ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)

LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	=	.005	< 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	=	.010	< 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	=	.010	< 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	=	.007	< 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	=	.008	< 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	=	.005	< 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	=	.155	< 2

HEIGHT:

	GROUP A-3	GROUP H-3	GROUP S-2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4-1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A-PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A-FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B-OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS	TABLE 1004.1.1
BUSINESS 100 GSF	
ASSEMBLY 15 GSF	
EGRESS WIDTH W/ SPRINKLER	TABLE 1005.1
A-3, B , S, S-1 AND S-2 OCCUPANCIES:	
STAIRS 0.2"/OCCUPANT	
OTHER 0.15"/OCCUPANT	
H-3 OCCUPANCY;	
STAIRS 0.2"/OCCUPANT	
OTHER 0.15"/OCCUPANT	
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH	
MIN. DOOR 34"	CBC 1008.1.1
MIN. STAIR 44"	CBC 1009.1.1
MIN. ACCESSIBLE STAIR 48"	CBC 1007.3
MIN. EXT. EXIT STAIR 48"	CBC 1007.8.2
MIN. CORRIDOR 44"	CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING	CBC 1008.1.2
DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES	CBC 1014.2 EXCEPTION 2
H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE	CBC 1024.1 EXCEPTION 1
MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A-3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H-3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S-1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S-2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT: 1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE -SIZE- 4-A:60-B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS)
75FT. MAX. TRAVEL DISTANCE NFPA 10 3-2.1
CLASS B HAZARDS (LAB AREAS)
50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

-FIRE ALARM AND DETECTION SYSTEMS	CBC 907
ATRIUM	CBC 907.2.13
-EMERGENCY ALARM SYSTEMS	CBC 908
GROUP H OCCUPANCY	CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A-3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H-3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S-1 MECHANICAL ROOMS	CBC 311.2
S-2 ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1-HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A-3:	1-HOUR
B TO H-3:	1-HOUR
B TO S-1:	NO SEPARATION REQUIRED
B TO S-2:	1-HOUR
S-1 TO H-3:	1-HOUR
S-1 TO S-2:	1-HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2-HOUR
INTERIOR BEARING WALLS	2-HOUR (1-HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1-HOUR < 30'; NON-RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON-RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2-HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1-HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B-FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A-3	B	B	C
B	B	C	C
S-1	C	C	C
S-2	C	C	C

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Revisions

BID DOCUMENTS	10/23/09
5 POST BID ADD	07/14/10
RECORD DRAWINGS	02/21/14

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title

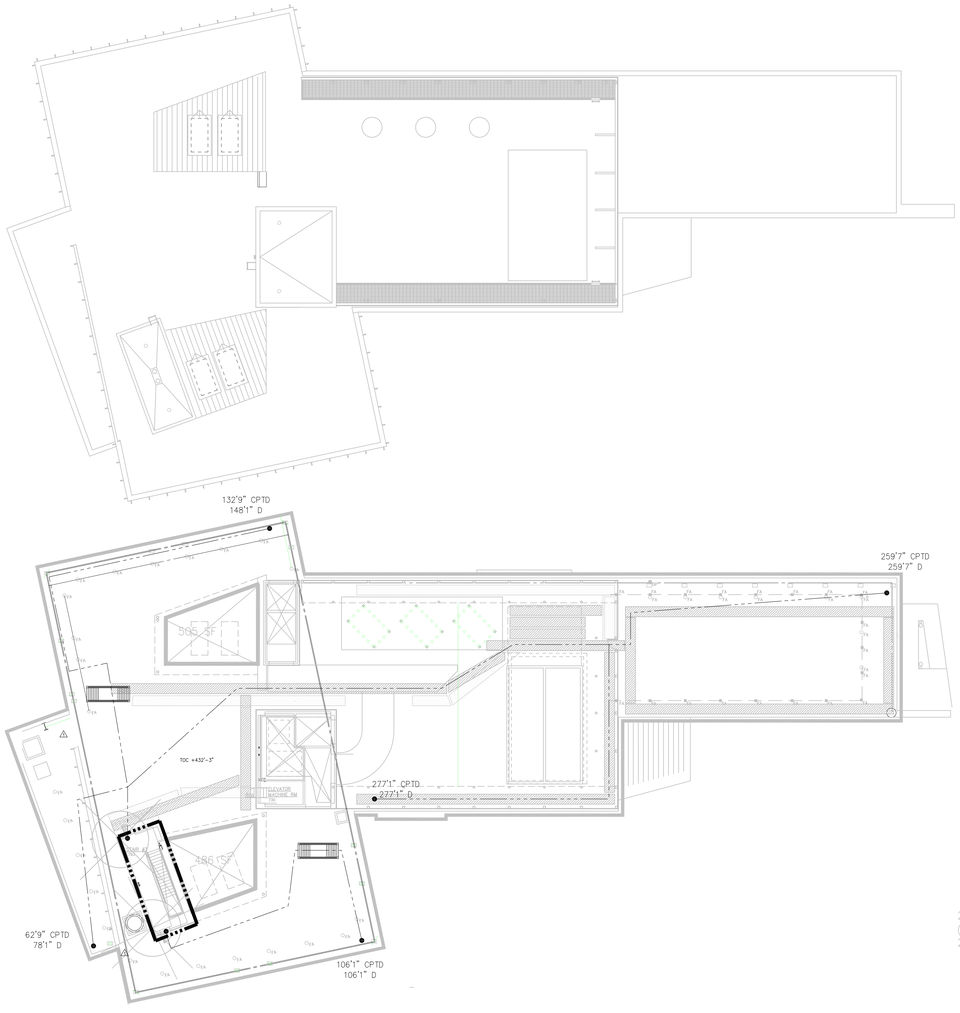
LIFE SAFETY PLAN - SIXTH FLOOR

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.

A0.16

File: Z:\LAX\Projects\L40302.05.0\cad\Sheets\A0-16.dwg
Plotted: 02/25/14 - 9:06am By: gerald.wang
XREFs: rgbcad-ref.dwg, tr-cad-ref.dwg, tr-cad-ref-ltcs...36.48.dwg



1 / A0.17 LIFE SAFETY PLAN – UPPER ROOF
SCALE: 1/16" = 1'-0"

21,227 SF
(–) 991 SHAFTS =
20,236 SF

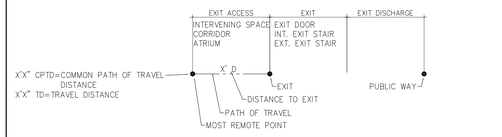
2 / A0.17 LIFE SAFETY PLAN – ROOF
SCALE: 1/16" = 1'-0"

SYMBOLS LEGEND

- ATRIUM SEPARATION/CONTROL AREA SEPARATION 1 HR. FIRE RATED WALL ASSEMBLY, CBC 404.5 EXCEPTION 3
- 1 HR. FIRE RATED SEPARATION
- EXIT ENCLOSURE & SHAFT ENCLOSURES 2 HR. FIRE RATED WALL ASSEMBLY, CBC 707.4 AND 1020.1
- CONTROL AREA SEPARATION 2 HR. FIRE RATED WALL ASSEMBLY, CBC 414.2.4
- X DIRECTION OF EGRESS AND NUMBER OF OCCUPANTS USING EGRESS
- EXIT SIGN, SINGLE FACE
- POINT OF TWO EXIT OPTIONS
- EXIT SIGN, DOUBLE FACE CBC
- ROOM NAME TAG: NAME / NAME / AREA / OC LOAD FACTOR OL — ROOM NAME, ROOM AREA, OCCUPANCY LOAD, OCCUPANCY LOAD FACTOR, OCCUPANCY GROUP
- EXIT COMPONENT TAG: NAME / OL WR WP — EXIT COMPONENT, WIDTH PROVIDED, WIDTH REQUIRED, OCCUPANT LOAD

MEANS OF EGRESS SYSTEM

TRAVEL DISTANCE FROM MOST REMOTE POINT TO EXIT MAX. DISTANCE 300'



X'X" CPTD=COMMON PATH OF TRAVEL DISTANCE
X'X" TD=TRAVEL DISTANCE

CODE ANALYSIS

OCCUPANCY CLASSIFICATIONS

A–3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H–3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S–1 MECHANICAL ROOMS	CBC 311.2
S–2 ELECTRICAL ROOMS	CBC 311.3

OCCUPANCIES

INDICATED ON PLANS.

FLOOR AREA CALCULATIONS

	CALIFORNIA BUILDING CODE	CALIFORNIA PLUMBING CODE
EXTERIOR WALLS		EXCLUDED
MECH/OP. EQMT.		EXCLUDED
STAIRS		EXCLUDED
ELEVATORS		EXCLUDED
SHAFTS	EXCLUDED	EXCLUDED
STORAGE		EXCLUDED
CLOSETS		EXCLUDED
TERRACES		EXCLUDED
ATRIUM		EXCLUDED
CORRIDORS		EXCLUDED
RESTROOMS		EXCLUDED
TOTAL AREA	208,608 SF	124,993 SF

AREAS:

FLOOR AREA OCCUPANCY (CBC SECTION 1002.1)		FLOOR AREA FIXTURE COUNT (CPC)		FLOOR AREA BY OCCUPANCY (CBC)	
LEVEL 1	23,146 SF	LEVEL 1	10,162 SF		
LEVEL 2	43,458 SF	LEVEL 2	31,624 SF	B	108,281 SF
LEVEL 3	43,209 SF	LEVEL 3	30,086 SF	A–3	12,748 SF
LEVEL 4	33,307 SF	LEVEL 4	24,280 SF	H–3	985 SF
LEVEL 5	25,294 SF	LEVEL 5	14,836 SF	S	1,405 SF
LEVEL 6	19,958 SF	LEVEL 6	14,005 SF	S–1	6,456 SF
ROOF	20,236 SF	ROOF	0 SF	S–2	1,284 SF
TOTAL	208,608 SF	TOTAL	124,993 SF	TOTAL	131,159 SF

HIGH–RISE BUILDINGS (NON HIGH–RISE) (CBC 403)

ACTUAL BUILDING HEIGHT (NON–HIGHRISE):
108'–0": 6 STORIES AND PENTHOUSE
DEFINED BUILDING HEIGHT (NON–HIGHRISE):
64'–0": TO TOP OF HIGHEST OCCUPIED FLOOR/LEVEL ABOVE BUILDING ACCESS.
(CBC 403.1 EXCEPTION [SFM] 403.1.2)

ALLOWABLE AREA AND HEIGHT (CBC 503/504)

ALLOWABLE HEIGHT AND BUILDING AREAS FOR NON–SEPARATED OCCUPANCIES:
(CBC TABLE 503) WITH AUTOMATIC SPRINKLER SYSTEM INCREASE
(CBC SECTION 504.2 AND 506.3)

	GROUP B	GROUP S–1
ALLOWABLE MAXIMUM HGT (FT)	160'	180'
ALLOWABLE MAXIMUM STORIES	11	12
ALLOWABLE MAX. AREA/STORY	UL	96,000 (48,000X2)

ACTUAL HEIGHT AND BUILDING AREAS PER CBC TABLE 503:

	CENTER FOR SCIENCE
ACTUAL MAXIMUM HGT (FT)	108'–0"
ACTUAL MAXIMUM STORIES	6
ACTUAL MAX. AREA/STORY	43,458

TOTAL ALLOWABLE BUILDING AREA: 96,000 SF X 6 FLOORS = 576,000 SF
TOTAL ACTUAL FLOOR AREA = 208,608 SF

ALLOWABLE HEIGHT AND BUILDING AREAS FOR SEPARATED OCCUPANCIES:
(CBC SECTION 508.3.3)

AREA:	GROUP A–3 (ACTUAL MAX. AREA/ ALLOWABLE MAX. AREA)	+	GROUP H–3	+	GROUP S–2	+	GROUP B	=	X < 1
LEVEL 1	10,162/96,000	+	0/96,000	+	986/96,000	+	335/UL	=	.005 < 1
LEVEL 2	0/96,000	+	985/96,000	+	0/96,000	+	30,020/UL	=	.010 < 1
LEVEL 3	943/96,000	+	0/96,000	+	0/96,000	+	28,418/UL	=	.010 < 1
LEVEL 4	712/96,000	+	0/96,000	+	0/96,000	+	22,976/UL	=	.007 < 1
LEVEL 5	739/96,000	+	0/96,000	+	0/96,000	+	13,435/UL	=	.008 < 1
LEVEL 6	192/96,000	+	0/96,000	+	298/96,000	+	13,097/UL	=	.005 < 1
TOTAL	12,748/96,000	+	985/96,000	+	1,284/96,000	+	108,281/UL	=	.155 < 2

HEIGHT:

	GROUP A–3	GROUP H–3	GROUP S–2
ALLOWABLE MAXIMUM HGT (FT)	180'	180'	180'
ALLOWABLE MAXIMUM STORIES	12	7	12

PLAN CHECK NOTES

EXIT ACCESS / EXIT / EXIT DISCHARGE

EXIT ACCESS

OCCUPANT LOADS BUSINESS 100 GSF ASSEMBLY 15 GSF	TABLE 1004.1.1
EGRESS WIDTH W/ SPRINKLER A–3, B , S, S–1 AND S–2 OCCUPANCIES: STAIRS 0.2"/OCCUPANT OTHER 0.15"/OCCUPANT H–3 OCCUPANCY: STAIRS 0.2"/OCCUPANT OTHER 0.15"/OCCUPANT	TABLE 1005.1
ACCESSIBLE MEANS OF EGRESS	CBC 1007
AMIN. EGRESS WIDTH MIN. DOOR 34" MIN. STAIR 44" MIN. ACCESSIBLE STAIR 48" MIN. EXT. EXIT STAIR 48" MIN. CORRIDOR 44"	 CBC 1008.1.1 CBC 1009.1.1 CBC 1007.3 CBC 1007.8.2 CBC 1017.2
AREA OF REFUGE	CBC 1007.6
EXTERIOR AREA OF ASSISTED RESCUE	CBC 1007.8
DOOR SWING DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE OR A GROUP H OCCUPANCY	CBC 1008.1.2
RAMPS	CBC 1010
EGRESS THROUGH INTERVENING SPACES H OCCUPANCY EGRESS IS NOT PROHIBITED THROUGH ADJOINING SPACE WHEN ADJOINING OR INTERVENING SPACES ARE THE SAME OR LESSER HAZZARD OCCUPANCY.	CBC 1014.2 EXCEPTION 2
COMMON PATH OF TRAVEL MAX. DIST. 100'	CBC 1014.3 EXCEPTION 1 & 2
EXIT AND EXIT ACCESS DOORWAYS SEPARATION OF EXITS 1/3 DIAGONAL	CBC 1015.2.1 EXCEPTION 2
EXIT ACCESS TRAVEL DISTANCE IN ATRIUM MAX. DIST. W/ SPRINKLER 200'	CBC 404.8
CORRIDOR RATING W/ SPRINKLER B OCCUPANCY (0) HOUR	CBC TABLE 1017.1
DEAD ENDS MAX. DIST. W/ SPRINKLER 50'	CBC TABLE 1017.3 EXCEPTION 2
EXIT DISCHARGE MAX. 50% EXITS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF DISCHARGE PROVIDED 1.1, 1.2 AND 1.3 ARE MET.	CBC 1024.1 EXCEPTION 1

MAXIMUM ALLOWABLE TRAVEL DISTANCES (CBC TALE 1016.1)

B OCCUPANCY	300' WITH SPRINKLER SYSTEM
A–3 OCCUPANCY	250' WITH SPRINKLER SYSTEM
H–3 OCCUPANCY	150' WITH SPRINKLER SYSTEM
S–1 OCCUPANCY	250' WITH SPRINKLER SYSTEM
S–2 OCCUPANCY	400' WITH SPRINKLER SYSTEM

FIRE PROTECTION SYSTEMS

AUTOMATIC SPRINKLER SYSTEMS (CBC SECTION 903)

FIRE SPRINKLER SYSTEM THROUGHOUT	CBC 901.2
ADDITIONAL REQUIRED FIRE SUPPRESSION ATRIUM	TABLE 903.2.13 CBC 404.3

STANDPIPE REQUIREMENTS (CBC SECTION 905)

STANDPIPE: CLASS I CBC 905.3.1, EXCEPTION 1
HOSE REQUIREMENT:
1. REQUIRED IN EVERY REQUIRED STAIRWAY AT MAIN LANDING, BY FIRE CODE OFFICIAL.
2. REQUIRED AT THE ROOF OR HIGHEST LANDING OF STAIRWAYS WITH STAIR ACCESS TO THE ROOF.
3. ADDITIONAL HOSE CONNECTION REQUIRED AT THE TOP OF THE MOST HYDRAULICALLY REMOTE STANDPIPE FOR TESTING PURPOSES.

FIRE EXTINGUISHERS (CBC SECTION 906)

REQUIRED: PROVIDE AS DIRECTED BY THE CALIFORNIA FIRE CODE (CFC 2007) AND NFPA 10
TYPE: FIRE EXTINGUISHERS TO BE –SIZE– 4–A:60–B:C 10LBS.
SPACING: CLASS A HAZARDS (OFFICE AREAS)
75FT. MAX. TRAVEL DISTANCE NFPA 10 3–2.1
CLASS B HAZARDS (LAB AREAS)
50FT. MAX. TRAVEL DISTANCE NFPA 10

FIRE ALARM AND DETECTION SYSTEMS (CBC SECTION 907)

–FIRE ALARM AND DETECTION SYSTEMS ATRIUM	CBC 907 CBC 907.2.13
–EMERGENCY ALARM SYSTEMS GROUP H OCCUPANCY	CBC 908 CBC 908.1

ADA COMPLIANT FIRE ADDRESSABLE FIRE ALARM SYSTEM/AREAS OF REFUGE
SMOKE DETECTION (DUCT MOUNTED INCLUDED) AT SELECTED LOCATIONS
AUDIO/VISUAL STROBE SIGNALING
FLOW AND TAMPER SWITCH MONITORING POINTS
ELEVATOR MONITOR AND CENTRAL TIE CAPABILITIES
EMERGENCY LIGHTING
EXIT LIGHTING
AUTOMATIC AIR HANDLING EQUIPMENT SHUTDOWN
FIRE DEPARTMENT COMMUNICATION SYSTEM
EMERGENCY AND STANDBY POWER SYSTEM

SMOKE CONTROL SYSTEM (CBC SECTION 909)

PASSIVE NATURAL VENTILATION SMOKE CONTROL SYSTEM IN ATRIUM

ALTERNATIVE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION CBC 108.7.2

CONSTRUCTION

RATED PARTITIONS

INDICATED ON PLANS.

OCCUPANCY CLASSIFICATIONS

A–3 SEMINAR ROOM W/OCCUPANT LOAD > 50	CBC 303.1
B MAIN OCCUPANCY	CBC 304.1
H–3 HAZARDOUS	CBC 307.1
S STORAGE ROOMS	CBC 311.1
S–1 MECHANICAL ROOMS	CBC 311.2
S–2 ELECTRICAL ROOMS	CBC 311.3

ATRIUM (CBC 404)

AUTOMATIC SPRINKLER PROTECTION	CBC 404.3 TABLE 903.2.13
1–HOUR SEPARATION, EXCEPT ANY THREE FLOORS	CBC 404.5 EXCEPTION 3
EXIT ACCESS TRAVEL DISTANCE MAX. = 200'	CBC 404.8

REQUIRED OCCUPANCY SEPARATION (CBC TABLE 508.3.3)

B TO A–3:	1–HOUR
B TO H–3:	1–HOUR
B TO S–1:	NO SEPARATION REQUIRED
B TO S–2:	1–HOUR
S–1 TO H–3:	1–HOUR
S–1 TO S–2:	1–HOUR

FIRE RESISTIVE REQUIREMENTS (CBC TABLE 601)

STRUCTURAL FRAME	2–HOUR (1–HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR BEARING WALLS	2–HOUR
INTERIOR BEARING WALLS	2–HOUR (1–HR WHERE ONLY SUPPORTING ROOF)
EXTERIOR NONBEARING WALLS & PARTITIONS	1–HOUR < 30'; NON–RATED N/C ≥ 30'
INTERIOR NONBEARING WALLS & PARTITIONS	NON–RATED
FLOOR CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	2–HOUR
ROOF CONSTRUCTION INCL. SUPPORTING BEAMS & JOISTS	1–HOUR

TYPE OF CONSTRUCTION (CBC 602.2)

TYPE 1B–FR (FULLY SPRINKLED, SUPERVISED AUTOMATIC SPRINKLER SYSTEM)

EXTERIOR WALL AND OPENING PROTECTION (CBC TABLE 704.8)

UNPROTECTED OPENINGS:	NO LIMIT > 30'
PROTECTED OPENINGS:	NO LIMIT > 30'

MAX. FLAME SPREAD CLASSIFICATION: INTERIOR FINISHES (CBC TABLE 803.5)

GROUP	EXIT ENCLOSURES AND EXIT PASSAGEWAYS SPRINKLER	CORRIDORS SPRINKLED	ROOMS AND ENCLOSED SPACES SPRINKLED
A–3	B	B	C
B	B	C	C
S–1	C	C	C
S–2	C	C	C

CONTROL AREAS (CBC TABLE 414.2.2)

CHEMICAL QUANTITIES: TYPE AND QUANTITY OF CHEMICALS AT OCCUPANCY SHALL NOT EXCEED CBC TABLE 414.2.5(1)

PLUMBING CALCULATION (CPC TABLE 4–1)

CALCULATIONS BASED ON 2007 CALIFORNIA PLUMBING CODE.

TYPE OF BUILDING OR OCCUPANCY:
OFFICE OR PUBLIC BUILDINGS

OCCUPANCY LOAD FACTOR:
GROUP A–PRINCIPLE ASSEMBLY AREA (NO FIXED SEATING): 30
GROUP A–FIXED SEATING: 1/2 NUMBER OF SEATING
GROUP B–OFFICE OR PUBLIC BUILDINGS: 200

AREA
PER TABLE A, ACCESSORY AREAS MAY BE EXCLUDED (EG. HALLWAY, RESTROOM, STAIR)

FLOOR LEVEL	LOAD FACTOR	AREA (SF)	LOAD BY OCCUP.	OCCUPANCY		REQ. UR	REQ. WC	REQ. LAV	PROVIDED UR	PROVIDED WC	PROVIDED LAV
LEVEL ONE	200	0	0	MALE	163	2	2	2	2	3	3
	30	7,750	259	FEMALE	163		8	2		9	3
	30	963	67								
LEVEL TWO	200	31,624	159	MALE	80	1	1	1	2	3	3
				FEMALE	80		4	1		5	3
LEVEL THREE	200	29,143	145	MALE	89	1	1	1	2	3	3
	30	2,757	32	FEMALE	89		4	1		5	3
LEVEL FOUR	200	23,568	118	MALE	71	1	1	1	2	3	3
	30	712	24	FEMALE	71		4	1		5	3
LEVEL FIVE	200	14,097	71	MALE	48	1	1	1	2	3	3
	30	739	25	FEMALE	48		3	1		5	3
LEVEL SIX	200	13,813	70	MALE	39	1	1	1	2	3	3
	30	192	7	FEMALE	39		3	1		5	3
TOTAL				MALE	516	8	7	8	12	18	18
				FEMALE	516		30	8		34	18

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Architecture / Planning / Interior Design
Portland Seattle Los Angeles Washington DC New York

515 South Flower Street, Suite 3700
Los Angeles, California 90071

(PH) 213 617 1901
(FAX) 213 617 0047

Consultants

STRUCTURAL ENGINEER
John A. Martin & Associates, Inc
1212 S. Flower Street
Los Angeles, CA 90015

MECHANICAL ENGINEER
Rumsey Engineers
99 Linden Street
Oakland, CA 94607

ELECTRICAL ENGINEER
Integrated Design Associates, Inc
3140 De La Cruz Boulevard, Suite 110
Santa Clara, CA 95054

CIVIL ENGINEER
Cannon Associates
1050 Southwood Drive
San Luis Obispo, CA 93401

LANDSCAPE ARCHITECT
Katherine Spitz and Associates
4212 1/2 Glencoe Avenue
Marina del Rey, CA 90292

LABORATORY
Research Facilities Design
3965 Fifth Avenue, Suite 300
San Diego, CA 92103–3107

LIGHTING DESIGN
David Nelson & Associates, LLC
P.O. Box 270254
Littleton, CO 80127

Revisions

BID DOCUMENTS	10/23/09
1 POST BID ADD	07/14/10
RECORD DRAWINGS	02/21/14

CENTER FOR SCIENCE
SAN LUIS OBISPO, CA

Drawing Title

LIFE SAFETY PLAN – ROOF

STATE OF CALIFORNIA · ALAN MAN · REGISTERED ARCHITECT

Date: FEBRUARY 21, 2014
Job No: L40302.05
Drawn By: TR/CS
Checked By:

Drawing No.

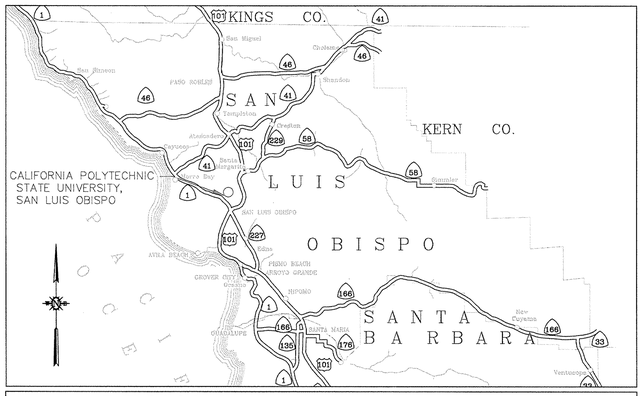
A0.17

File: Z:\LAX\Projects\L40302.S\Cost\Sheets\A0–17.dwg
Plotted: 2/21/2014 4:14:36pm by Chris Sheets
Xrefs: xgrid.dwg tpr–sheet.dwg tpr–title.dwg tpr–r–upper.dwg tpr–r–roof.dwg tpr–r–upper.dwg

APPENDIX C

Fire Suppression Drawings

CAL POLY
CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.



REGIONAL MAP N.T.S.

DESIGNED AND INSTALLED BY

AERO AUTOMATIC SPRINKLER CO.

PROJECT DIRECTORY

OWNER CALIFORNIA STATE POLYTECHNIC UNIVERSITY
FACILITIES PLANNING & CAPITAL PROJECTS
BUILDING 70
SAN LUIS OBISPO, CA 93047
TEL- (805) 756-2581
FAX- (805) 756-7566

ARCHITECT ZIMMER GUNSUL FRASCA ARCHITECTS, LLP
515 SOUTH FLOWER ST.
SUITE 3700
LOS ANGELES, CA 90071
TEL- (213) 617-1901
FAX- (213) 617-0047

STRUCTURAL ENGINEER JOHN A. MARTIN & ASSOCIATES
950 S. GRAND AVENUE
4TH FLOOR
LOS ANGELES, CA 90015
TEL- (213) 483-6490
FAX- (213) 483-3084

MECHANICAL/ PLUMBING ENGINEER RUMSEY ENGINEERS
99 LINDEN STREET
OAKLAND, CA 94607
TEL- (510) 663-2070
FAX- (510) 663-2080

ELECTRICAL ENGINEER INTEGRATED DESIGN ASSOCIATES
1084 FOXWORTHY AVENUE, SUITE 150
SAN JOSE, CA 95118
TEL- (408) 448-6300
FAX- (408) 448-6301

CIVIL ENGINEER CANNON ASSOCIATES
364 PACIFIC STREET
SAN LUIS OBISPO, CA 93401
TEL- (805) 544-7407
FAX- (805) 544-3863

LANDSCAPE ARCHITECT KATHERINE SPITZ ASSOCIATES
4212 1/2 GLENCOE AVENUE
MARINA DEL REY, CA 90292
TEL- (310) 574-4460
FAX- (310) 574-4462

LABORATORY CONSULTANT RESEARCH FACILITIES DESIGN
3965 FIFTH AVENUE, SUITE 300
SAN DIEGO, CA. 92103-3107
TEL- (619) 297-0159
FAX- (619) 294-4901

LIGHTING DESIGN DAVID NELSON AND ASSOCIATES, LLC
P.O. BOX 270254
LITTLETON, CO 80127
TEL- (720) 981-4560
FAX- (303) 484-3230

PROJECT DATA

NEW BUILDING DATA

NUMBER OF STORIES:	SIX (6) STORIES
ZGF PROJECT NUMBER:	L40302
TYPE CONSTRUCTION:	1B, FIRE-RESISTIVE
BUILDING OCCUPANCY:	GROUP B, BUSINESS OCCUPANCY, CONTAINING THE FOLLOWING USES:

USE	OCCUPANCY
LOBBIES/ LECTURE	A-3
OFFICES:	B
CONFERENCE ROOMS: (LESS THAN 50 OCCUPANTS)	B
LABORATORIES:	B
ELECTRICAL AND TELEPHONE / DATA	S-1
MECHANICAL ROOMS:	S-1
STORAGE	H-3
STORAGE	S-2

FIRE PROTECTION: FULLY FIRE SPRINKLERED
HEIGHT: 108'
FLOOR AREA:

FLOOR	SQ FT
LEVEL ONE:	23,146 G.S.F.
LEVEL TWO:	43,458 G.S.F.
LEVEL THREE:	43,209 G.S.F.
LEVEL FOUR:	33,307 G.S.F.
LEVEL FIVE:	25,294 G.S.F.
LEVEL SIX:	19,958 G.S.F.
TOTAL:	188,372 G.S.F.

BUILDING CODES:
2007 (CBC) CALIFORNIA BUILDING CODE
2007 (CFC) CALIFORNIA FIRE CODE
2007 (CMC) CALIFORNIA MECHANICAL CODE
2007 (CPC) CALIFORNIA PLUMBING CODE
2006 (NFPA 70) NATIONAL ELECTRICAL CODE
2006 (NFPA 101) LIFE SAFETY CODE
ADA STANDARDS FOR ACCESSIBLE DESIGN
ADA ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES (ADAAG) [28 CFR PART 36, APPENDIX A]
NFPA 13 - AUTOMATIC SPRINKLER SYSTEMS, 2007 EDITION.
NFPA 14 - STANDPIPE AND HOSE SYSTEMS, 2004 EDITION.
NFPA 20 - STATIONARY PUMPS FOR FIRE PROTECTION, 2003 EDITION.

FIRE PROTECTION SYMBOLS

SYMBOL	DESCRIPTION
●	RECESSED PENDENT SPRINKLER
●200	HIGH TEMPERATURE PENDENT SPRINKLER
○	UPRIGHT SPRINKLER
◙	EXT. COVERAGE PENDENT SPRINKLER
◎	UPRIGHT SPRINKLER ON SPRIG UP
◁	HORZ. SIDEWALL SPRINKLER
	RISE OR DROP IN PIPING w/ TEE
	RISE OR DROP IN PIPING w/ ELBOW
	PIPE HANGER LOCATIONS
	PIPE HANGER LOCATION W/ STIFFNER
	FIRE SPRINKLER RISER
	INSPECTOR'S TEST CONNECTION
	NEW PIPING
	EXISTING PIPING
XX	HYDRAULIC REFERENCE POINT
LAT	LATERAL SWAY BRACE
LONG	LONGITUDAL SWAY BRACE
× BLR	BRANCH LINE RESTRAINT (BLR)
	4 WAY SWAY BRACE
✱3'-1 1/2"	DECK TO CENTERLINE
10'-4" AFF	CENTERLINE ABOVE FINISH FLOOR
✳	DENOTES EXISTING 1" OUTLET

SCOPE OF WORK / HAZARD ANALYSIS

PROVIDE A COMPLETE WET PIPE FIRE SPRINKLER SYSTEM FOR A NEW 6-STORY CLASSROOM/LABRATORY BUILDING WITH FIRE PUMP & CLASS 1 STANDPIPE SYSTEM.
ALL SPRINKLERS TO BE QUICK RESPONSE TYPE UNLESS NOTED OTHERWISE.
SPRINKLERS IN FINISHED CEILINGS TO BE RECESSED CHROME PENDENT SPRINKLERS.
SPRINKLERS IN EXPOSED AREAS TO BE CHROME UPRIGHT OR PENDENT SPRINKLERS.
PIPING TO BE BLACK STEEL SCHEDULE 10 AND SCHEDULE 40.

DESIGN CRITERIA:
OCCUPANCY CLASSIFICATION

◇	OCCUPANCY	HAZARD	MAX. SPACING	DESIGN	HOSE
A-3	LOBBIES/LECTURE	LIGHT HAZARD	225	.10/1500	100/0
B	OFFICE/CONFERENCE RM	LIGHT HAZARD	130	.10/1500	100/0
B	LABORATORIES	O.H. GR. 1	130	.15/1500	100/150
S-1	STORAGE/MECH/ELECT RM	O.H. GR. 1	130	.15/1500	100/150

FLOW TEST INFORMATION:	ACTUAL	REDUCED 10 PERCENT
STATIC:	60 psi	54 psi
RESIDUAL:	55 psi	49 psi
FLOW:	914 gpm	914 gpm

TEST DATE: 8-19-2011 9:12 AM
ORIFICE SIZE: 2-1/2"
ORIFICE COEFFICIENT: 0.90

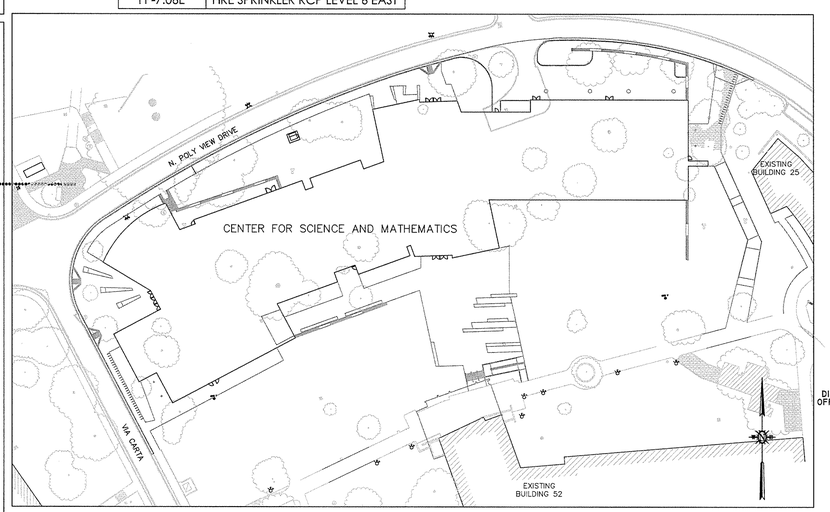
FLOW TEST PERFORMED BY FLUID RESOURCE MANAGEMENT
NOTE: FLOWING HYDRANT # 64 WITH STATIC & RESIDUAL PRESSURE FROM HYDRANT # 63

GENERAL SYSTEM NOTES:

1. ALL SYSTEM PIPING SHALL BE HYDROSTATICALLY TESTED AT 200 PSI OR AT 50 PSI ABOVE THE OPERATIONAL STATIC PRESSURE OF THE SYSTEM, WHICHEVER IS GREATER FOR TWO HOURS.
2. EACH VALVE SHALL HAVE A PERMANENTLY AFFIXED SIGN INDICATING ITS FUNCTION. ALL SPRINKLER SYSTEM CONTROL VALVE HANDLES TO BE LOCATED 7'-0" MAX. A.F.F.
3. A STOCK OF SPARE SPRINKLERS OF EACH STYLE AND TEMPERATURE RATING, WITH A SPRINKLER WRENCH, SHALL BE LOCATED NEAR THE RISER WHERE THE TEMPERATURE TO WHICH THEY
4. SPRINKLERS SHALL BE QUICK RESPONSE WITH CHROME RECESSED ESCUTCHEONS U.O.N. AND SHALL BE IN ALIGNMENT AND PARALLEL TO CEILING GRIDS
   SPRINKLERS IN UNFINISHED AREAS TO BE TYCO MODEL TY-FRB QUICK RESPONSE BRASS UPRIGHT
5. MAIN PIPING FOR THIS SYSTEM SHALL BE SCHEDULE 10 PIPE WITH GROOVED ENDS WITH APPLICABLE FITTINGS.
   BRANCH LINE CONNECTIONS TO THE MAIN SHALL BE PRE-DRILLED WITH SHOP WELDED OUTLETS.
   THREADED PIPING 1" TO 2" TO BE BLACK STEEL BMT SCHEDULE 40 WITH BLACK CAST IRON OR DUCTILE IRON FITTINGS
   1 1/4" AND LARGER BRANCH LINE & MAIN PIPING TO BE SCHEDULE 10 PIPE WITH GROOVED ENDS WITH GROOVED FITTINGS.
6. ALL MATERIALS USED IN THE INSTALLATION OF THESE SYSTEMS SHALL BE NEW AND OF CURRENT ISSUE, AND APPROVED BY U.L. (UNDERWRITERS LAB) AND/OR FM (FACTORY MUTUAL). ALL MATERIALS SHALL BE IN CONFORMANCE WITH NFPA-13, 2007 AS WELL AS THE AUTHORITY HAVING JURISDICTION.
7. SYSTEM PIPING WILL BE SUPPORTED WITH HANGERS IN ACCORDANCE WITH NFPA-13, 2007.
8. SPACING AND DETAILS OF THE SUPPORT AND BRACING OF FIRE SPRINKLER PIPING SHALL COMPLY WITH THE 2007 EDITION OF NFPA 13.
9. PAINTING OF THE SYSTEM PIPING AND COMPONENTS IS NOT PART OF THIS SCOPE AND, IF REQUIRED, IT SHALL BE PERFORMED BY OTHERS
10. UNDERGROUND PIPING IS NOT PART OF THIS SCOPE. FIRE PROTECTION CONTRACT TO START AT FLANGE (BY OTHERS) AT 6" ABOVE FINISHED FLOOR.
11. WIRING OF WATERFLOW SWITCH & CONTROL VALVE TAMPER SWITCHES BY OTHERS. ALL OTHER ALARM DEVICES TO BE PROVIDED, INSTALLED AND TESTED BY OTHERS

Sheet List Table

Sheet Number	Sheet Title
FP-1.0	COVER SHEET
FP-2.0	FIRE SPRINKLER SITE PLAN
FP-3.0	FIRE PUMP PLAN
~~FP-4.0~~	~~TEMP. STANDPIPE~~
FP-4.0	STANDPIPE - OVERALL ISOMETRIC
FP-4.1	STANDPIPE # 1 DETAILS
FP-4.2	STANDPIPE # 3 DETAILS
FP-4.3	STANDPIPE # 4 DETAILS
FP-4.4	STANDPIPE # 5 DETAILS
FP-5.0	HANGER & E.Q. DETAILS
FP-6.01W	FIRE SPRINKLER PLAN LEVEL 1 WEST
FP-6.02W	FIRE SPRINKLER PLAN LEVEL 2 WEST
FP-6.02E	FIRE SPRINKLER PLAN LEVEL 2 EAST
FP-6.03W	FIRE SPRINKLER PLAN LEVEL 3 WEST
FP-6.03E	FIRE SPRINKLER PLAN LEVEL 3 EAST
FP-6.04W	FIRE SPRINKLER PLAN LEVEL 4 WEST
FP-6.04E	FIRE SPRINKLER PLAN LEVEL 4 EAST
FP-6.05E	FIRE SPRINKLER PLAN LEVEL 5 EAST
FP-6.06E	FIRE SPRINKLER PLAN LEVEL 6 EAST
FP-7.01W	FIRE SPRINKLER RCP LEVEL 1 WEST
FP-7.02W	FIRE SPRINKLER RCP LEVEL 2 WEST
FP-7.02E	FIRE SPRINKLER RCP LEVEL 2 EAST
FP-7.03W	FIRE SPRINKLER RCP LEVEL 3 WEST
FP-7.03E	FIRE SPRINKLER RCP LEVEL 3 EAST
FP-7.04W	FIRE SPRINKLER RCP LEVEL 4 WEST
FP-7.04E	FIRE SPRINKLER RCP LEVEL 4 EAST
FP-7.05E	FIRE SPRINKLER RCP LEVEL 5 EAST
FP-7.06E	FIRE SPRINKLER RCP LEVEL 6 EAST



VICINITY MAP 0 50 100 1 INCH = 50 FEET

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECH
OFFICE OF REGULATION SERVICES
APPL 01-110181

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 EXP 12-31-11 MECHANICAL CALIFORNIA 09/29/11

—SECTION 210500—
COMMON WORK RESULTS FOR FIRE SUPPRESSION
PART 1 GENERAL
1.6.3 SHOP DRAWINGS

—SECTION 211200—
FIRE SUPPRESSION STANDPIPES
PART 1 GENERAL
1.4.3 SHOP DRAWINGS

—SECTION 211300—
FIRE SUPPRESSION SPRINKLER SYSTEMS
PART 1 GENERAL
1.4.3 SHOP DRAWINGS

—SECTION 213000—
FIRE PUMP
PART 1 GENERAL
1.4.3 SHOP DRAWINGS

#	DATE	BY	DESCRIPTION	QTY.
1	8-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

REVISIONS

ESCUTCHEON: ESC. TYPE | FINISH | TEMP. | QTY.

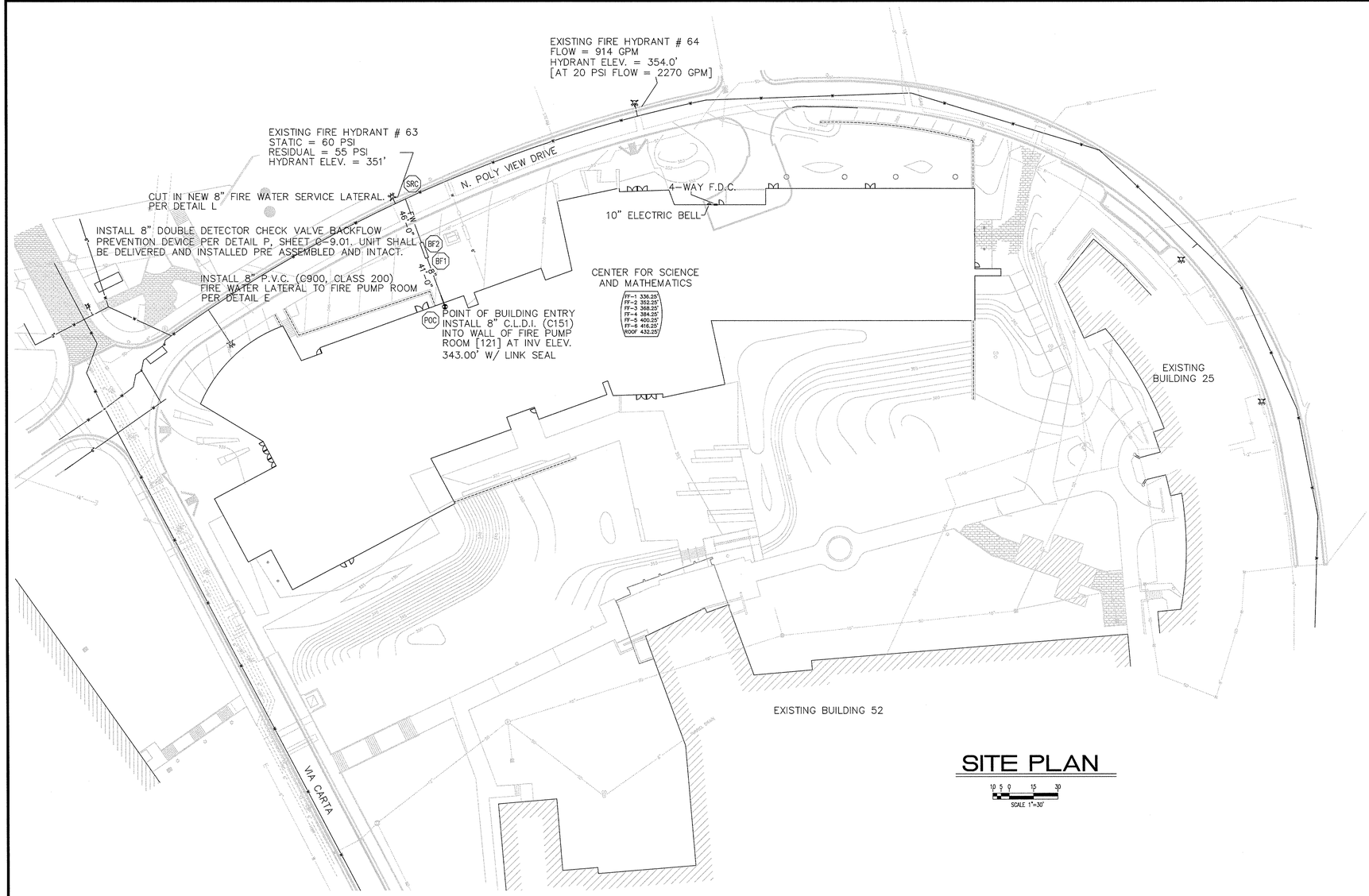
TOTAL SPRINKLERS THIS SHEET

SPRINKLER HEAD LEGEND: SYM. | MFG. | MODEL | SIN | RESP | STYLE | FINISH | N.P.T. | ORIFICE | K | TEMP.

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3154
CA-C16-901529 NV-C41-69370 AZ-L16-234798 AZ-C16-234797 UT-9370-6690455-5501 NM-MB 12-354807

PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO, CA.
CONTACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103 SAN DIEGO, CA. 92122
PLAN DESCRIPTION: COVER SHEET
DRAWN BY: NRL
SCALE: AS NOTED
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-1.0



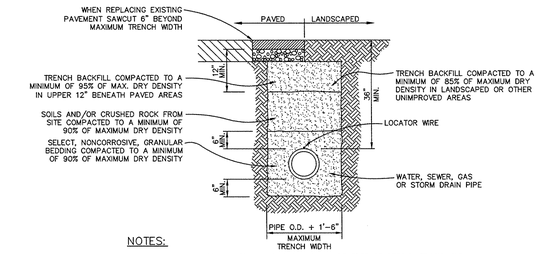
SITE PLAN

10 5 0 15 30
SCALE 1"=30'

FLOW TEST SUMMARY	
STATIC PSI	60
RESIDUAL PSI	55
PITOT PSI	35
ORIFICE DIAMETER	2 1/2
COEFFICIENT OF DISCHARGE	0.9
GPM	914
DATE	8-19-2011
LOCATION	N. POLY VIEW DRIVE
BY WHO	FLUID RESOURCE MANAGEMENT, INC.

ADJUSTED FLOW 10 % REDUCTION	
STATIC PSI	54
RESIDUAL PSI	49
GPM	914

STATIC & RESIDUAL TAKEN FROM HYD. # 63
FLOW TAKEN FROM HYD. # 64



NOTES:

A. ALL MATERIAL USED AS TRENCH BACKFILL SHALL BE FREE OF DEBRIS, TRASH, OLD PAVEMENT AND ORGANIC MATERIAL AND SHALL BE CLEANED OF ANY ROCKS AND IRREDUCIBLE MATERIAL LARGER THAN 3 INCHES.

B. WHEN BACKFILL MATERIAL INCLUDES ROCKS, THE ROCKS SHALL BE PLACED IN A SUFFICIENT SOIL MATRIX TO ENSURE THAT VOIDS CAUSED BY NESTING OF THE ROCKS WILL NOT OCCUR AND THAT THE FILL CAN BE PROPERLY COMPACTED.

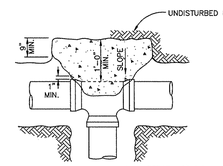
C. SELECT BEDDING SHALL NOT CONTAIN ANY ROCKS.

D. THE PAVEMENT AND LANDSCAPED AREAS SHALL BE INSTALLED PER APPROPRIATE PLANS AND SPECIFICATIONS.

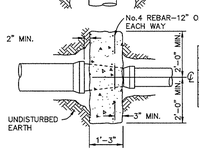
E. No. 12 AWG LOCATOR WIRE SHALL BE TAPED TO THE TOP OF ALL PIPES.

E — PIPE IN TRENCH DETAIL
N.T.S.

NOTE; UTILITY PLAN PREVIOUSLY APPROVED BY THE OFFICE OF STATE FIRE MARSHAL (FIRE and PANIC ONLY) ON NOV. 10, 2009. THESE DETAILS ARE ALL FROM THAT CIVIL PACKAGE.



PIPE SIZE	BEARING SIZE
12"	15 S.F.
10"	11 S.F.
8"	7 S.F.
6"	4 S.F.
4"	2 S.F.

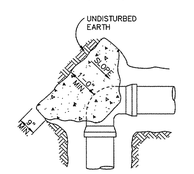


REDUCER SIZE		
LARGE END	SMALL END	BEARING AREA
12"	8"	9 S.F.
12"	10"	5 S.F.
8"	6"	4 S.F.

NOTE:
BEARING AREA SHALL BE AGAINST UNDISTURBED EARTH

ALL BOLTS AND FITTINGS SHALL BE COVERED AND TAPED WITH PLASTIC WRAP, CUMULATIVE 15 MIL.

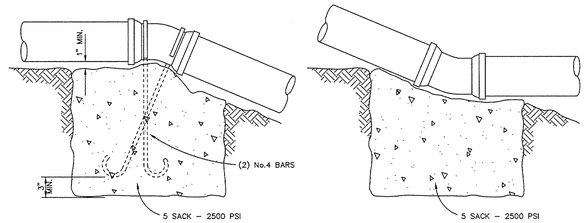
CONCRETE SHALL BE 5-SACK, 2500 PSI



PIPE SIZE	BEARING AREA			
	11-1/4° BEND	22-1/2° BEND	45° BEND	90° BEND
12"	3 S.F.	6 S.F.	12 S.F.	21 S.F.
10"	2 S.F.	4 S.F.	8 S.F.	15 S.F.
8"	2 S.F.	3 S.F.	5 S.F.	10 S.F.
6"	1 S.F.	2 S.F.	3 S.F.	4 S.F.
4"	1 S.F.	1 S.F.	1 S.F.	2 S.F.

N — THRUST BLOCK DETAIL
N.T.S.

NOTE:
1. CONCRETE BLOCK SHOULD BE APPROX. EQUAL IN ALL DIMENSIONS.
2. ALL BOLTED FLANGED ITEMS SHALL HAVE CUMULATIVE 15 MIL PLASTIC WRAP AND TAPED COVERING BOLTS AND FITTINGS.

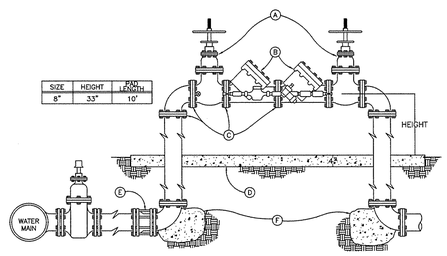


PIPE SIZE	CONCRETE VOLUMES		
	11-1/4° BEND	22-1/2° BEND	45° BEND
12"	1 YD	3 YDS	6 YDS
10"	1 YD	2 YDS	4 YDS
8"	0.5 YD	1 YD	2 YDS

PIPE SIZE	BEARING AREA			
	11-1/4° BEND	22-1/2° BEND	45° BEND	90° BEND
12"	3 S.F.	6 S.F.	12 S.F.	21 S.F.
10"	2 S.F.	4 S.F.	8 S.F.	15 S.F.
8"	2 S.F.	3 S.F.	5 S.F.	10 S.F.
6"	1 S.F.	2 S.F.	3 S.F.	4 S.F.
4"	1 S.F.	1 S.F.	1 S.F.	2 S.F.

O — VERTICAL THRUST BLOCK DETAIL
N.T.S.

SIZE	HEIGHT	END LENGTH
8"	33"	10"



(A) 8" O.S.&Y. GATE VALVES WITH FULLY-ENCAPSULATED RESILIENT SEAT – Dresser or Kennedy (CONFORMING TO LATEST EDITION OF AWWA STANDARD C509-80. [8" WILKINS MODEL 350ADA]

(B) U.S.C. APPROVED DOUBLE DETECTOR CHECK VALVE BACKFLOW PREVENTION ASSEMBLY, WITH 3/4" NON-VALVED BYPASS METER ASSEMBLY. [8" WILKINS MODEL 350ADA]

(C) ALL RISERS AND ABOVE-GROUND MAINLINE FITTINGS SHALL BE FLANGE-TYPE.

(D) P.C.C. PAD, 12" MIN. AROUND RISERS, 5-SACK.

(E) M.J. x FLANGE ADAPTOR.

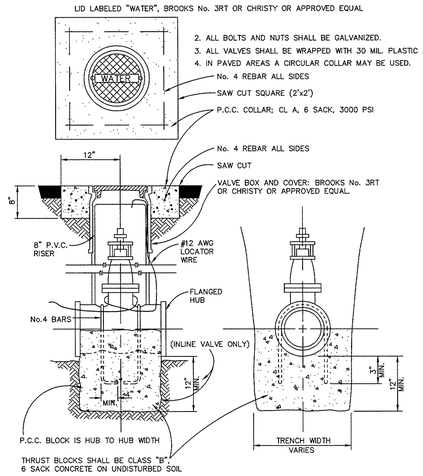
(F) P.C.C. THRUST BLOCKS, 5-SACK.

(G) 2-2 1/2" FDC ON DOWN STREAM SIDE OF BACKFLOW PREVENTION DEVICE.

(H) DOUBLE CHECK ASSEMBLY SHALL BE PROVIDED PER THE COUNTY OF SAN LUIS OBISPO APPROVED BACK FLOW DEVICES LIST. [8" WILKINS MODEL 350ADA]

P — DOUBLE CHECK ASSEMBLY
N.T.S.

LID LABELED "WATER", BROOKS No. 3RT OR CHRISTY OR APPROVED EQUAL



L — GATE VALVE BOX & ANCHOR
N.T.S.

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECH
OFFICE OF REGULATION SERVICES
APPL 01-110181

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION STATE OF CALIFORNIA
09/29/11

ESCUTCHEON: CSC. TYPE | FINISH | TEMP.

SPRINKLER HEAD LEGEND: SYM. | MFG. | MODEL | SIN | RESP. | STYLE | FINISH | N.P.T. | ORIFICE | K | TEMP.

QTY.

NO.	DATE	DRWN.	DESCRIPTION
1	9-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

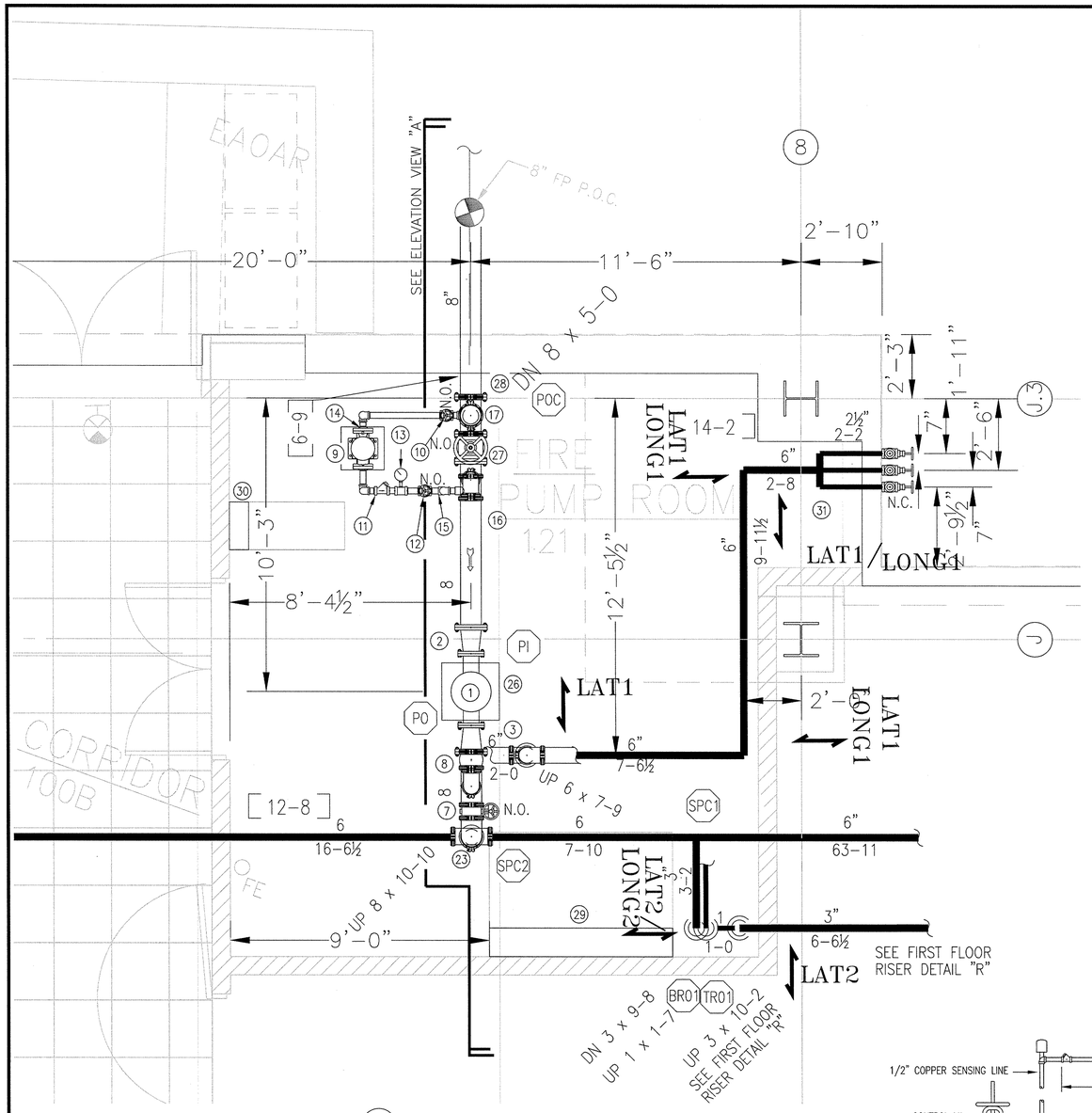
AUTOMATIC SPRINKLER Co
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3164
AZ-L16-234799 CA-C16-908529
LV-0076-2008 LT-0076-2008A55-5501 NM-MB 12-254907

DESIGNED: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO, CA.

CONTRACTOR: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER SITE PLAN

DRAWN BY: NRL
SCALE: AS NOTED
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-2.0



FIRE PUMP ROOM

1 ½ 0 2 4

SCALE 1/2"=1'-0"

FIRE PUMP KEY NOTES

1– VERTICAL INLINE FIRE PUMP RATED 113 P.S.I. @ 750 GPM W/ELECTRIC MOTOR DRIVE (60 H.P.)
2– 8"x6" ECCENTRIC FLANGED REDUCER
3– 8"X6" CONCENTRIC FLANGED INCREASER
4– DISCHARGE GUAGE
5– SUCTION GAGE
6– 8" GROOVED TEE
7– 8" GROOVED BUTTERFLY VA. W/ TAMPER SWITCH
8– 8" GROOVED CHECK VALVE. (250 PSI)
9– JOCKEY PUMP (CRN 3–11 [2.0 H.P.])
10– 1 1/4" THREADED O.S.& Y. VALVE
11– 1 1/4" THREADED CHECK VALVE
12– 1 1/4" THREADED H.D. O.S.& Y. VALVE
13– WATER GAGE ON 1/4" 3–WAY VALVE
14– 1 1/4" TO JOCKEY PUMP
15– 1 1/4" FROM JOCKEY PUMP
16– 8" CITY BYPASS
17– 8" GROOVED 90° ELBOW
18– 8" GROOVED COUPLING FLEXIBLE
19– 6" GROOVED COUPLING FLEXIBLE
20– 1" AIR RELEASE VALVE
21– 2" PIPE STAND.
22– 6" GROOVED 90° ELBOW.
23– 6" GROOVED TEE.
24– 6" GROOVED BUTTERFLY VA. W/ TAMPER SWITCH.
25– 8" X 6" GROOVED REDUCING COUPLING.
26– 24" X 24" X 8" FIRE PUMP HOUSEKEEPING PAD
27– 8" O.S.&Y. W/ TAMPER SWITCH
28– 8" GROOVED FLANGE
29– FIRE PUMP CONTROL PANEL WITH AUTOMATIC TRANSFER SWITCH.
30– JOCKEY PUMP CONTROL PANEL.
31– 6" TEST HEADER W/ THREE (3) 2 1/2" HOSE VA.
32– 6" FLOW METER [GROOVED]

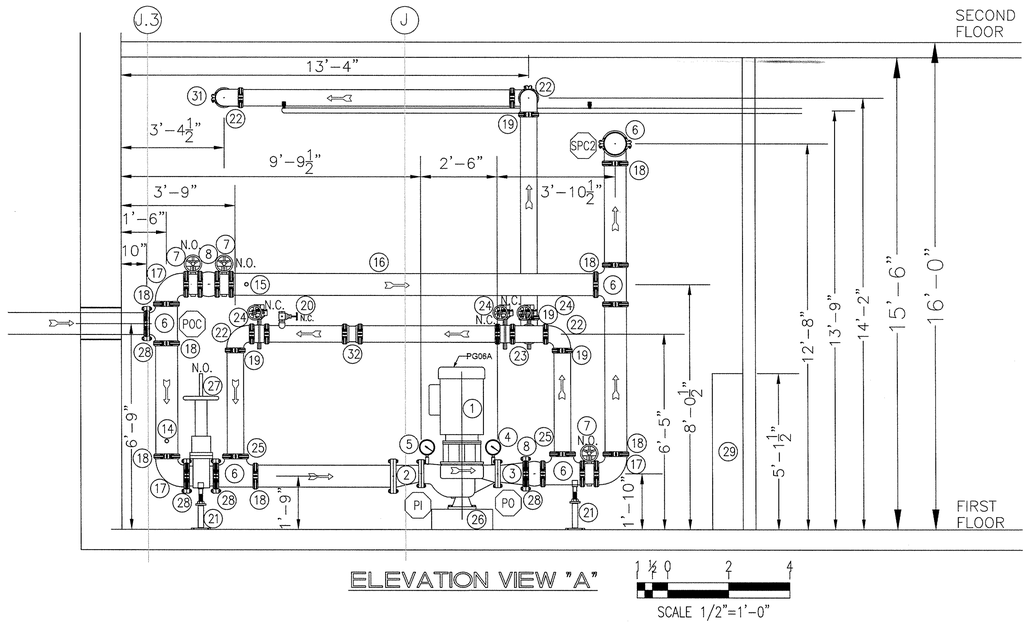
FLOW TEST SUMMARY

STATIC PSI	60
RESIDUAL PSI	55
PITOT PSI	35
ORIFICE DIAMETER	2 1/2
COEFFICIENT OF DISCHARGE	0.9
GPM	914
DATE	8-19-2011
LOCATION	N. POLY VIEW DRIVE
BY WHO	FLUID RESOURCE MANAGEMENT, INC.

ADJUSTED FLOW
10 % REDUCTION

STATIC PSI	54
RESIDUAL PSI	49
GPM	914

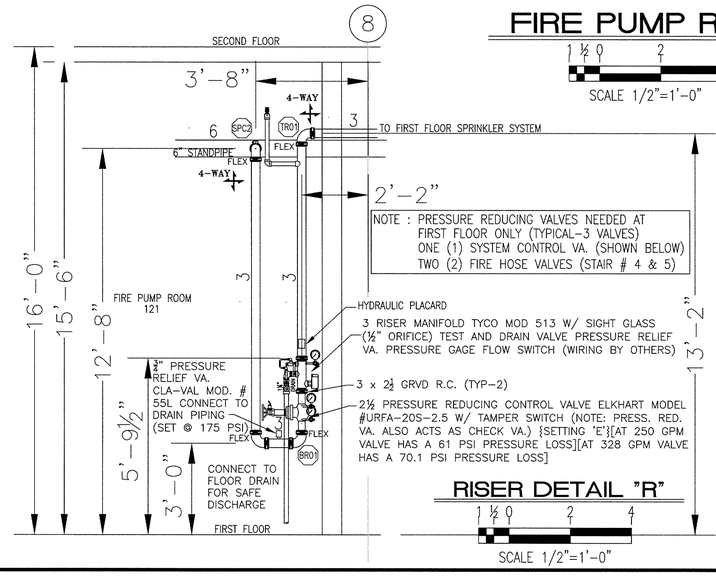
STATIC & RESIDUAL TAKEN FROM HYD. # 63
FLOW TAKEN FROM HYD. # 64



ELEVATION VIEW "A"

1 ½ 0 2 4

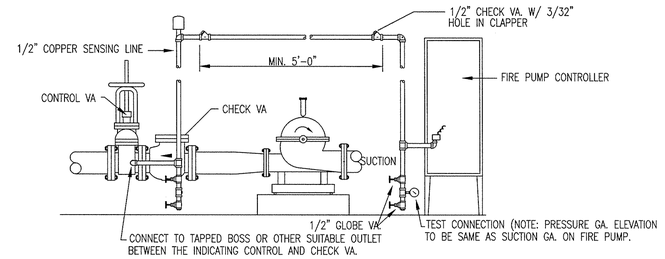
SCALE 1/2"=1'-0"



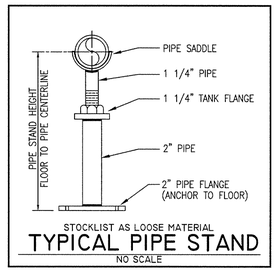
RISER DETAIL "R"

1 ½ 0 2 4

SCALE 1/2"=1'-0"



(NOTE: EACH OF THE TWO (2) FIRE PUMPS AND JOCKEY PUMP SHALL HAVE SEPARATE SENSING LINES AS SHOWN)



STOCKLIST AS LOOSE MATERIAL

TYPICAL PIPE STAND

NO SCALE

GENERAL FIRE PUMP NOTES:

1. ALL PIPING TO BE INSTALLED AND TESTED PER NFPA–13 2007 EDITION & NFPA–20 2003 EDITION.
2. ALL HANGERS AND SUPPORTS TO BE STANDARD AS PER NFPA–13 2010 EDITION.
3. ALL GROOVED COUPLINGS SHALL BE FLEX. (TYCO) OR EQUAL. ALL COUPLINGS AND FITTINGS ON DISCHARGE SIDE OF PUMP SHALL 175# RATED.
4. ALL MATERIALS TO BE U.L. LISTED.
5. ALL VALVES TO BE MONITORED WITH TAMPER SWITCHES.
6. MATERIALS SHALL BE U.S. MANUFACTURE.
7. PUMP ROOM TO BE PROVIDED WITH SUFFICIENT HEAT AND VENTILATION TO MAINTAIN A MINIMUM TEMPERATURE OF 40°F.
8. ALL ELECTRICAL WIRING TO BE PROVIDED BY OTHERS.
9. ALL PAINTING OF PIPING TO BE PROVIDED BY OTHERS.
10. ALL CONCRETE PADS, FOUNDATIONS, ETC., TO BE PROVIDED BY OTHERS.
11. ADEQUATE CLEARANCE SHALL BE PROVIDED AROUND ALL PUMPS AND VALVES.

SPECIFIC FIRE PUMP NOTES:

1. ALL 1" THRU 2" PIPE SHALL BE BLACK SCHEDULE 40 W/DUCTILE IRON SCREWED FITTINGS.
2. 8" PIPE ON SUCTION SIDE OF PUMP SHALL BE GALVANIZED SCH 40 WITH CUT GROOVED OR WELDED, W/GROOVED, FLANGED AND WELDED FITTINGS.
3. ALL 6" & 8" DISCHARGE PIPE SHALL BE BLACK SCHEDULE 40 WITH EITHER GROOVED OR FLANGED FITTING/COUP.
4. CITY FLOW TEST: STATIC=60 psi; RESIDUAL=55 psi; FLOW=914 gpm
5. PUMP DESIGN CURVE: CHURN–––125 PSI @ 0 GPM
   DESIGN–––113 PSI @ 750 GPM
   150%––– 86 PSI @ 1125 GPM
6. PUMP SHALL BE PERFORMANCE TESTED TO THE THREE (3) POINTS LISTED IN NOTE 5, PER NFPA–20, PARAGRAPH 14.2.7.2 CONTROLLER SHALL BE TESTED WITH SIX (6) AUTOMATIC STARTS, AND SIX (6) MANUAL STARTS; EACH SHALL HAVE A MINIMUM OF FIVE (5) MINUTES OF PUMP OPERATION, PER NFPA–20, PARAGRAPH 14.2.8.1, 14.2.8.2 TOTAL PUMP OPERATION SHALL BE A MINIMUM OF ONE (1) HOUR, PER NFPA–20, PARAGRAPH 14.2.12.

FIRE PUMP SETTINGS :

FIRE PUMP MAXIMUM CHURN = 191 PSI
JOCKEY PUMP STOP = 165 PSI
JOCKEY PUMP START = 155 PSI
FIRE PUMP START = 150 PSI

PROVIDE AUX. DRAINS FOR ALL TRAPPED PORTIONS OF PUMPROOM PIPING
SUPPORT ALL PIPE WITH PIPE STANDS OR FROM CONCRETE STRUCTURE AS APPROPRIATE.
FIELD VERIFY ALL INCOMING SPIGOT LOCATIONS AND ADJUST PIPING AS REQUIRED TO COMPENSATE FOR ACTUAL FIELD DIMENSIONS

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
APPL 01-110181

REGISTERED PROFESSIONAL ENGINEER
GEORGE PROVENCHER
FP 693
exp 12-31-11
STATE OF CALIFORNIA
09/29/11

SPRINKLER HEAD LEGEND
SYM. | MFG. | MODEL | SIN | RESP | STYLE | FINISH | N.P.T. | ORIFICE | K | TEMP. | ESCUTCHEON SSC. TYPE | FINISH | TEMP. | QTY.

REVISIONS
NO. | DATE | BY | DESCRIPTION
1 | 8-29-2011 | NRL | SUBMITTAL TO GENERAL CONTRACTOR

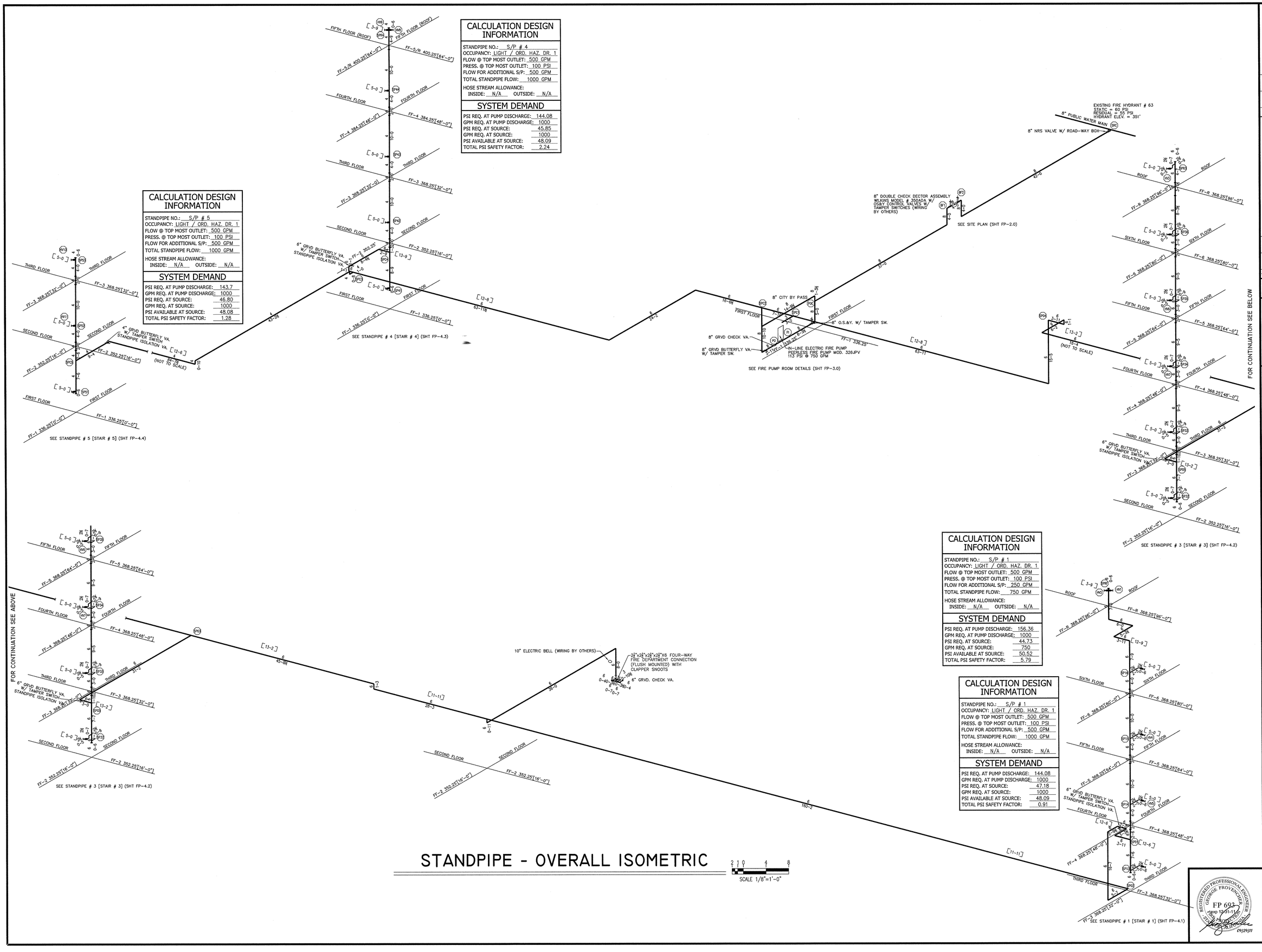
TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER Co
21600 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.465.6554
AZ-L16-284799 CA-C16-906529 NV-0078797 UT-3370-6890455-5501 NM-MB 12-354927

PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO, CA.
CONTRACTOR: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103 SAN DIEGO, CA. 92122
PHONE (858) 450-0505 FAX (858) 450-0508
SHEET: FIRE PUMP PLAN

DRAWN BY: NRL
SCALE: AS NOTED
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-3.0


CALCULATION DESIGN INFORMATION
STANDPIPE NO.: S/P # 5
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 500 GPM
TOTAL STANDPIPE FLOW: 1000 GPM
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A
SYSTEM DEMAND
PSI REQ. AT PUMP DISCHARGE: 143.7
GPM REQ. AT PUMP DISCHARGE: 1000
PSI REQ. AT SOURCE: 46.80
GPM REQ. AT SOURCE: 1000
PSI AVAILABLE AT SOURCE: 48.08
TOTAL PSI SAFETY FACTOR: 1.28
CALCULATION DESIGN INFORMATION
STANDPIPE NO.: S/P # 4
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 500 GPM
TOTAL STANDPIPE FLOW: 1000 GPM
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A
SYSTEM DEMAND
PSI REQ. AT PUMP DISCHARGE: 144.08
GPM REQ. AT PUMP DISCHARGE: 1000
PSI REQ. AT SOURCE: 45.85
GPM REQ. AT SOURCE: 1000
PSI AVAILABLE AT SOURCE: 48.09
TOTAL PSI SAFETY FACTOR: 2.24
CALCULATION DESIGN INFORMATION
STANDPIPE NO.: S/P # 1
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 250 GPM
TOTAL STANDPIPE FLOW: 750 GPM
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A
SYSTEM DEMAND
PSI REQ. AT PUMP DISCHARGE: 156.36
GPM REQ. AT PUMP DISCHARGE: 1000
PSI REQ. AT SOURCE: 44.73
GPM REQ. AT SOURCE: 750
PSI AVAILABLE AT SOURCE: 50.52
TOTAL PSI SAFETY FACTOR: 5.79
CALCULATION DESIGN INFORMATION
STANDPIPE NO.: S/P # 1
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 500 GPM
TOTAL STANDPIPE FLOW: 1000 GPM
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A
SYSTEM DEMAND
PSI REQ. AT PUMP DISCHARGE: 144.08
GPM REQ. AT PUMP DISCHARGE: 1000
PSI REQ. AT SOURCE: 47.18
GPM REQ. AT SOURCE: 1000
PSI AVAILABLE AT SOURCE: 48.09
TOTAL PSI SAFETY FACTOR: 0.91
SEE STANDPIPE # 5 [STAIR # 5] (SHT FP-4.4)
SEE STANDPIPE # 4 [STAIR # 4] (SHT FP-4.3)
SEE FIRE PUMP ROOM DETAILS (SHT FP-3.0)
SEE SITE PLAN (SHT FP-2.0)
SEE STANDPIPE # 3 [STAIR # 3] (SHT FP-4.2)
SEE STANDPIPE # 1 [STAIR # 1] (SHT FP-4.1)
FOR CONTINUATION SEE BELOW
FOR CONTINUATION SEE ABOVE
8" PUBLIC WATER MAIN
8" NRS VALVE W/ ROAD-WAY BOX
EXISTING FIRE HYDRANT # 63
STATIC = 60 PSI
RESIDUAL = 55 PSI
HYDRANT ELEV. = 351'
8" DOUBLE CHECK DECTOR ASSEMBLY WILKINS MODEL # 350ADA W/ OS&Y CONTROL VALVES W/ TAMPER SWITCHES (WIRING BY OTHERS)
8" CITY BY PASS
8" O.S.&Y. W/ TAMPER SW.
8" GRVD CHECK VA.
8" GRVD BUTTERFLY VA. W/ TAMPER SW.
IN-LINE ELECTRIC FIRE PUMP
PEERLESS FIRE PUMP MOD. 326JPV
113 PSI @ 750 GPM
4" GRVD BUTTERFLY VA. W/ TAMPER SWITCH STANDPIPE ISOLATION VA.
6" GRVD BUTTERFLY VA. W/ TAMPER SWITCH STANDPIPE ISOLATION VA.
10" ELECTRIC BELL (WIRING BY OTHERS)
2½"x2½"x2½"x6 FOUR-WAY FIRE DEPARTMENT CONNECTION (FLUSH MOUNTED) WITH CLAPPER SNOOTS
6" GRVD. CHECK VA.
(NOT TO SCALE)
ROOF
FIFTH FLOOR
FOURTH FLOOR
THIRD FLOOR
SECOND FLOOR
FIRST FLOOR
SIXTH FLOOR
FF-R 368.25'[96'-0"]
FF-5 368.25'[64'-0"]
FF-4 368.25'[48'-0"]
FF-3 368.25'[32'-0"]
FF-2 352.25'[16'-0"]
FF-1 336.25'[0'-0"]
FF-6 368.25'[80'-0"]
FF-5/R 400.25'[64'-0"]
FF-4 384.25'[48'-0"]
FF-3 368.25'[32'-0"]
FF-2 352.25'[16'-0"]
FF-1 336.25'[0'-0"]
SCALE 1/8"=1'-0"
STANDPIPE - OVERALL ISOMETRIC
SPRINKLER HEAD LEGEND
MFG. | MODEL | STYLE | FINISH | N.P.T. | ORIFICE | K. | TEMP. | ESC. TYPE | FINISH | TEMP. | QTY.
VIKING | MICRO-DROP | PENDENT | CHROME | ½" | 17/32" | 5.6 | 155° | ESCUTCHEON | CHROME | 155° | 1
VIKING | MICRO-DROP | SIDEWALL | CHROME | ½" | 17/32" | 5.6 | 155° | ESCUTCHEON | CHROME | 155° | 1
| DATE | BY | DESCRIPTION
1 | 10-24-2011 | RPC | SUBMITTAL TO GENERAL CONTRACTOR
QTY | REVISIONS
TOTAL SPRINKLERS THIS SHEET
NORTH
AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.0564
CA-C16-901529 NV-0048850
AZ-L16-234799 NM-GB 12-354807
UT-5970-6892435-5501
PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO, CA.
CONTRACT MFR: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE. SUITE 103 SAN DIEGO, CA. 92122
PLAN DESCRIPTION: STANDPIPE - OVERALL ISOMETRIC
REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION
09/29/11
DRAWN BY: ----
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-4.0

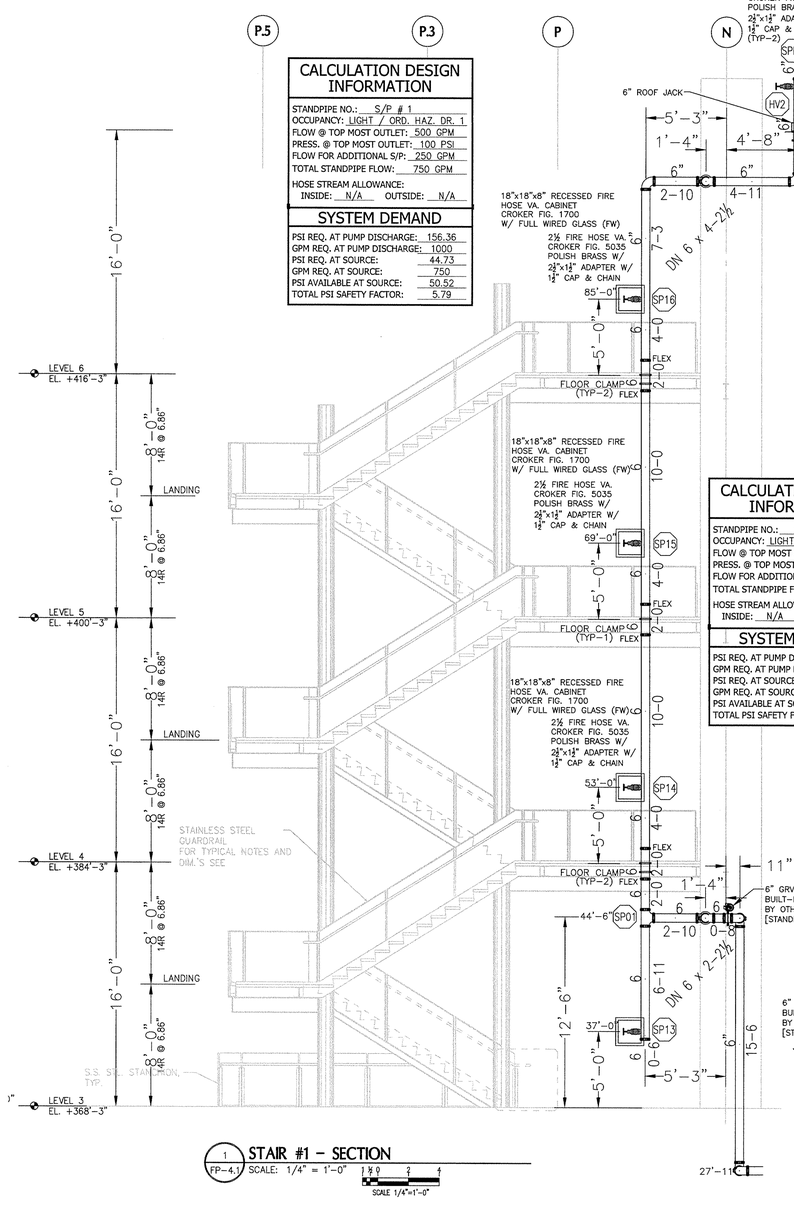
CALCULATION DESIGN INFORMATION

STANDPIPE NO.: S/P # 1
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 250 GPM
TOTAL STANDPIPE FLOW: 750 GPM

HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A

SYSTEM DEMAND

PSI REQ. AT PUMP DISCHARGE:	156.36
GPM REQ. AT PUMP DISCHARGE:	1000
PSI REQ. AT SOURCE:	44.73
GPM REQ. AT SOURCE:	750
PSI AVAILABLE AT SOURCE:	50.52
TOTAL PSI SAFETY FACTOR:	5.79



1 FP-4.1 **STAIR #1 – SECTION**
SCALE: 1/4" = 1'-0"
SCALE 1/4"=1'-0"

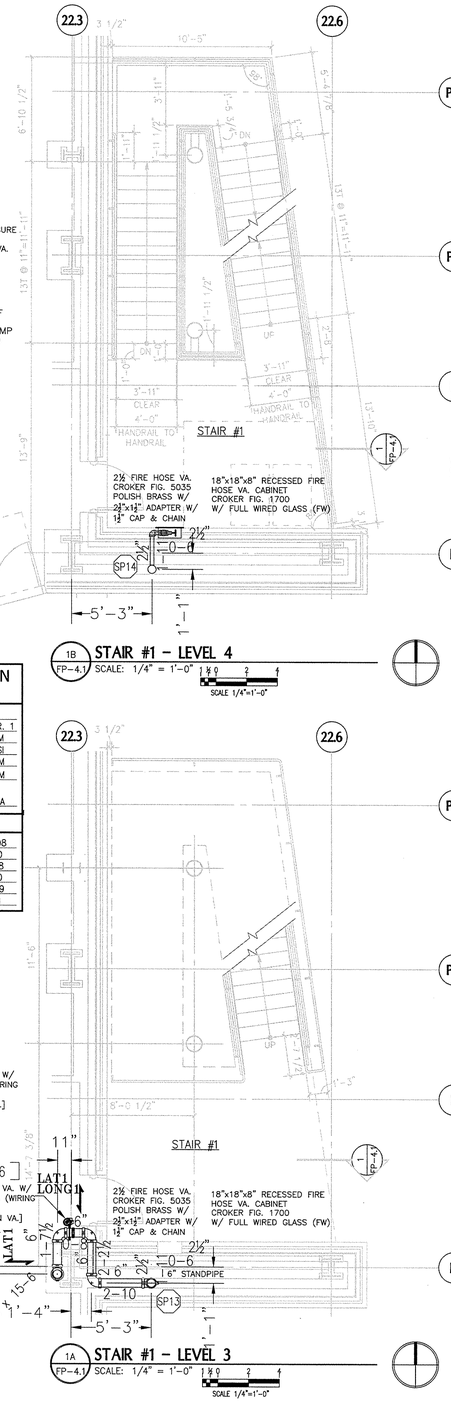
CALCULATION DESIGN INFORMATION

STANDPIPE NO.: S/P # 1
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 500 GPM
TOTAL STANDPIPE FLOW: 1000 GPM

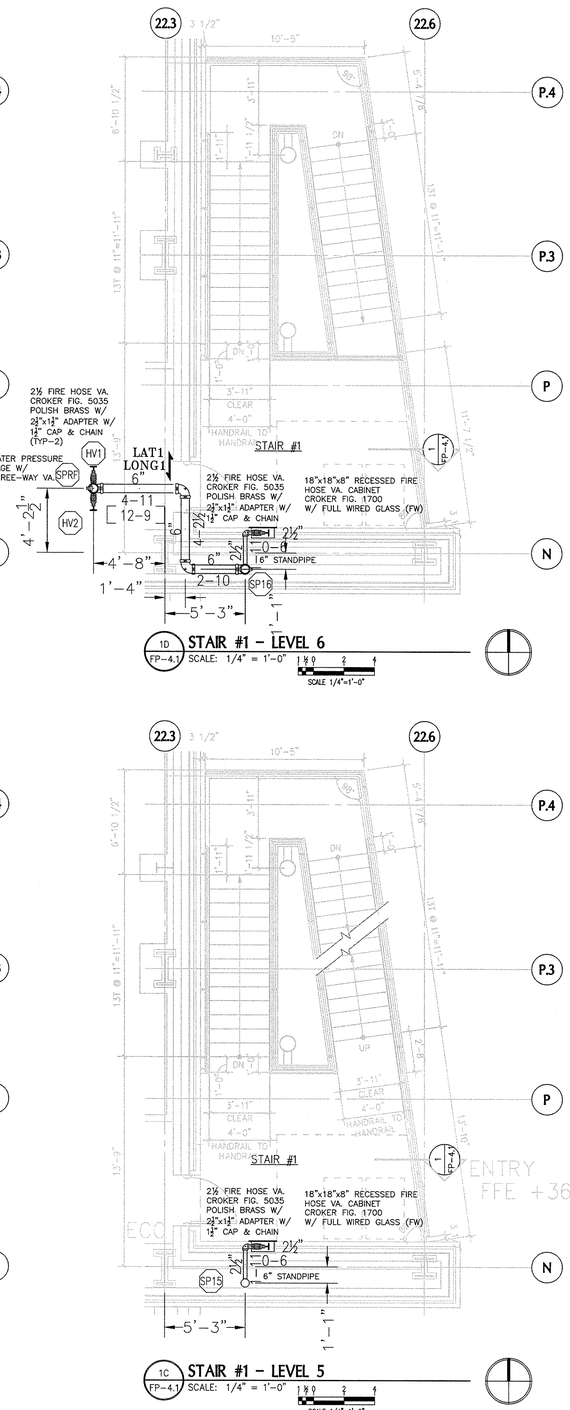
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A

SYSTEM DEMAND

PSI REQ. AT PUMP DISCHARGE:	144.08
GPM REQ. AT PUMP DISCHARGE:	1000
PSI REQ. AT SOURCE:	47.18
GPM REQ. AT SOURCE:	1000
PSI AVAILABLE AT SOURCE:	48.09
TOTAL PSI SAFETY FACTOR:	0.91



1B FP-4.1 **STAIR #1 – LEVEL 4**
SCALE: 1/4" = 1'-0"
SCALE 1/4"=1'-0"



1D FP-4.1 **STAIR #1 – LEVEL 6**
SCALE: 1/4" = 1'-0"
SCALE 1/4"=1'-0"

1A FP-4.1 **STAIR #1 – LEVEL 3**
SCALE: 1/4" = 1'-0"
SCALE 1/4"=1'-0"

1C FP-4.1 **STAIR #1 – LEVEL 5**
SCALE: 1/4" = 1'-0"
SCALE 1/4"=1'-0"

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.

ESCUTCHEON

ESC.	TYPE	FINISH	TEMP.

#	DATE	BY	DESCRIPTION	QTY
A	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.582.7800 Fax 623.434.0354
AZ-L06-234799 NV-0044-66529 CA-C16-601529 UT-3370-6890455-5501 NM-MS 12-354927

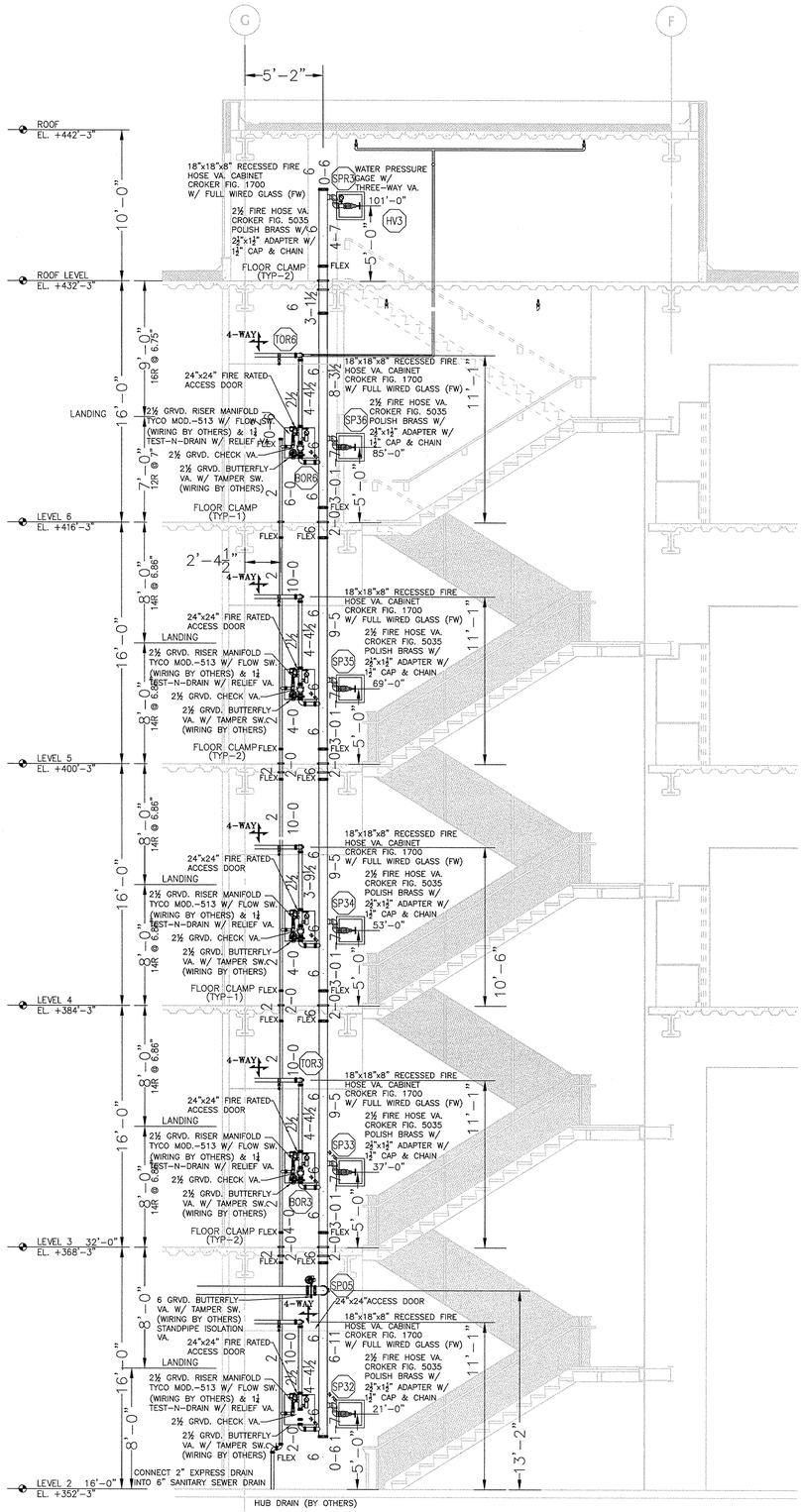
PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONTRACTOR: GILBANE CONSTRUCTION
615 ELSINORE PLACE, SUITE 105
SAN DIEGO, CA. 92102

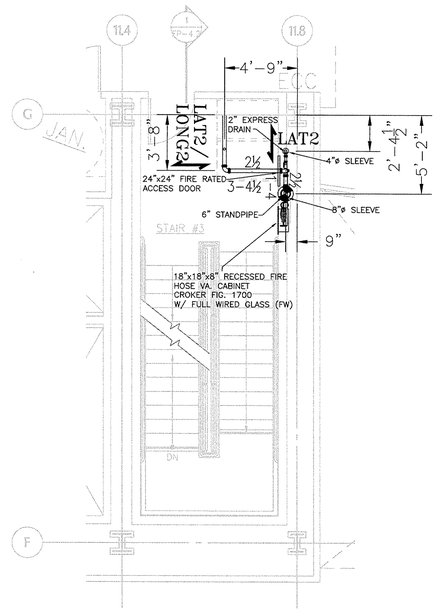
PLAN DESCRIPTION: STANDPIPE # 1 DETAILS

DRAWN BY: ----
SCALE: 1/4"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-4.1

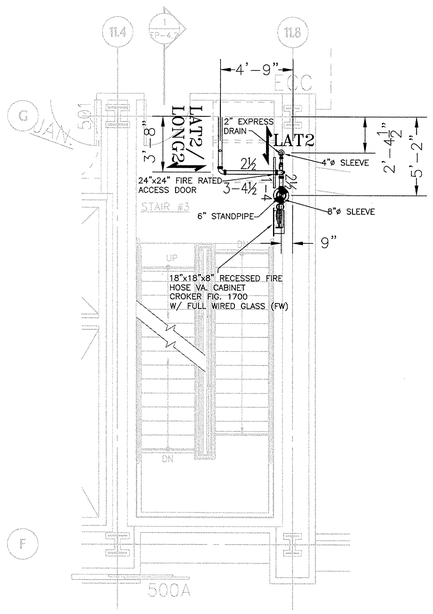
REGISTERED PROFESSIONAL ENGINEER
GEORGE PROVENCHER
FP 693
exp 12-31-11
STATE OF CALIFORNIA
09/29/11



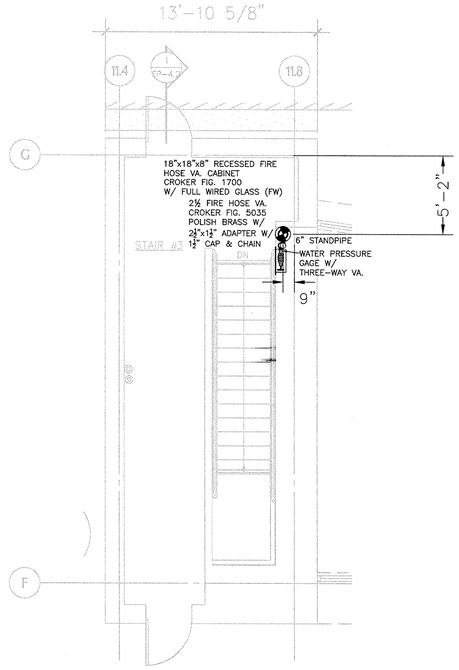
1 / FP-4.2 **SECTION- STAIR #3**
SCALE: 1/4" = 1'-0"



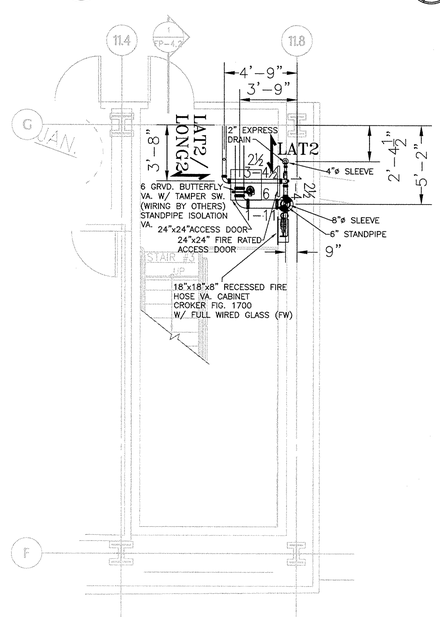
1B / FP-4.2 **STAIR #3 - LEVEL 3**
SCALE: 1/4" = 1'-0"



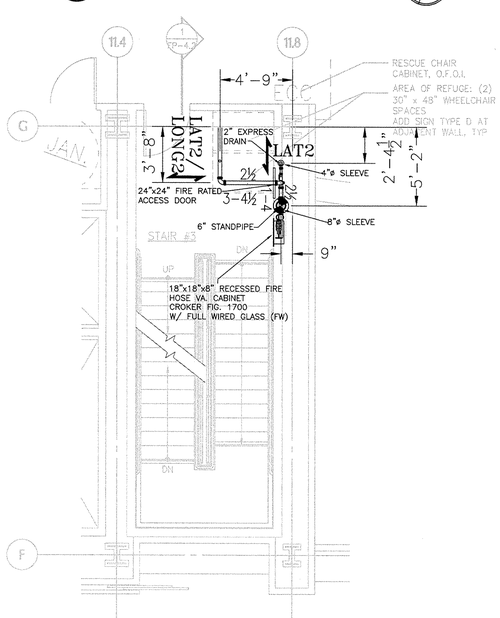
1D / FP-4.2 **STAIR #3 - LEVEL 5**
SCALE: 1/4" = 1'-0"



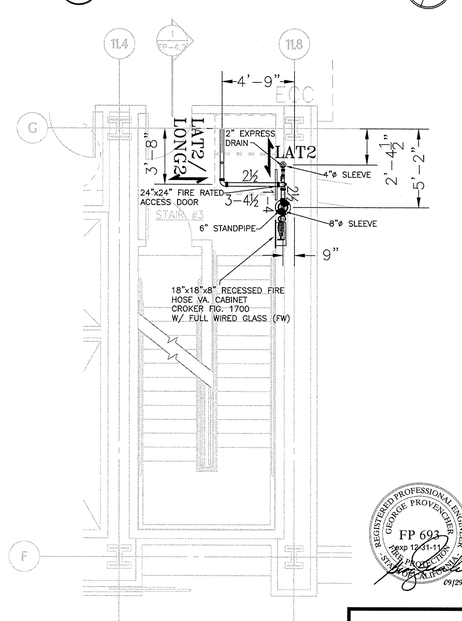
1F / FP-4.2 **STAIR #3 - ROOF LEVEL**
SCALE: 1/4" = 1'-0"



1A / FP-4.2 **STAIR #3 - LEVEL 2**
SCALE: 1/4" = 1'-0"



1C / FP-4.2 **STAIR #3 - LEVEL 4**
SCALE: 1/4" = 1'-0"



1E / FP-4.2 **STAIR #3 - LEVEL 6**
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
GEORGE PROVENCHER
FP 693
exp 12-31-11
FIRE PROTECTION
09/29/11

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.

SYM.	ORIFICE	K	TEMP.	ESC. TYPE	FINISH	TEMP.

ESCUTCHEON

#	DATE	BY	DESCRIPTION	QTY.
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

TOTAL SPRINKLERS THIS SHEET QTY.

REVISIONS

NORTH

AERO AUTOMATIC SPRINKLER CO.
2160S North Central Ave. Phoenix, Arizona 85004
623.580.7800 Fax 623.454.3564
AZ-L16-234799 CA-C16-905529
NV-0048660 NM-376-0000
UT-5970-6892405-5501 NM-MB 92-354907

PROJECT:
CAL POLY
CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONTRACTOR:
GILBANE CONSTRUCTION
5255 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122
PH: (858) 909-2000 FAX: (858) 909-2020

STANDPIPE # 3 DETAILS

DRAWN BY:	----
SCALE:	1/4"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-4.2

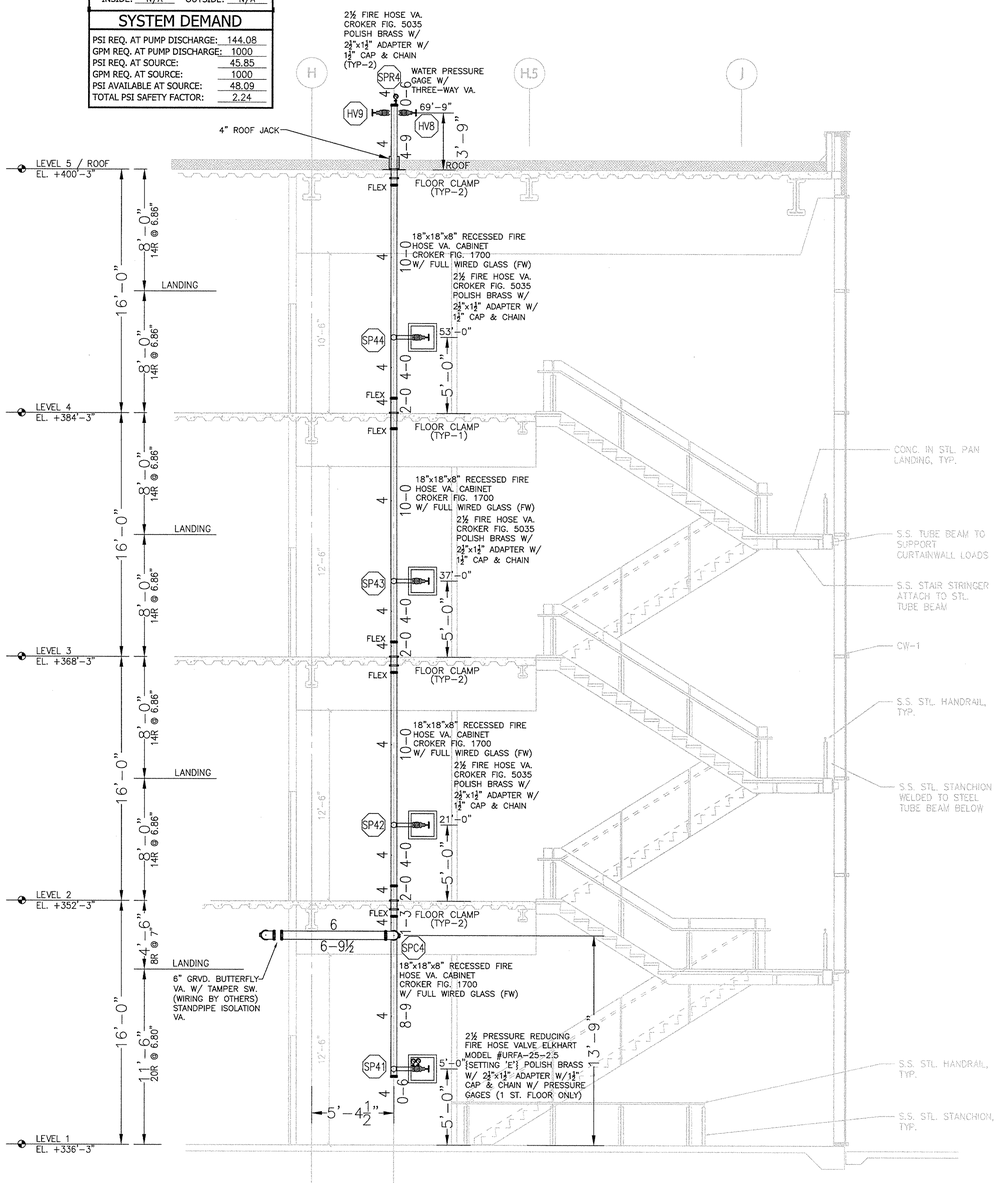
CALCULATION DESIGN INFORMATION

STANDPIPE NO.: S/P # 4
OCCUPANCY: LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET: 500 GPM
PRESS. @ TOP MOST OUTLET: 100 PSI
FLOW FOR ADDITIONAL S/P: 500 GPM
TOTAL STANDPIPE FLOW: 1000 GPM

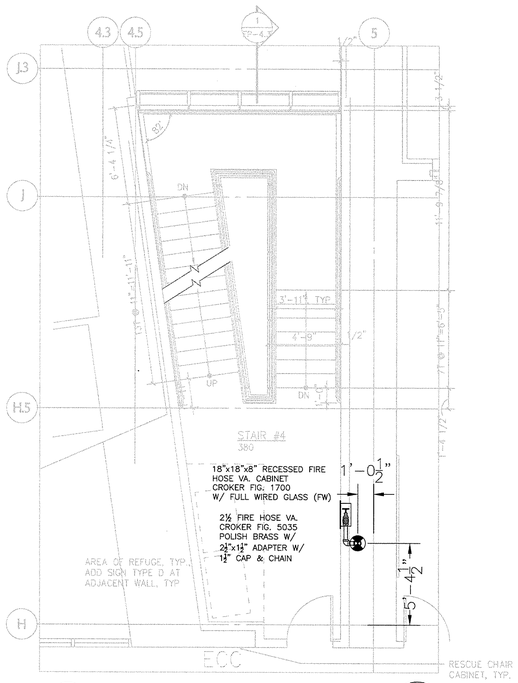
HOSE STREAM ALLOWANCE:
INSIDE: N/A OUTSIDE: N/A

SYSTEM DEMAND

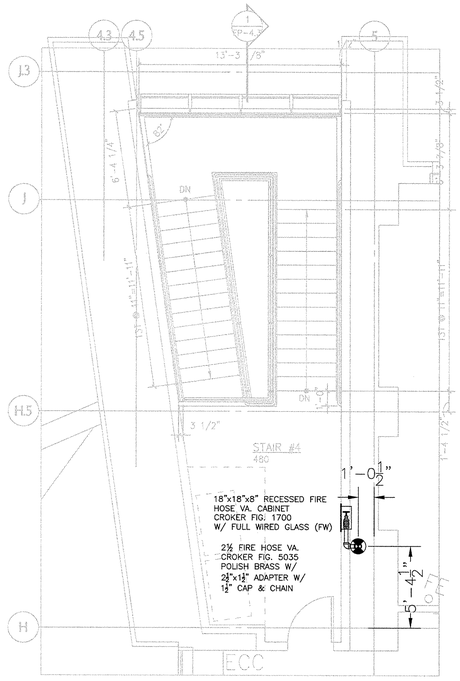
PSI REQ. AT PUMP DISCHARGE:	144.08
GPM REQ. AT PUMP DISCHARGE:	1000
PSI REQ. AT SOURCE:	45.85
GPM REQ. AT SOURCE:	1000
PSI AVAILABLE AT SOURCE:	48.09
TOTAL PSI SAFETY FACTOR:	2.24



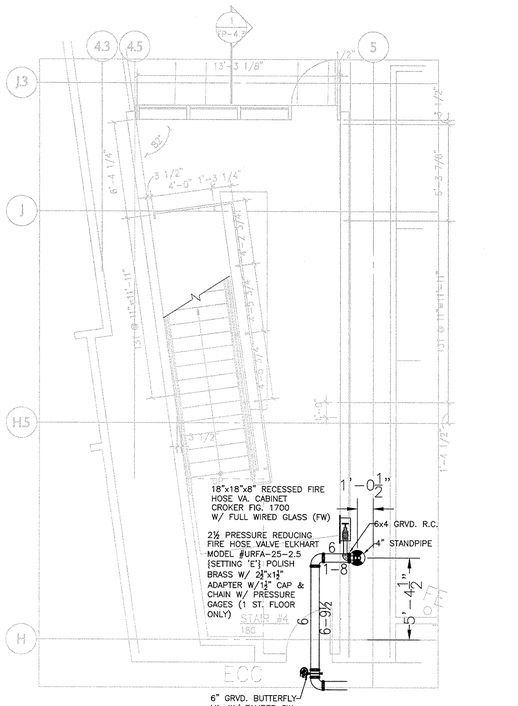
1 FP-4.3 **STAIR #4 – SECTION**
SCALE: 1/4" = 1'-0"



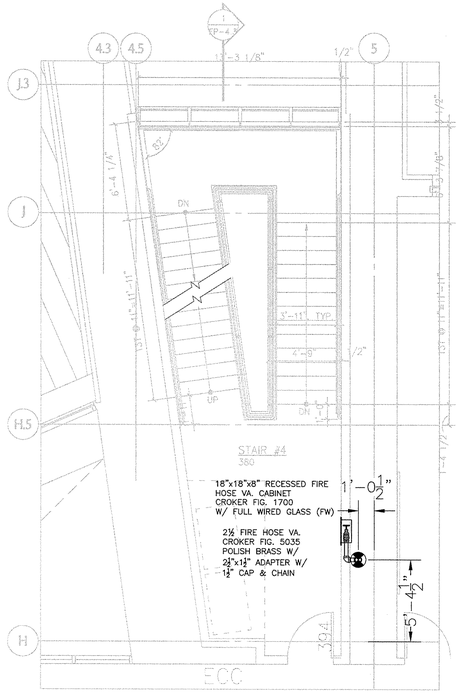
1B FP-4.3 **STAIR #4 – LEVEL 2**
SCALE: 1/4" = 1'-0"



1D FP-4.3 **STAIR #4 – LEVEL 4**
SCALE: 1/4" = 1'-0"



1A FP-4.3 **STAIR #4 – LEVEL 1**
SCALE: 1/4" = 1'-0"



1C FP-4.3 **STAIR #4 – LEVEL 3**
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION STATE OF ARIZONA
09/29/11

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON ESC. TYPE	FINISH	TEMP.	QTY.

#	DATE	BY	DESCRIPTION	QTY.
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.582.7900 Fax 623.434-8254
AZ-L16-254799 CA-C16-901559 NV-0046050 NM-MB 12-354877
UT-5370-6690455-5501

PROJECT:
CAL POLY
CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONSTRUCTION MANAGER:
GILBANE CONSTRUCTION
4365 EXECUTIVE DRIVE, SUITE 105
SAN DIEGO, CA. 92121

SHEET TITLE:
STANDPIPE # 4 DETAILS

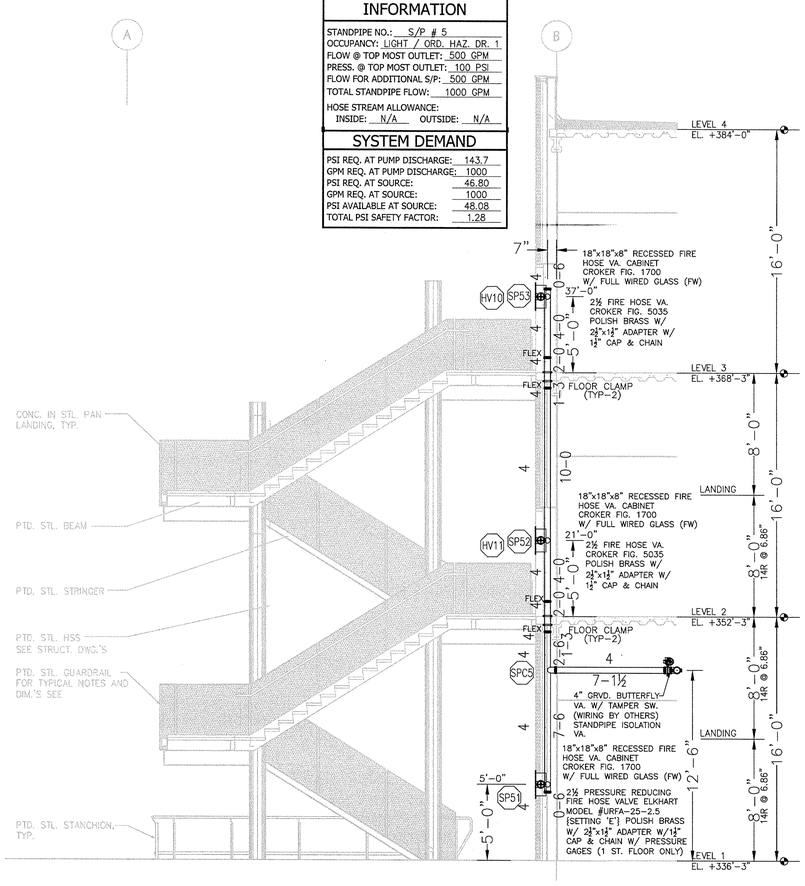
DRAWN BY: ----
SCALE: 1/4"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-4.3

CALCULATION DESIGN INFORMATION

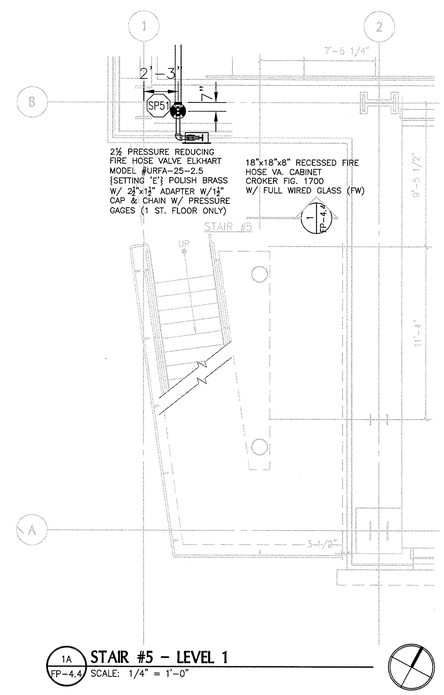
STANDPIPE NO.:	S/P # 5
OCCUPANCY:	LIGHT / ORD. HAZ. DR. 1
FLOW @ TOP MOST OUTLET:	500 GPM
PRESS. @ TOP MOST OUTLET:	100 PSI
FLOW FOR ADDITIONAL S/P:	500 GPM
TOTAL STANDPIPE FLOW:	1000 GPM
HOSE STREAM ALLOWANCE:	
INSIDE: N/A	OUTSIDE: N/A

SYSTEM DEMAND

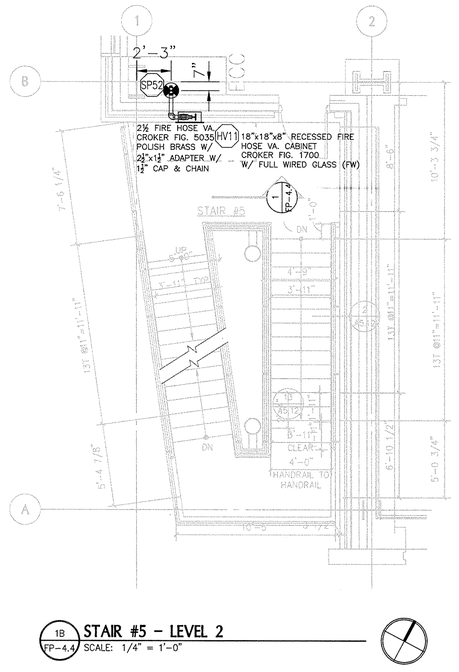
PSI REQ. AT PUMP DISCHARGE:	143.7
GPM REQ. AT PUMP DISCHARGE:	1000
PSI REQ. AT SOURCE:	46.80
GPM REQ. AT SOURCE:	1000
PSI AVAILABLE AT SOURCE:	48.08
TOTAL PSI SAFETY FACTOR:	1.28



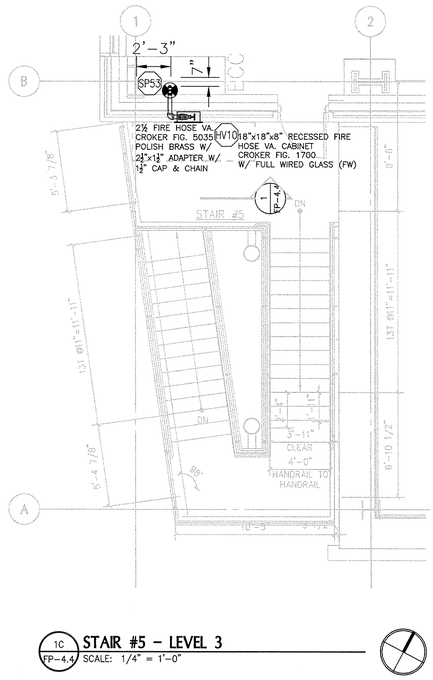
1 FP-4.4 **SECTION-STAIR #5**
SCALE: 1/4" = 1'-0"



1A FP-4.4 **STAIR #5 - LEVEL 1**
SCALE: 1/4" = 1'-0"



1B FP-4.4 **STAIR #5 - LEVEL 2**
SCALE: 1/4" = 1'-0"



1C FP-4.4 **STAIR #5 - LEVEL 3**
SCALE: 1/4" = 1'-0"

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.

ESCUTCHEON

ESC. TYPE	FINISH	TEMP.

#	DATE	BY	REVISIONS	QTY.
3	9-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

TOTAL SPRINKLERS THIS SHEET QTY.

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax. 623.434.5164
AZ-L-16-234799 CA-C16-906529
AZ-C-39-234977 NV-044-0070
UT-5377>6980X495-5501 NM-MS 12-354907

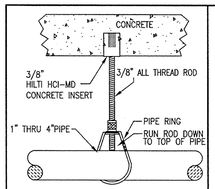
IMAGE: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO, CA.

CONTRACT MGR: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 105
SAN DIEGO, CA. 92122

PLAN DESCRIPTION: STANDPIPE # 5 DETAILS

DRAWN BY: ----
SCALE: 1/4"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-4.4

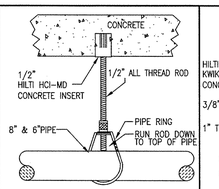
REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 STATE OF ARIZONA
09/29/11



HANGER #05 - ROD & RING

HANGER DETAIL

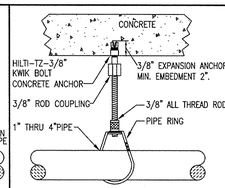
NO SCALE



HANGER #05 - ROD & RING

HANGER DETAIL

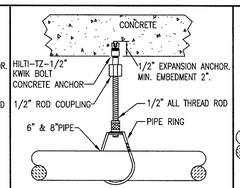
NO SCALE



HANGER #04 - KB-TZ EXPANSION ANCHOR

HANGER DETAIL

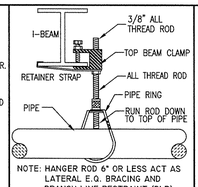
NO SCALE



HANGER #04 - KB-TZ EXPANSION ANCHOR

HANGER DETAIL

NO SCALE

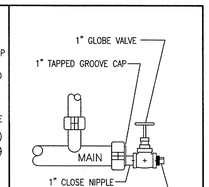


NOTE: HANGER ROD 6" OR LESS ACT AS LATERAL E.Q. BRACING AND BRANCH LINE RESTRAINT (BLR)

HANGER #01 - TOP BEAM CLAMP

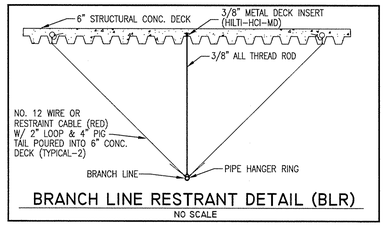
HANGER DETAIL

NO SCALE



AUXILIARY DRAIN

NO SCALE



BRANCH LINE RESTRANT DETAIL (BLR)

NO SCALE

Tol-Brace Seismic Calculations

Project Address: Cal Poly Center for Science; California Polytechnic State University; San Luis Obispo, Ca.; Job # 10034

Aero Automatic Sprinkler C
21605 N. Central Ave.
Phoenix, Az. 85024
(623)580-7847
CA-C16-901529

TOLCO a brand of NIBCO

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

Maximum Spacing	40' 0" (12.19 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	30° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	1227 lbs (557 kg)
Force Factor (Cp)	0.61

Fastener Information

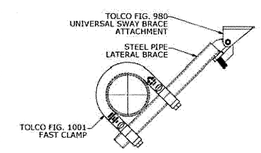
Fastener Orientation	NFPA Type A
Type	HILTI-TZ
Diameter	1/2
Length	3 3/4
Maximum Load	1412 lbs (640 kg)

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.1001 Clamp	1007 lbs (457 kg)
Fig.980 Universal Swivel	1382 lbs (627 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Brace Identification on Plans	LAT 1
Orientation of Brace	Lateral

Braced Pipe: 6" Sch.40 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
6" Sch 40 Steel Pipe (152.4 mm)	40ft (12.2 m)	773 lbs (351 kg)
Percentage added for Fittings and Sprinklers	15%	116 lbs (52.62 kg)
Total Adjusted Load of all pipe within Zone of Influence		889 lbs (403 kg)

{Tol-Brace Version 7}

Tol-Brace Seismic Calculations

Project Address: Cal Poly Center for Science; California Polytechnic State University; San Luis Obispo, Ca.; Job # 10034

Aero Automatic Sprinkler C
21605 N. Central Ave.
Phoenix, Az. 85024
(623)580-7847
CA-C16-901529

TOLCO a brand of NIBCO

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

Maximum Spacing	45' 0" (13.72 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	30° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	1227 lbs (557 kg)
Force Factor (Cp)	0.61

Fastener Information

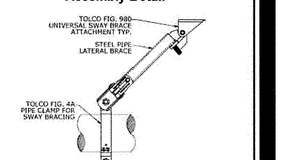
Fastener Orientation	NFPA Type A
Type	HILTI-TZ
Diameter	1/2
Length	3 3/4
Maximum Load	1412 lbs (640 kg)

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.4A Clamp	1007 lbs (457 kg)
Fig.980 Universal Swivel	1382 lbs (627 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Brace Identification on Plans	LONG 1
Orientation of Brace	Longitudinal

Braced Pipe: 6" Sch.40 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
6" Sch 40 Steel Pipe (152.4 mm)	45ft (13.7 m)	870 lbs (395 kg)
Percentage added for Fittings and Sprinklers	15%	130 lbs (58.97 kg)
Total Adjusted Load of all pipe within Zone of Influence		1000 lbs (454 kg)

{Tol-Brace Version 7}

Tol-Brace Seismic Calculations

Project Address: Cal Poly Center for Science; California Polytechnic State University; San Luis Obispo, Ca.; Job # 10034

Aero Automatic Sprinkler C
21605 N. Central Ave.
Phoenix, Az. 85024
(623)580-7847
CA-C16-901529

TOLCO a brand of NIBCO

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

Maximum Spacing	35' 0" (10.67 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	30° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	1227 lbs (557 kg)
Force Factor (Cp)	0.61

Fastener Information

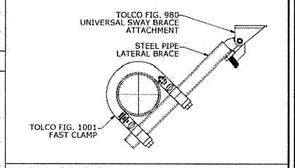
Fastener Orientation	NFPA Type A
Type	HILTI-TZ
Diameter	1/2
Length	3 3/4
Maximum Load	1412 lbs (640 kg)

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.1001 Clamp	1007 lbs (457 kg)
Fig.980 Universal Swivel	1382 lbs (627 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Brace Identification on Plans	LAT 2
Orientation of Brace	Lateral

Braced Pipe: 3" Sch.10 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
3" Sch 10 Steel Pipe (76.2 mm)	35ft (10.7 m)	170 lbs (77 kg)
1.5" Sch.40 Steel Pipe (38.1 mm)	10ft (3 m)	22 lbs (10 kg)
1.25" Sch.40 Steel Pipe (31.75 mm)	31ft (9.4 m)	55 lbs (25 kg)
1" Sch.40 Steel Pipe (25.4 mm)	140ft (42.7 m)	175 lbs (79 kg)
Percentage added for Fittings and Sprinklers	15%	63 lbs (28.56 kg)
Total Adjusted Load of all pipe within Zone of Influence		485 lbs (220 kg)

{Tol-Brace Version 7}

Tol-Brace Seismic Calculations

Project Address: Cal Poly Center for Science; California Polytechnic State University; San Luis Obispo, Ca.; Job # 10034

Aero Automatic Sprinkler C
21605 N. Central Ave.
Phoenix, Az. 85024
(623)580-7847
CA-C16-901529

TOLCO a brand of NIBCO

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

Maximum Spacing	80' 0" (24.38 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	30° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	1227 lbs (557 kg)
Force Factor (Cp)	0.61

Fastener Information

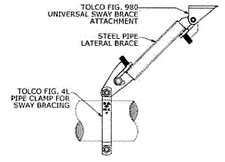
Fastener Orientation	NFPA Type A
Type	HILTI-TZ
Diameter	1/2
Length	3 3/4
Maximum Load	1412 lbs (640 kg)

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.4L Clamp	1007 lbs (457 kg)
Fig.980 Universal Swivel	1382 lbs (627 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Brace Identification on Plans	LONG 2
Orientation of Brace	Longitudinal

Braced Pipe: 3" Sch.10 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
3" Sch.10 Steel Pipe (76.2 mm)	80ft (24.4 m)	387 lbs (176 kg)
Percentage added for Fittings and Sprinklers	15%	58 lbs (26.31 kg)
Total Adjusted Load of all pipe within Zone of Influence		446 lbs (202 kg)

{Tol-Brace Version 7}

SPRINKLER PIPE HANGER SPACING
N.F.P.A. 13, 2007 EDITION

TABLE 9.2.2.1 MAXIMUM DISTANCE BETWEEN HANGERS (FT-IN.)

NOMINAL PIPE SIZE	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3" & 4"	6"	8"
STEEL PIPE	N/A	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0
THREADED LIGHTWALL	N/A	12-0	12-0	12-0	12-0			N/A	N/A
COPPER TUBE									
CPVC	5-6	6-0	6-6	7-0	8-0	9-0	N/A	N/A	N/A

FIGURE A-9.2.3.4 DISTANCE FROM SPRINKLER TO HANGER

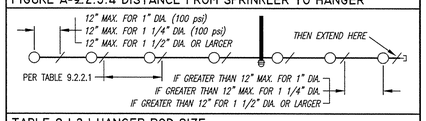


TABLE 9.1.2.1 HANGER ROD SIZE

PIPE SIZE	DIAMETER OF ROD	PIPE SIZE	DIAMETER OF ROD
UP TO AND INCLUDING 4"	3/8"	6" AND 8"	1/2"

THE CUMULATIVE HORIZONTAL LENGTH OF AN UNSUPPORTED ARMOVER TO A SPRINKLER, SPRINKLER DROP, OR SPRIG-UP SHALL NOT EXCEED 12 IN. FOR STEEL OR 6 IN. FOR COPPER TUBE. (PRESSURE EXCEEDS 100 psi)

SWAY BRACING

SWAY BRACE COMPONENTS

FIG. 980 TYPICAL

FIG. 1001 FAST CLAMPS* UNDERWRITERS LABORATORIES LISTED MUST BE USE WITH TOLCO U.L. LISTED ATTACHMENTS. FIG. 980 SWIVEL FITTINGS

FIG. 1001 FAST CLAMP* RISER BRACE

PIPE CLAMP (FIG. 4L) USED IN LONGITUDINAL BRACE (OPTIONAL METHOD)

LATERAL (TRANSVERSE) BRACE

FIG. 980 TYPICAL

FIG. 1001

LEAF SPRING

LEAF SPRING CONFIGURATION AND ORIENTATION BEFORE NUTS ARE TIGHTENED

FIG. 1001 FAST CLAMP* LEAF SPRING SHOWN FLAT

NOTE: TO ASSURE MINIMUM REQUIRED TORQUE-TIGHTEN HEX NUTS UNTIL LEAF SPRING IS FLAT.

FIG. 1001 FAST CLAMP* LONGITUDINAL BRACE (OPTIONAL METHOD)

FIG. 980 TYPICAL

FIG. 1001

FIG. 1100

MAINTAIN SHORTEST POSSIBLE DISTANCE BETWEEN CENTER LINES

NOTES

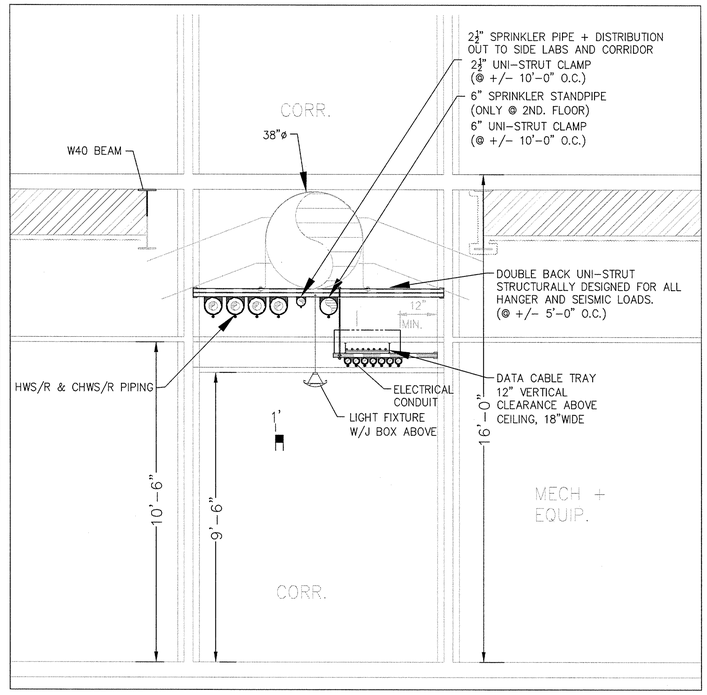
1. LAT 1 TO BE USED FOR LATERAL SWAY BRACING OF SPRINKLER SYSTEM 6" MAINS. MAX SPACING 40'-0".
2. LAT 2 TO BE USED FOR LATERAL SWAY BRACING OF SPRINKLER SYSTEM 3" OR 2 1/2" MAINS WITH BRANCH LINES. MAX SPACING 35'-0".
3. LONG 1 TO BE USED FOR LONGITUDINAL SWAY BRACING OF SPRINKLER SYSTEM 6" MAINS. MAX SPACING 45'-0".
4. LONG 2 TO BE USED FOR LONGITUDINAL SWAY BRACING OF SPRINKLER SYSTEM 3" OR 2 1/2" MAINS. MAX SPACING 80'-0".

SEISMIC CRITERIA

SEISMIC DESIGN CATEGORY	D
SEISMIC IMP. FACTOR	1.0
SITE SOIL PROFILE TYPE	B
SPECTRAL RESPONSE ACCELERATIONS:	
	Ss = 1.26*
	S1 = 0.481*
SEISMIC COEFFICIENT:	
	Cp = 0.61**

*Ss & S1 VALUES TAKEN FROM STRUCTURAL DRAWING S 1.01 - DATED 10-23-2009

** VALUE INTERPOLATED FROM TABLE 9.3.5.6.2 OF N.F.P.A.



HANGER DETAIL # 10

6" 0 2' 4'

SCALE 1/2"=1'-0"

WEIGHT OF WATER FILLED PIPE [LB./FT.]

		NOMINAL SIZE	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"
THREADED OR GROOVED PIPE	SCHEDULE 40	I.D.	2.05	2.93	3.61	5.13	7.89	10.82	16.40	31.69	47.70
GROOVED PIPE	SCHEDULE 10	I.D.	NOT USED	NOT USED	NOT USED	4.22	5.89	7.94	11.78	23.03	40.08

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
APPL 01-110181

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 MECHANICAL 09/29/11

SPRINKLER HEAD LEGEND: SYM. | MFG. | MODEL | SIN | RESP | STYLE | FINISH | N.P.T. | ORIFICE | K | TEMP. | ESC. TYPE | FINISH | TEMP. | QTY.

ESCUTCHEON

#	DATE	BY	DESCRIPTION	QTY
2	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR	

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave.
Phoenix, Arizona 85024
623.580.7800
Fax 623.434.3154
AZ-L16-234798
CA-C16-901529
UT-5207-7869234455-5501
NV-NB 12-354927

CONTRACTOR: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

ARCHITECT: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

PLAN LEGEND: HANGER & E.Q. DETAILS

DRAWN BY: NRL
SCALE: AS NOTED
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-5.0

CALCULATION DESIGN INFORMATION

AREA:	"1-2"
OCCUPANCY:	LECTURE
HAZARD:	LIGHT HAZARD
DENSITY:	0.10 GPM / SQ.FT.
AREA OF OPERATION:	1575 SQ. FT.
AREA PER HEAD:	163 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE: INSIDE:	100 OUTSIDE:

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	162.2
GPM REQ. AT BASE OF RISER:	328.4
PSI REQ. AT SOURCE:	45.59
GPM REQ. AT SOURCE:	428.4
PSI AVAILABLE AT SOURCE:	52.76
TOTAL PSI SAFETY FACTOR:	7.17

NOTE: ALL HANGER RODS 6' OR LESS ACT AS LATERAL E.Q. BRACING & BRANCH LINE RESTRAINT (BLR).

REMOTE AREA I-2

REMOTE AREA I-1

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

1" AUX. DRAIN VA. W/ 1" PLUG

4" OS&Y BUTTERFLY GRID BUTTERFLY SW. W/ TAMPER SWITCH & SIAMESE ISOLATION VALVE

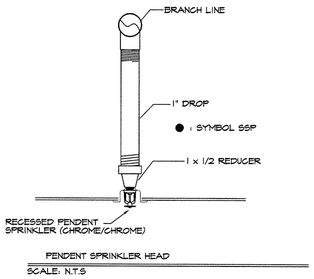
SEE STANDPIPE DETAIL #1 SHT FP-4.0

CALCULATION DESIGN INFORMATION

AREA:	"1-1"
OCCUPANCY:	LECTURE
HAZARD:	LIGHT HAZARD
DENSITY:	0.10 GPM / SQ.FT.
AREA OF OPERATION:	1520 SQ. FT.
AREA PER HEAD:	168 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE: INSIDE:	100 OUTSIDE:

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	126.6
GPM REQ. AT BASE OF RISER:	250.6
PSI REQ. AT SOURCE:	7.27
GPM REQ. AT SOURCE:	350.6
PSI AVAILABLE AT SOURCE:	53.15
TOTAL PSI SAFETY FACTOR:	45.88



PENDENT SPRINKLER HEAD

SCALE: N.T.S

KEY PLAN

FIRE SPRINKLER PLAN LEVEL I WEST

SCALE 1/8"=1'-0"

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON ESC. TYPE	FINISH	TEMP	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHROM	1/2"	1/2"	5.6	155	RECESSED	CHROM	N/A	123
◎/○	TYCO	TY-FRB	TY3131	QR	UPR	CHROM	1/2"	1/2"	5.6	200	--	--	--	66
▽	TYCO	TY-FRB	TY3331	QR	HSW	BRASS	1/2"	1/2"	5.6	200	--	--	--	1

TOTAL SPRINKLERS THIS SHEET 190

#	DATE	BY	DESCRIPTION
	7-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

NORTH

AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.0354
AZ-L-16-234799 CA-C16-901599
NV-0046-0077 NM-MS 12-354807
UT-5370-6880455-5501

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

OWNER/OWNER REP: GILBANE CONSTRUCTION
615 SEABREEZE DRIVE, SUITE 103
SAN DIEGO, CA. 92122

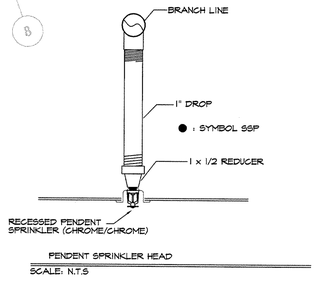
PLAN DESCRIPTION: FIRE SPRINKLER PLAN LEVEL I WEST

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 CIVIL STATE OF ARIZONA 09/29/11

DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-6.01W

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER PLAN LEVEL 2 WEST

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND

SYM	MFG	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON

ESC. TYPE	FINISH	TEMP	QTY.
RECESSED	CHRM	N/A	185
–	–	–	2

MARK	DATE	BY	DESCRIPTION
A	4-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

REVISIONS

188 TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER CO.

21805 North Central Ave. Phoenix, Arizona 85024

623.580.7800 Fax 623.434.3154

AZ-L16-234798 AZ-C16-234797

CA-C16-920659 NV-C41-69370 NM-M3 12-354807

UT-5570-6680455-5501

PROJECT: CAL POLY CENTER FOR SCIENCE

SAN LUIS OBISPO, CA.

CONTRACT INFO: GILBANE CONSTRUCTION

6265 GREENWICH DRIVE, SUITE 105 SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER PLAN LEVEL 2 WEST

DRAWN BY: NRL

SCALE: 1/8"=1'-0"

DATE: 8-15-2011

CONTRACT: 10034

SHEET: FP-6.02W

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCIO FP 693 exp 12-31-11 FIRE PROTECTION 09/29/11

1" AUX. DRAIN VA W/ 1" PLUG

10" ELECTRIC BELL (WIRING BY OTHERS)

6x2½x2½x2½ 4-WAY T.D.C.

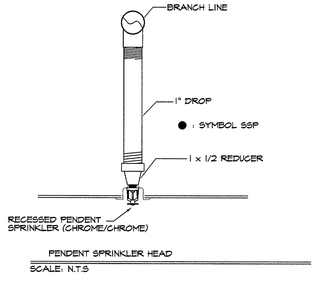
1" DI-ELECTRIC UNION (PIPING UNDER STAIRS TO BE COPPER)

3" DI-ELECTRIC UNION (PIPING UNDER STAIRS TO BE COPPER)

1" AUX. DRAIN VA W/ 1" PLUG

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER PLAN LEVEL 2 EAST

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	ORIFICE	TEMP
●	TYCO	TY-FRB	TY3231	QR	PEND	CHROME	1/2"	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHROME	1/2"	200

ESCUTCHEON

ESC. TYPE	FINISH	TEMP	QTY.
RECESSED	CHROME	N/A	186
–	–	–	2

#	DATE	BY	DESCRIPTION
1	7-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

TOTAL SPRINKLERS THIS SHEET 188

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.9354
AZ-L16-234798 CA-CSF-801529
AZ-C39-234797 NV-0078
UT-5370-6892455-5501 NM-MB 12-354807

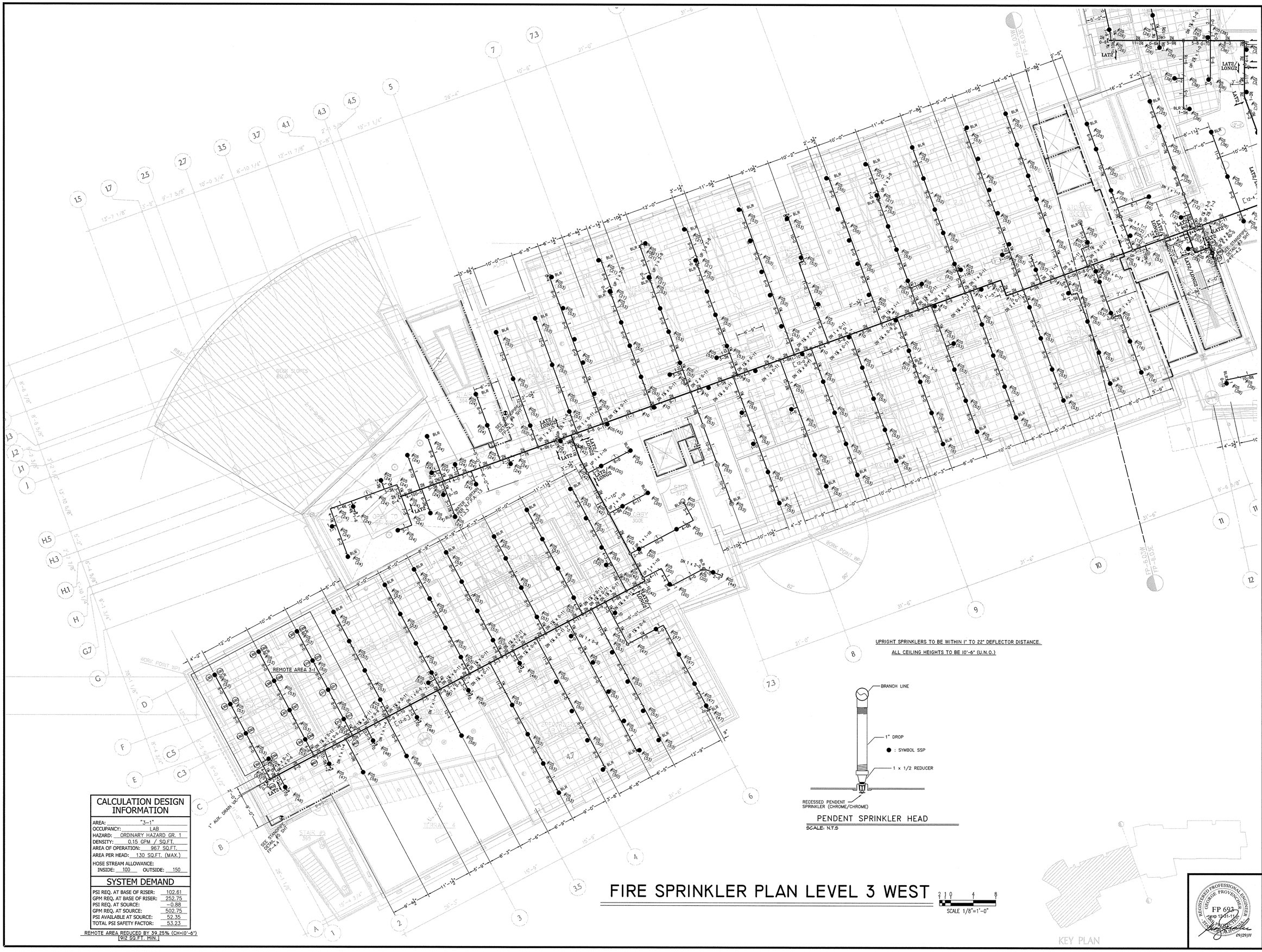
PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT BY: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

SHEET TITLE: FIRE SPRINKLER PLAN LEVEL 2 EAST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-6.02E

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 EXP. 12-31-11 STATE OF ARIZONA (9)(29)11



CALCULATION DESIGN INFORMATION

AREA:	"3-1"
OCCUPANCY:	LAB
HAZARD:	ORDINARY HAZARD GR. 1
DENSITY:	0.15 GPM / SQ.FT.
AREA OF OPERATION:	967 SQ.FT.
AREA PER HEAD:	130 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE: 150

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	102.61
GPM REQ. AT BASE OF RISER:	252.75
PSI REQ. AT SOURCE:	-0.88
GPM REQ. AT SOURCE:	502.75
PSI AVAILABLE AT SOURCE:	52.35
TOTAL PSI SAFETY FACTOR:	53.23

REMOTE AREA REDUCED BY 39.25% (CH=10'-6")
[912 SQ.FT. MIN.]

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER PLAN LEVEL 3 WEST

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON

ESC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	204
–	–	–	4

#	DATE	BY	DESCRIPTION
1	9-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

TOTAL SPRINKLERS THIS SHEET 208

REVISIONS

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.434.3164
AZ-L16-234798 CA-C16-903529
UT-5370-6902455-5501 NM-463 182-346907

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER PLAN LEVEL 3 WEST

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 STATE OF ARIZONA 09/29/11

DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-6.03W

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

REMOTE AREA 3-2

BRANCH LINE

1" DROP

SYMBOL SSP

1 x 1/2 REDUCER

RECESSED PENDENT SPRINKLER (CHROME/CHROME)

PENDENT SPRINKLER HEAD

SCALE: N.T.S

CALCULATION DESIGN INFORMATION

AREA:	"3-2"
OCCUPANCY:	LAB
HAZARD:	ORDINARY HAZARD GR. 1
DENSITY:	0.15 GPM / SQ.FT.
AREA OF OPERATION:	1135 SQ.FT.
AREA PER HEAD:	130 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE: 150

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	107.33
GPM REQ. AT BASE OF RISER:	233.54
PSI REQ. AT SOURCE:	3.22
GPM REQ. AT SOURCE:	483.54
PSI AVAILABLE AT SOURCE:	52.45
TOTAL PSI SAFETY FACTOR:	49.23

REMOTE AREA REDUCED BY 39.25% (CH=10'-6")
[912 SQ.FT. MIN.]

FIRE SPRINKLER PLAN LEVEL 3 EAST

SCALE 1/8"=1'-0"

KEY PLAN

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 EXP 12-31-11 FIRE PROTECTION STATE OF ARIZONA 09/29/11

SPRINKLER HEAD LEGEND

SYM	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON	FINISH	TEMP.	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155	RECESSED	CHRM	N/A	224
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200	–	–	–	2

#	DATE	BY	REVISIONS
226			TOTAL SPRINKLERS THIS SHEET
A	11-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

NORTH

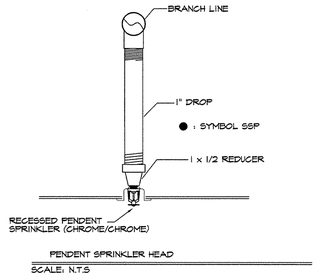
AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.434.7054
AZ-L16-234799 NV-0044700
CA-C16-601529 CO-20070707
UT-13270-6890455-5501 NM-MB 12-354827

PROJECT: CAL POLY CENTER FOR SCIENCE SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION 9265 GREENWICH DRIVE, SUITE 105 SAN DIEGO, CA. 92122

FIRE SPRINKLER PLAN LEVEL 3 EAST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-6.03E



UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

SCALE 1/8"=1'-0"

FIRE SPRINKLER PLAN LEVEL 4 WEST

KEY PLAN

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION (9/29/11)

SPRINKLER HEAD LEGEND

SYM	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.O.T.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"
◎	TYCO	TY-FRB	TY5151	QR	UPR	BRASS	1/2"

ESCUTCHEON

ESC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	118
"	"	"	3

SYM	ORIFICE	K	TEMP.
●	1/2"	5.6	155
◎	1/2"	5.6	200

#	DATE	BY	DESCRIPTION
1	9-29-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR
2			
3			

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER CO.
21600 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.434.8554
AZ-L16-284798 CA-C16-906529
NV-0046207 NM-MB 12-354807
UT-3670-6890455-5501

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 105
SAN DIEGO, CA. 92122

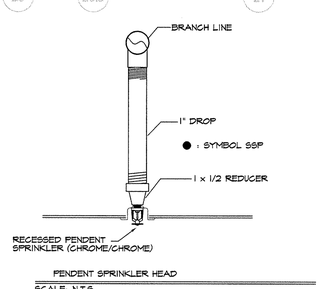
PLAN DESCRIPTION: FIRE SPRINKLER PLAN LEVEL 4 WEST

DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-6.04W

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

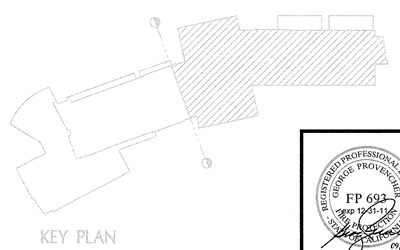
FLECTOR DISTANCE.



FIRE SPRINKLER PLAN LEVEL 4 EAST

2 1 0 4 8

SCALE 1/8"=1'-0"



SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON

SSC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	189
I	_	_	5

TOTAL SPRINKLERS THIS SHEET 194

#	DATE	BY	REVISIONS
1	9-26-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3154
AZ-L16-234798 AZ-C-234798
CA-C16-902529 NV-0048798
UT-5370-6892455-5501 NM-148 12-254927

PROJECT: CAL POLY CENTER FOR SCIENCE, SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION, 9265 GREENWICH DRIVE, SUITE 103, SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER PLAN LEVEL 4 EAST

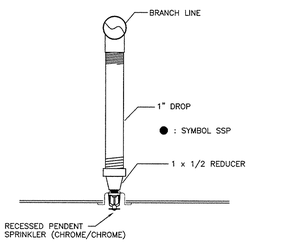
DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-6.04E

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION

09129111

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER PLAN LEVEL 5 EAST

2 1 0 4 8

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND

SYM	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON

SSC-TYPE	FINISH	TEMP
RECESSED	CHRM	N/A
–	–	–

QTY. 184 10

NO.	DATE	DESCRIPTION
194		REVISIONS
	7-26-2011	SUBMITTAL TO GENERAL CONTRACTOR

TOTAL SPRINKLERS THIS SHEET

NORTH

AUTOMATIC SPRINKLER Co
29808 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax. 623.434.3564
CA-C16-900529 NV-0048870
AZ-L16-234799 AZ-C16-234797
UT-8370-6860435-5501 NM-MB 12-384907

PROJECT:
CAL POLY
CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

GILBANE CONSTRUCTION
7535 CENTURION CRIVE, SUITE 103
SAN DIEGO, CA. 92122
PLAN DESIGNER: NRL

SHEET TITLE: FIRE SPRINKLER PLAN LEVEL 5 EAST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-6.05E

REGISTERED PROFESSIONAL ENGINEER
GEORGE PROVENCHER
FP 693
exp 12-31-11
STATE OF FIRE PROTECTION
(9)29)11

CALCULATION DESIGN INFORMATION

AREA:	"6-4"
OCCUPANCY:	OFFICE / LOBBY
HAZARD:	LIGHT HAZARD
DENSITY:	0.10 GPM / SQ.FT.
AREA OF OPERATION:	1567 SQ. FT.
AREA PER HEAD:	210 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE:

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	116.86
GPM REQ. AT BASE OF RISER:	347.3
PSI REQ. AT SOURCE:	39.09
GPM REQ. AT SOURCE:	447.3
PSI AVAILABLE AT SOURCE:	52.66
TOTAL PSI SAFETY FACTOR:	13.57

CALCULATION DESIGN INFORMATION

AREA:	"6-3"
OCCUPANCY:	LAB
HAZARD:	ORDINARY HAZARD GR. 1
DENSITY:	0.15 GPM / SQ.FT.
AREA OF OPERATION:	920 SQ.FT.
AREA PER HEAD:	130 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE: 150

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	108.4
GPM REQ. AT BASE OF RISER:	273.4
PSI REQ. AT SOURCE:	26.71
GPM REQ. AT SOURCE:	523.4
PSI AVAILABLE AT SOURCE:	52.11
TOTAL PSI SAFETY FACTOR:	25.4

CALCULATION DESIGN INFORMATION

AREA:	"6-1"
OCCUPANCY:	LAB
HAZARD:	ORDINARY HAZARD GR. 1
DENSITY:	0.15 GPM / SQ.FT.
AREA OF OPERATION:	940 SQ.FT.
AREA PER HEAD:	130 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE: 150

SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	95.47
GPM REQ. AT BASE OF RISER:	233.15
PSI REQ. AT SOURCE:	12.35
GPM REQ. AT SOURCE:	483.15
PSI AVAILABLE AT SOURCE:	53.35
TOTAL PSI SAFETY FACTOR:	40.1

REMOTE AREA REDUCED BY 39.25% (CH=10'-6")
[912 SQ.FT. MIN.]

CALCULATION DESIGN INFORMATION

AREA:	"6-2"
OCCUPANCY:	CORRIDOR
HAZARD:	LIGHT HAZARD
DENSITY:	0.10 GPM / SQ.FT.
AREA OF OPERATION:	5 HEADS CORR.
AREA PER HEAD:	225 SQ.FT. (MAX.)
HOSE STREAM ALLOWANCE:	
INSIDE: 100	OUTSIDE:

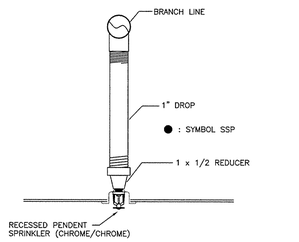
SYSTEM DEMAND

PSI REQ. AT BASE OF RISER:	34.5
GPM REQ. AT BASE OF RISER:	113.1
PSI REQ. AT SOURCE:	-51.52
GPM REQ. AT SOURCE:	213.09
PSI AVAILABLE AT SOURCE:	53.58
TOTAL PSI SAFETY FACTOR:	105.1

REMOTE AREA 6-4
REMOTE AREA 6-3
REMOTE AREA 6-1
REMOTE AREA 6-2

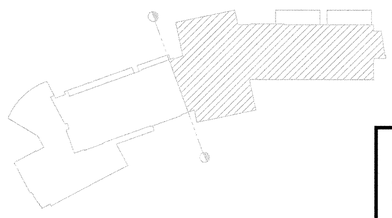
UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S



FIRE SPRINKLER PLAN LEVEL 6 EAST

SCALE 1/8"=1'-0"

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON	FINISH	TEMP
●	TYCO	TY1-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155	RECESSED	N/A	N/A
◎	TYCO	TY1-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200	N/A	N/A	N/A

#	DATE	BY	DESCRIPTION
4	9-26-2011	NBL	SUBMITTAL TO GENERAL CONTRACTOR

QTY. 193 20 215

TOTAL SPRINKLERS THIS SHEET

NORTH

AUTOMATIC SPRINKLER Co.
21605 North Central Ave. Phoenix, Arizona 850324
623.580.7800 Fax 623.434.3354
AZ-L16-234799 AZ-C16-234799
CA-C16-805529 NV-0048455
UT-3637042-6902 NM-MB 12-354927

PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
9265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

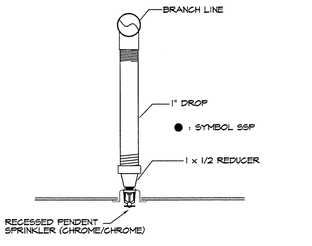
PLAN TITLE: FIRE SPRINKLER PLAN LEVEL 6 EAST

REGISTERED PROFESSIONAL ENGINEER
GEORGE PROVENCHER
FP 693
EXP 12-31-11
FIRE PROTECTION
09/29/11

DRAWN BY: ----
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-6.06E

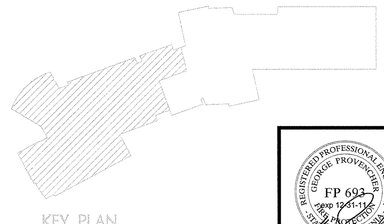
UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S



FIRE SPRINKLER RCP LEVEL I WEST

SCALE 1/8"=1'-0"

SPRINKLER HEAD LEGEND

SYM	MFG.	MODEL	SIN	RESP	STYLE	FINISH	NPT	ORIFICE	K	TEMP.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
@/O	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200
▷	TYCO	TY-FRB	TY3331	QR	HSW	BRASS	1/2"	1/2"	5.6	200

ESCUTCHEON

SSC	TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	123	1
—	—	—	66	1
—	—	—	—	1

BY	DESCRIPTION
NRL	SUBMITTAL TO GENERAL CONTRACTOR

190 REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

AERO AUTOMATIC SPRINKLER Co.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3354
AZ-L16-234798 CA-C16-601529
NV-0046570 NM-MB 12-354807
UT-9370-6892455-5501

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT #/S: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

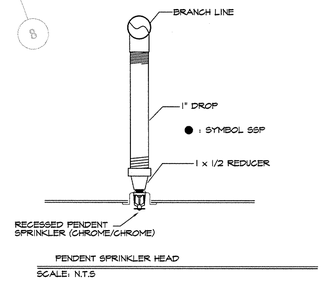
PLAN DESCRIPTION: FIRE SPRINKLER RCP LEVEL I WEST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-7.01W

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 Exp 12-31-11 FIRE PROTECTION 09/29/11

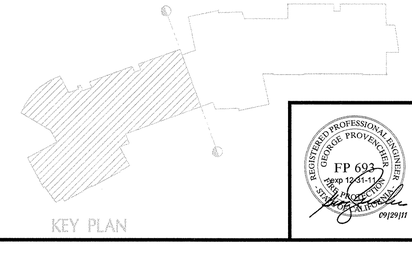
UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S



FIRE SPRINKLER RCP LEVEL 2 WEST

SCALE 1/8"=1'-0"

SPRINKLER HEAD LEGEND

SYM	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON TYPE	FINISH	TEMP.	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHROM	1/2"	1/2"	5.6	155	RECESSED	CHROM	N/A	186
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHROM	1/2"	1/2"	5.6	200	–	–	–	2

NO.	DATE	BY	DESCRIPTION
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

REVISIONS

TOTAL SPRINKLERS THIS SHEET 186

NORTH

AUTOMATIC SPRINKLER CO.
21805 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.0154
AZ-L16-234799 CA-C16-920529
CO-0048-0000 NV-0048-0000
UT-3270-6692455-5501 NM-MB 12-354807

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACTOR: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

PURCHASE ORDER:

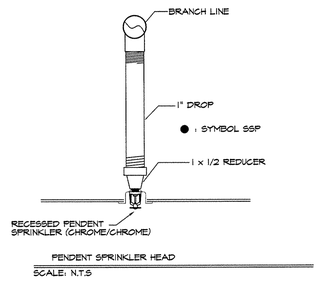
FIRE SPRINKLER RCP LEVEL 2 WEST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-7.02W

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 STATE OF ARIZONA 09/29/11

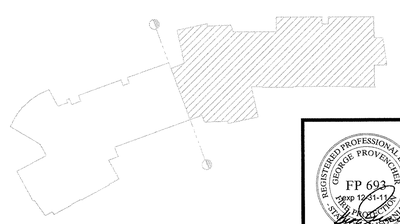
UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S



FIRE SPRINKLER RCP LEVEL 2 EAST

SCALE 1/8"=1'-0"

SPRINKLER HEAD LEGEND								
SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	TEMP.	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	155	186
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	200	2

ESCUTCHEON			
ESC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	186
—	—	—	2

SPRINKLER HEAD LEGEND								
SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	ORIFICE	K	TEMP.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	5.6	200

#	DATE	BY	DESCRIPTION
1	10-24-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

TOTAL SPRINKLERS THIS SHEET: 188

AUTOMATIC SPRINKLER Co.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.434.3154
CA-CSB-1015259 NV-0046570
AZ-L16-234798 AZ-C16-234797
UT-5370-6880455-5501 NM-MB 12-354807

PROJECT: CAL POLY CENTER FOR SCIENCE, SAN LUIS OBISPO, CA.

CONTRACT FOR: GILBANE CONSTRUCTION, 6265 GREENWICH DRIVE, SUITE 103, SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER RCP LEVEL 2 EAST

DRAWN BY: NRL

SCALE: 1/8"=1'-0"

DATE: 8-15-2011

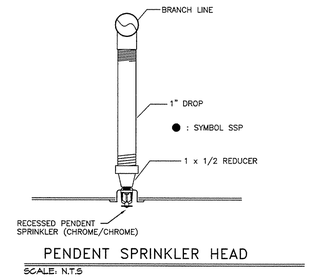
CONTRACT: 10034

SHEET: FP-7.02E

REGISTERED PROFESSIONAL ENGINEER — GEORGE PROVENCHER — FP 693 — exp 12-31-11 — STATE OF ARIZONA — 09/29/11

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER RCP LEVEL 3 WEST

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND										
SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON			
ESC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	204
–	–	–	4

TOTAL SPRINKLERS THIS SHEET 208

#	DATE	BY	DESCRIPTION
REVISIONS			
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3154
CA-C16-902529 NV-CAR-68370 AZ-L16-234798 AZ-C16-234797 UT-5070-6804455-5501 NM-IAS 52-504607

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

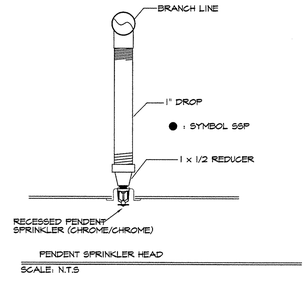
PLAN DESCRIPTION: FIRE SPRINKLER RCP LEVEL 3 WEST

DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-7.03W

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 EXP. 12-31-11 FIRE PROTECTION 09/29/11

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

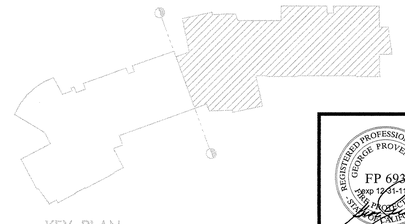
ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)



SCALE: N.T.S

FIRE SPRINKLER RCP LEVEL 3 EAST

SCALE 1/8"=1'-0"



SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESCUTCHEON ESC. TYPE	FINISH	TEMP.	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155	RECESSED	CHRM	N/A	224
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200	–	–	–	2

#	DATE	BY	DESCRIPTION
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

TOTAL SPRINKLERS THIS SHEET 226

NORTH

AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7900 Fax 623.434.3564
AZ-L16-234798 AZ-C39-234798
NV-0049600 NV-0049601
UT-35370-6505K455-5501 NM-MB 12-254907

PROJECT: CAL POLY CENTER FOR SCIENCE, SAN LUIS OBISPO, CA.

CONTRACT #: GILBANE CONSTRUCTION, 6265 GREENWICH DRIVE, SUITE 105, SAN DIEGO, CA. 92122

PLAN TITLE: FIRE SPRINKLER RCP LEVEL 3 EAST

DRAWN BY: NRL

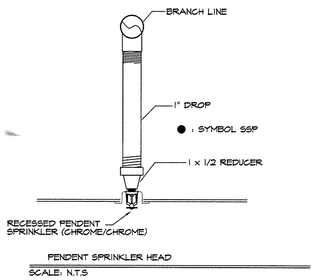
SCALE: 1/8"=1'-0"

DATE: 8-15-2011

CONTRACT: 10034

SHEET: FP-7.03E

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 STATE OF ARIZONA 09/29/11



UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

SCALE 1/8"=1'-0"

FIRE SPRINKLER RCP LEVEL 4 WEST

KEY PLAN

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 EXP 12-31-11 FIRE PROTECTION 09/29/11

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

ESCUTCHEON

ESC. TYPE	FINISH	TEMP.	QTY.
RECESSED	CHRM	N/A	116
–	–	–	3

#	DATE	BY	DESCRIPTION
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

REVISIONS

TOTAL SPRINKLERS THIS SHEET

NORTH

FIRE AUTOMATIC SPRINKLER CO.
21805 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3564
AZ-L16-234798 CA-C16-905259
AZ-C16-234798 NV-0046909
UT-5977O-6902455-5501 NM-MS 12-354807

OWNER:
CAL POLY
CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONTRACT MGR:
GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

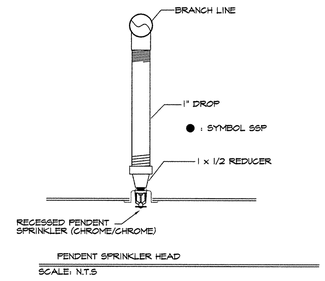
PROJECT:
FIRE SPRINKLER RCP LEVEL 4 WEST

DRAWN BY:	NRL
SCALE:	1/8"=1'-0"
DATE:	8-15-2011
CONTRACT:	10034
SHEET:	FP-7.04W

FLECTOR DISTANCE.

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

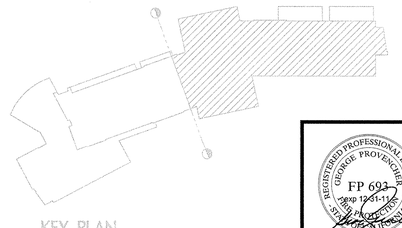


SCALE: N.T.S

FIRE SPRINKLER RCP LEVEL 4 EAST

2 1 0 4 8

SCALE 1/8"=1'-0"



ESCUTCHEON

QTY.	ESC. TYPE	FINISH	TEMP
185	RECESSED	CHRM	N/A
15	–	–	–

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200

NO.	DATE	BY	DESCRIPTION
1	4-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

REVISIONS

TOTAL SPRINKLERS THIS SHEET 194

NORTH

AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3154
AZ-L16-234798 CA-C16-910529 NV-0046007 NM-MB 12-354807
UT-8370-6690455-5501

PROJECT: CAL POLY CENTER FOR SCIENCE
SAN LUIS OBISPO, CA.

CONSULTANT: GILBANE CONSTRUCTION
8245 GREENWICH DRIVE SUITE 103
SAN DIEGO, CA. 92122
PHONE (858)558-6900

FIRE SPRINKLER RCP LEVEL 4 EAST

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-7.04E

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER STATE OF ARIZONA
FP 693
Exp 12-31-11
09/29/11

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER RCP LEVEL 5 EAST

SCALE 1/8"=1'-0"

KEY PLAN

SPRINKLER HEAD LEGEND / ESCUTCHEON

SYM.	MFG.	MODEL	SIN	RESP	STYLE	FINISH	N.P.T.	ORIFICE	K	TEMP.	ESC. TYPE	FINISH	TEMP.	QTY.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHRM	1/2"	1/2"	5.6	155	RECESSED	CHRM	N/A	184
◎	TYCO	TY-FRB	TY3131	QR	UPR	CHRM	1/2"	1/2"	5.6	200	–	–	–	10

TOTAL SPRINKLERS THIS SHEET 194

REVISIONS

#	DATE	BY	DESCRIPTION
1	9-28-2011	NRL	SUBMITTAL TO GENERAL CONTRACTOR

NORTH

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax 623.434.3154
AZ-L16-234798 AZ-C16-234797 UT-S370-6690455-5501
CA-C16-901529 NV-C41-69370 NM-MS 12-354807

PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

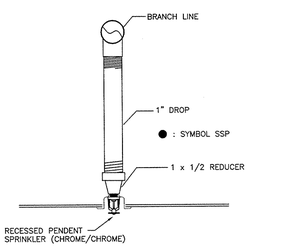
PLAN DESCRIPTION: FIRE SPRINKLER RCP LEVEL 5 EAST

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 FIRE PROTECTION STATE OF CALIFORNIA 09/29/11

DRAWN BY: NRL
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-7.05E

UPRIGHT SPRINKLERS TO BE WITHIN 1" TO 22" DEFLECTOR DISTANCE.

ALL CEILING HEIGHTS TO BE 10'-6" (U.N.O.)

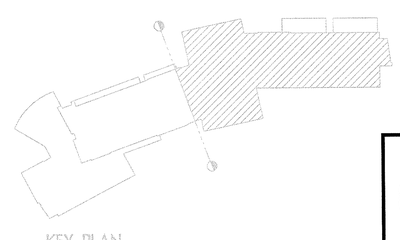


PENDENT SPRINKLER HEAD

SCALE: N.T.S

FIRE SPRINKLER RCP LEVEL 6 EAST

SCALE 1/8"=1'-0"



KEY PLAN

SPRINKLER HEAD LEGEND

SYM.	MFG.	MODEL	SIN	RESP.	STYLE	FINISH	TEMP.	K	ORIFICE N.P.T.
●	TYCO	TY-FRB	TY3231	QR	PEND	CHROME	155	5.6	1/2"
◎	TYCO	TY-FRB	TY3151	QR	UPR	CHROME	200	5.6	1/2"

NORTH

REVISIONS	DESCRIPTION	DATE	BY
1	SUBMITTAL TO GENERAL CONTRACTOR	12-9-2011	HPL
2			
3			
4			
5			
6			
7			
8			
9			
10			

TOTAL SPRINKLERS THIS SHEET 213

ESCUTCHEON	ESC. TYPE	FINISH	TEMP.	QTY.
	RECESSED	CHROME	N/A	193
	N/A	N/A	N/A	20

AERO AUTOMATIC SPRINKLER CO.
21605 North Central Ave. Phoenix, Arizona 85024
623.580.7800 Fax. 623.434.3154
AZ-L16-234798 AZ-C16-234797
CA-C16-901529 NV-C41-68370
UT-5370-6936455-5501 NM-MS 12-054807

PROJECT: CAL POLY CENTER FOR SCIENCE
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO, CA.

CONTRACT WITH: GILBANE CONSTRUCTION
6265 GREENWICH DRIVE, SUITE 103
SAN DIEGO, CA. 92122

PLAN DESCRIPTION: FIRE SPRINKLER RCP LEVEL 6 EAST

DRAWN BY: ----
SCALE: 1/8"=1'-0"
DATE: 8-15-2011
CONTRACT: 10034
SHEET: FP-7.06E

REGISTERED PROFESSIONAL ENGINEER GEORGE PROVENCHER FP 693 exp 12-31-11 STATE OF CALIFORNIA
09/29/11

APPENDIX D

Fire Alarm Drawings

Deep Blue Integration

FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM RECORD OF COMPLETION

To be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Attach additional sheets, data, or calculations as necessary to provide a complete record.

1. PROPERTY INFORMATION

Name of property: *Cal Poly Center For Math And Science 180*

Address: *01 Grand AVE, SAN LUIS OBISPO, CA 93407*

Description of property: CLASSROOM LABS, LECTURE HALLS, FACULTY OFFICES

Occupancy type: A, B, H3

Name of property representative: GILBANECO – CONTRACTOR, CAL POLY FACILITIES + CAPITOL PROJECTS

Address: 1 GRAND AVE, BLDG 70 - SAN LUIS OBISPO, CA 93407

Phone: 805-441-2186 Fax: E-mail: PJUDD@CALPOLY.EDU

Authority having jurisdiction over this property: OSFM 1234 E. SHAW AVE FRESNO, CA 93710

Phone: 916-825-7880 Fax: E-mail: POLLY.PARENTI@FIRE.CA.GOV

2. INSTALLATION, SERVICE, AND TESTING CONTRACTOR INFORMATION

Installation contractor for this equipment: *Deep Blue Integration Inc.*

Address: *3442 Empresa Dr., Suite C, San Luis Obispo, California, 93401*

License or certification number: *B, C-10, C-16 #943465*

Phone: *1-888-600-0324* Fax: *805-791-2037* E-mail: *info@deepblueintegration.com*

Service organization for this equipment: *Deep Blue Integration Inc.*

Address: *3442 Empresa Dr., Suite C, San Luis Obispo, California, 93401*

License or certification number: *B, C-10, C-16 #943465*

Phone: *888-600-0324* Fax: *805-791-2037* E-mail: *info@deepblueintegration.com*

A contract for test and inspection in accordance with NFPA standards is in effect as of:

Contracted testing company: *N/A*

Address:

Phone: Fax: E-mail:

Contract expires: Contract number: Frequency of routine inspections:

3. DESCRIPTION OF SYSTEM OR SERVICE

☐ Fire alarm system (nonvoice)

☒ Fire alarm with in-building fire emergency voice alarm communication system (EVACS)

☐ Mass notification system (MNS)

☐ Combination system, with the following components:

☐ Fire alarm ☐ EVACS ☐ MNS ☐ Two-way, in-building, emergency communication system

☐ Other (specify):

3. DESCRIPTION OF SYSTEM OR SERVICE *(continued)*

NFPA 72 edition: Additional description of system(s):

3.1 Control Unit

Manufacturer: *Honywell Notifier* Model number: *NFS2-640*

3.2 Mass Notification System ☐ This system does not incorporate an MNS

3.2.1 System Type:

☒ In-building MNS—combination

☐ In-building MNS—stand-alone ☐ Wide-area MNS ☐ Distributed recipient MNS

☐ Other (specify):

3.2.2 System Features:

☒ Combination fire alarm/MNS ☐ MNS autonomous control unit ☐ Wide-area MNS to regional national alerting interface

☐ Local operating console (LOC) ☐ Direct recipient MNS (DRMNS) ☐ Wide-area MNS to DRMNS interface

☐ Wide-area MNS to high-power speaker array (HPSA) interface ☐ In-building MNS to wide-area MNS interface

☐ Other (specify):

3.3 System Documentation

☒ An owner's manual, a copy of the manufacturer's instructions, a written sequence of operation, and a copy of the numbered record drawings are stored on site. Location: *At Alarm Panel*

3.4 System Software ☒ This system does not have alterable site-specific software.

Operating system (executive) software revision level:

Site-specific software revision date: *2-2013* Revision completed by: *Honywell*

☐ A copy of the site-specific software is stored on site. Location:

3.5 Off-Premises Signal Transmission ☐ This system does not have off-premises transmission.

Name of organization receiving alarm signals with phone numbers:

Alarm: *Cal Poly Dispach Center* Phone: *805-756-2281*

Supervisory: *Cal Poly Dispach Center* Phone: *805-756-2281*

Trouble: *Cal Poly Dispach Center* Phone: *805-756-2281*

Entity to which alarms are retransmitted: DACT Phone:

Method of retransmission: ~~[illegible]~~*y*

If Chapter 26, specify the means of transmission from the protected premises to the supervising station:

If Chapter 27, specify the type of auxiliary alarm system: ☐ Local energy ☐ Shunt ☐ Wired ☐ Wireless

4. CIRCUITS AND PATHWAYS

4.1 Signaling Line Pathways

4.1.1 Pathways Class Designations and Survivability

Pathways class: B Survivability level: 1 Quantity: 2
(See NFPA 72, Sections 12.3 and 12.4)

4.1.2 Pathways Utilizing Two or More Media

Quantity: Description:

4.1.3 Device Power Pathways

☒ No separate power pathways from the signaling line pathway

☐ Power pathways are separate but of the same pathway classification as the signaling line pathway

☐ Power pathways are separate and different classification from the signaling line pathway

4.1.4 Isolation Modules

Quantity:

4.2 Alarm Initiating Device Pathways

4.2.1 Pathways Class Designations and Survivability

Pathways class: Survivability level: Quantity:
(See NFPA 72, Sections 12.3 and 12.4)

4.2.2 Pathways Utilizing Two or More Media

Quantity: Description:

4.2.3 Device Power Pathways

☒ No separate power pathways from the initiating device pathway

☐ Power pathways are separate but of the same pathway classification as the initiating device pathway

☐ Power pathways are separate and different classification from the initiating device pathway

4.3 Non-Voice Audible System Pathways

4.3.1 Pathways Class Designations and Survivability

Pathways class: B Survivability level: 1 Quantity: 22
(See NFPA 72, Sections 12.3 and 12.4)

4.3.2 Pathways Utilizing Two or More Media

Quantity: Description:

4.3.3 Device Power Pathways

☒ No separate power pathways from the notification appliance pathway

☐ Power pathways are separate but of the same pathway classification as the notification appliance pathway

☐ Power pathways are separate and different classification from the notification appliance pathway

5. ALARM INITIATING DEVICES

5.1 Manual Initiating Devices

5.1.1 Manual Fire Alarm Boxes ☐ This system does not have manual fire alarm boxes.

Type and number of devices: Addressable: ~~20~~ 30 Conventional: Coded: Transmitter:

Other (specify):

5.1.2 Other Alarm Boxes ☒ This system does not have other alarm boxes.

Description:

Type and number of devices: Addressable: Conventional: Coded: Transmitter:

Other (specify):

5.2 Automatic Initiating Devices

5.2.1 Smoke Detectors ☐ This system does not have smoke detectors.

Type and number of devices: Addressable: 30 Conventional: BEAM SMOKE DETECTION—

Other (specify): 11 ~~8~~ IMAGERS AND EMITTERS

Type of coverage: ☐ Complete area ☒ Partial area ☐ Nonrequired partial area

Other (specify):

Type of smoke detector sensing technology: ☐ Ionization ☒ Photoelectric ☐ Multicriteria ☐ Aspirating ☒ Beam

Other (specify):

5.2.2 Duct Smoke Detectors ☐ This system does not have alarm-causing duct smoke detectors.

Type and number of devices: Addressable: 62 Conventional:

Other (specify):

Type of coverage: Partial Area – LOCAL @ SFD LOCATIONS

Type of smoke detector sensing technology: ☐ Ionization ☒ Photoelectric ☐ Aspirating ☐ Beam

5.2.3 Radiant Energy (Flame) Detectors ☒ This system does not have radiant energy detectors.

Type and number of devices: Addressable: Conventional:

Other (specify):

Type of coverage:

5.2.4 Gas Detectors ☒ This system does not have gas detectors.

Type of detector(s):

Number of devices: Addressable: Conventional:

Type of coverage:

5.2.5 Heat Detectors ☒ This system does not have heat detectors.

Type and number of devices: Addressable: Conventional:

Type of coverage: ☐ Complete area ☐ Partial area ☐ Nonrequired partial area ☐ Linear ☐ Spot

Type of heat detector sensing technology: ☐ Fixed temperature ☐ Rate-of-rise ☐ Rate compensated

5. ALARM INITIATING DEVICES *(continued)*

5.2.6 Addressable Monitoring Modules ☐ This system does not have monitoring modules.

Number of devices: 29 — TROUBLE MONITORS, NON-ALARM POINTS

5.2.7 Waterflow Alarm Devices ☐ This system does not have waterflow alarm devices.

Type and number of devices: Addressable: 7 Conventional: Coded: Transmitter:

5.2.8 Alarm Verification ☒ This system does not incorporate alarm verification.

Number of devices subject to alarm verification: Alarm verification set for: seconds

5.2.9 Presignal ☒ This system does not incorporate pre-signal.

Number of devices subject to presignal:

Describe presignal functions:

5.2.10 Positive Alarm Sequence (PAS) ☒ This system does not incorporate PAS.

Describe PAS:

5.2.11 Other Initiating Devices ☒ This system does not have other initiating devices.

Describe:

6. SUPERVISORY SIGNAL-INITIATING DEVICES

6.1 Sprinkler System Supervisory Devices ☐ This system does not have sprinkler supervisory devices.

Type and number of devices: Addressable: 12 Conventional: Coded: Transmitter:

Other (specify):

6.2 Fire Pump Description and Supervisory Devices ☐ This system does not have a fire pump.

Type fire pump: ☒ Electric pump ☐ Engine

Type and number of devices: Addressable: 3 Conventional: Coded: Transmitter:

Other (specify):

6.2.1 Fire Pump Functions Supervised

☒ Power ☒ Running ☒ Phase reversal ☐ Selector switch not in auto ☐ Engine or control panel trouble ☐ Low fuel

Other (specify):

6.3 Duct Smoke Detectors (DSDs) ☐ This system does not have DSDs causing supervisory signals.

Type and number of devices: Addressable: Conventional:

Other (specify):

Type of coverage:

Type of smoke detector sensing technology: ☐ Ionization ☐ Photoelectric ☐ Aspirating ☐ Beam

6.4 Other Supervisory Devices ☐ This system does not have other supervisory devices.

Describe: SMOKE FIRE DAMPER POSITION INDICATORS 52

FIREFIGHTER SMOKE CONTROL PANEL 1

7. MONITORED SYSTEMS

7.1 Engine-Driven Generator ☒ This system does not have a generator.

7.1.1 Generator Functions Supervised

☐ Engine or control panel trouble ☐ Generator running ☐ Selector switch not in auto ☐ Low fuel

☐ Other (specify):

7.2 Special Hazard Suppression Systems ☒ This system does not monitor special hazard systems.

Description of special hazard system(s):

7.3 Other Monitoring Systems ☒ This system does not monitor other systems.

Description of special hazard system(s):

8. ANNUNCIATORS

☐ This system does not have annunciators.

8.1 Location and Description of Annunciators

Location 1: *Floor 2 North Lobby*

Location 2: *Floor 1 West Lobby*

Location 3:

9. ALARM NOTIFICATION APPLIANCES

9.1 In-Building Fire Emergency Voice Alarm Communication System ☐ This system does not have an EVACS.

Number of single voice alarm channels: 1

Number of multiple voice alarm channels:

Number of speakers: 172

Number of speaker circuits: 9

Location of amplification and sound-processing equipment: *Elecrtical Rooms at FAPS Locations*

Location of paging microphone stations:

Location 1: AT FA CU, Room 122

Location 2:

Location 3:

9.2 Nonvoice Notification Appliances ☐ This system does not have nonvoice notification appliances.

Horns: Ø With visible: — Bells: 1 With visible: Ø

Chimes: Ø With visible: —

Visible only: 66 Other (describe):

9.3 Notification Appliance Power Extender Panels ☐ This system does not have power extender panels.

Quantity: 4

Locations: Rooms 267, 332, 467, 632

10. MASS NOTIFICATION CONTROLS, APPLIANCES, AND CIRCUITS ☒ This system does not have an MNS.

10.1 MNS Local Operating Consoles

Location 1:

Location 2:

Location 3:

10.2 High-Power Speaker Arrays

Number of HPSA speaker initiation zones:

Location 1:

Location 2:

Location 3:

10.3 Mass Notification Devices

Combination fire alarm/MNS visible appliances: MNS-only visible appliances:

Textual signs: Other (describe):

Supervision class:

10.3.1 Special Hazard Notification

☐ This system does not have special suppression predischarge notification.

☐ MNS systems DO NOT override notification appliances required to provide special suppression predischarge notification.

11. TWO-WAY EMERGENCY COMMUNICATION SYSTEMS

11.1 Telephone System

☐ This system does not have a two-way telephone system.

Number of telephone jacks installed: 12 Number of warden stations installed: 0

Number of telephone handsets stored on site: 5

Type of telephone system installed: ☐ Electrically powered ☒ Sound powered

11.2 Two-Way Radio Communications Enhancement System

☒ This system does not have a two-way radio communications enhancement system.

Percentage of area covered by two-way radio service: Critical areas: % General building areas: %

Amplification component locations:

Inbound signal strength: dBm Outbound signal strength: dBm

Donor antenna isolation is: dB above the signal booster gain

Radio frequencies covered:

Radio system monitor panel location:

11. TWO-WAY EMERGENCY COMMUNICATION SYSTEMS *(continued)*

11.3 Area of Refuge (Area of Rescue Assistance) Emergency Communications Systems

☒ This system does not have an area of refuge (area of rescue assistance) emergency communications system.

Number of stations: Location of central control point:

Days and hours when central control point is attended:

Location of alternate control point:

Days and hours when alternate control point is attended:

11.4 Elevator Emergency Communications Systems

☒ This system does not have an elevator emergency communications system.

Number of elevators with stations: Location of central control point:

Days and hours when central control point is attended:

Location of alternate control point:

Days and hours when alternate control point is attended:

11.5 Other Two-Way Communication Systems

Describe:

12. CONTROL FUNCTIONS

This system activates the following control fuctions:

☒ Hold-open door releasing devices ☒ Smoke management ☒ HVAC shutdown ☒ F/S dampers

☐ Door unlocking ☒ Elevator recall ☐ Fuel source shutdown ☐ Extinguishing agent release

☐ Elevator shunt trip ☐ Mass notification system override of fire alarm notification appliances

Other (specify):

12.1 Addressable Control Modules

☐ This system does not have control modules.

Number of devices: 90 - RELAY + CONTROL FUNCTIONS

Other (specify):

13. SYSTEM POWER

13.1 Control Unit

13.1.1 Primary Power

Input voltage of control panel: 120 VAC Control panel amps: 6 AMP

Overcurrent protection: Type: BREAKER Amps: 20 AMP

Location (of primary supply panel board): PANEL 1D W, CIRCUIT #

Disconnecting means location: TEL/DATA ROOM #106

13.1.2 Engine-Driven Generator

☒ This system does not have a generator.

Location of generator:

Location of fuel storage: Type of fuel:

13. SYSTEM POWER *(continued)*

13.1.3 Uninterruptible Power System ☒ This system does not have a UPS.

Equipment powered by a UPS system:

Location of UPS system:

Calculated capacity of UPS batteries to drive the system components connected to it:

In standby mode (hours): In alarm mode (minutes):

13.1.4 Batteries

Location: AT FACP Type: SLA Nominal voltage: 12 VDC Amp/hour rating: 55 AH

Calculated capacity of batteries to drive the system:

In standby mode (hours): 24 In alarm mode (minutes): 15

☒ Batteries are marked with date of manufacture ☐ Battery calculations are attached - ON AS-BUILT PLANS

13.2 In-Building Fire Emergency Voice Alarm Communication System or Mass Notification System

☐ This system does not have an EVACS or MNS system.

13.2.1 Primary Power

Input voltage of EVACS or MNS panel: 120 VAC EVACS or MNS panel amps: 3 AMP

Overcurrent protection: Type: BREAKER Amps: 20 AMP

Location (of primary supply panel board): PANEL 1DW CIRUIT# -

Disconnecting means location: TEL/DATA Room 106

13.2.2 Engine-Driven Generator ☒ This system does not have a generator.

Location of generator:

Location of fuel storage: Type of fuel:

13.2.3 Uninterruptible Power System ☒ This system does not have a UPS.

Equipment powered by a UPS system:

Location of UPS system:

Calculated capacity of UPS batteries to drive the system components connected to it:

In standby mode (hours): In alarm mode (minutes):

13.2.4 Batteries

Location: AT FACP Type: SLA Nominal voltage: 12 VDC Amp/hour rating: 55 AH

Calculated capacity of batteries to drive the system:

In standby mode (hours): 24 In alarm mode (minutes): 15

☒ Batteries are marked with date of manufacture ☐ Battery calculations are attached - ON AS-BUILT PLAN

13. SYSTEM POWER *(continued)*

13.3 Notification Appliance Power Extender Panels ☐ This system does not have power extender panels.

13.3.1 Primary Power

Input voltage of power extender panel(s): 120 VAC Power extender panel amps: 6 AMP

Overcurrent protection: Type: BREAKER Amps: 20 AMP

Location (of primary supply panel board): PANEL 2SB-W#1 Rooms 267,

Disconnecting means location: PANEL 3SB-E#6 332, 467, 632

PANEL 4SB-W#9

PANEL 6SB-W#27

13.3.2 Engine-Driven Generator ☒ This system does not have a generator.

Location of generator:

Location of fuel storage: Type of fuel:

13.3.3 Uninterruptible Power System ☒ This system does not have a UPS.

Equipment powered by a UPS system:

Location of UPS system:

Calculated capacity of UPS batteries to drive the system components connected to it:

In standby mode (hours): In alarm mode (minutes):

13.3.4 Batteries

Location: Type: Nominal voltage: Amp/hour rating:

Calculated capacity of batteries to drive the system:

In standby mode (hours): In alarm mode (minutes):

☐ Batteries are marked with date of manufacture ☐ Battery calculations are attached

14. RECORD OF SYSTEM INSTALLATION

Fill out after all installation is complete and wiring has been checked for opens, shorts, ground faults, and improper branching, but before confucting operational acceptance tests.

This is a: ☒ New system ☐ Modification to an existing system Permit number:

The system has been installed in accordance with the following requirements: (Note any or all that apply.)

☒ *NFPA 72*, Edition: 2007

☐ *NFPA 70, National Electrical Code*, Article 760, Edition: 2005, CEC 2007

☒ Manufacturer's published instructions

Other (specify): CBC 2007, CFC 2007, PARTS OF CFC 2010, APPROVED PLANS & SPECIFICATION

System deviations from referenced NFPA standards: NONE

Signed: Printed name: CURTIS STREETER Date:

Organization: DEEP BLUE INTEGRATION, INC. Title: PRESIDENT Phone: 888-600 0324

15. RECORD OF SYSTEM OPERATIONAL ACCEPTANCE TEST

☑ New system

All operational features and functions of this system were tested by, or in the presence of, the signer shown below, on the date shown below, and were found to be operating properly in accordance with the requirements for the following:

☐ Modifications to an existing system

All newly modified operational features and functions of the system were tested by, or in the presence of, the signer shown below, on the date shown below, and were found to be operating properly in accordance with the requirements of the following:

☑ *NFPA 72*, Edition: 2007

☑ *NFPA 70, National Electrical Code,* Article 760, Edition: 2005, CEC 2007

☒ Manufacturer's published instructions APPROVED PLANS + SPECIFICATIONS

Other (specify): CBC 2007, CFC 2007, PARTS OF CFC 2010

☒ Individual device testing documentation [Inspection and Testing Form (Figure 14.6.2.4) ~~is attached~~] ON CD ROM

Signed: [signature] Printed name: CURTIS STREETER Date: 8-15-13

Organization: DEEP BLUE INTEGRATION INC. Title: PRESIDENT Phone: 888-600-0324

16. CERTIFICATIONS AND APPROVALS

16.1 System Installation Contractor:

This system, as specified herein, has been installed and tested according to all NFPA standards cited herein.

Signed: [signature] Printed name: CURTIS STREETER Date: 8-15-13

Organization: DEEP BLUE INTEGRATION INC. Title: PRESIDENT Phone: 888-600-0324

16.2 System Service Contractor:

The undersigned has a service contract for this system in effect as of the date shown below.

Signed: [signature] Printed name: CURTIS STREETER Date: 8-15-13

Organization: DEEP BLUE INTEGRATION INC. Title: PRESIDENT Phone: 888-600-0324

16.3 Supervising Station:

This system, as specified herein, will be monitored according to all NFPA standards cited herein.

Signed: [signature] Printed name: CURTIS STREETER Date: 8-15-13

Organization: DEEP BLUE INTEGRATION INC. Title: PRESIDENT Phone: 888 600 0324

16. CERTIFICATIONS AND APPROVALS *(continued)*

16.4 Property or Owner Representative:

This system, as specified herein, will be monitored according to all NFPA standards cited herein.

Signed: [signature] Printed name: PERRY JUDD Date:

Organization: CAL POLY FACILITIES * CAPITAL PROJECTS Title: Phone: 805-441-2186

16.5 Authority Having Jurisdiction:

I have witnessed a satisfactory acceptance test of this system and find it to be installed and operating properly in accordance with its approved plans and specifications, with its approved sequence of operations, and with all NFPA standards cited herein.

Signed: Polly Parenti Printed name: Polly Parenti Date: 8-15-13

Organization: OSFM Title: DEPUTY STATE FIRE MARSHAL Phone: 916-845-7880

GENERAL NOTES

1. NOTIFICATION DEVICES CANNOT BE T-TAPPED. ADDRESSABLE (IDC) DEVICES CAN BE T-TAPPED. ALL FIRE ALARM CABLING SHALL SHALL BE RUN FROM DEVICE TO DEVICE, WITH NO SPLICES. ANY REQUIRED TERMINATIONS MUST BE MADE IN APPROVED BOX.

2. ALL INTERIOR INITIATING DEVICES, NOTIFICATION DEVICES, AND MODULES REQUIRE 4"SQUARE SPECIAL DEEP BACK BOXES U.O.N.

3. PANEL BACK BOXES AND OTHER LISTED BACK BOXES SHALL BE PROVIDED TO THE EC BY DBI. ALL CONTROL PANELS, POWER SUPPLIES, AND BATTERY BOXES SHALL UTILIZE ONLY FACTORY KNOCKOUTS NEAR THE TOP OF THE CAN TO ALLOW PLACEMENT OF BATTERIES.

4. ALL FIRE ALARM CONDUIT TO BE $\frac{3}{4}$" EMT MINIMUM U.O.N. FIRE ALARM CONDUIT SHALL BE SEPARATE FROM CONDUIT SYSTEM FOR SECURITY ALARM CABLING AND OTHER SYSTEMS.

5. WALL MOUNT AUDIO/VISUAL DEVICES SHALL BE MOUNTED 80" AFF TO BOTTOM OF THE STROBE LENS.

6. MANUAL PULL STATIONS SHALL BE MOUNTED 48" AFF TO CENTERLINE OF BOX. MPS SHALL BE DOUBLE ACTION AND KEYED THE SAME AS THE FACP.

7. DEDICATED 120 VAC CIRCUIT WITH LOCKOUT @ BREAKER TO BE PROVIDED BY OTHERS AT LOCATION OF PANELS AND POWER SUPPLIES.

8. KNOX BOX, PIV, SUPERVISORY SWITCHES, FLOW SWITCHES, SOLENOIDS, AND SPRINKLER BELLS SHALL BE PROVIDED BY OTHERS.

9. SMOKE DETECTORS SHALL NOT BE PLACED WITHIN 3' OF ANY SUPPLY AIR REGISTER OR WHERE THE AIR MOVEMENT EXCEEDS THE MANUFACTURER'S LISTING.

10. FIRE FIGHTER TELEPHONE RISER IS CLASS A, STYLE Z

11. VOLTAGE DROP CALCULATIONS FOR NOTIFICATION DEVICES ARE BASED ON THE LAYOUT SHOWN. DEVIATION FROM THESE PLANS COULD RESULT IN ADDITIONAL CONDUIT WORK, REENGINEERING, UPSIZED CABLE AND/OR ADDITIONAL POWER REQUIREMENTS.

12. PAINT ALL FIRE ALARM JUNCTION BOXES AND COVERS RED IN UNFINISHED AREAS (IE ABOVE CEILINGS, MECHANICAL ROOMS ETC.) IN FINISHED AREAS CONDUIT AND JUNCTION BOXES CAN BE PAINTED TO MATCH THE ROOM FINISH, THE INSIDE COVER IF THE JUNCTION BOX MUST BE IDENTIFIED AS "FIRE ALARM" AND THE CONDUIT MUST HAVE PAINTED RED BANDS $\frac{3}{4}$" WIDE AT 10' CENTERS AND AT EACH SIDE OF A FLOOR, WALL, OR CEILING PENETRATION.

13. UPON COMPLETION OF INSTALLATION OF THE FIRE ALARM SYSTEM A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE AUTHORITY HAVING JURISDICTION (AHJ).

14. ALL NOTIFICATION DEVICES SHALL BE SYNCHRONIZED.

15. A STAMPED SET OF APPROVED FIRE ALARM PLANS SHALL BE AT THE JOBSITE AND USED FOR INSTALLATION.

16. SIGNALING LINE CIRCUIT IS CLASS B, STYLE 4

17. NOTIFICATION APPLIANCE CIRCUIT IS CLASS B, STYLE Y

5

18. ALL SMOKE DETECTORS SHALL BE INSTALLED AT LEAST 1'-0" FROM FLUORESCENT LIGHT FIXTURES TO AVOID UNWANTED ALARMS AND SHALL BE INSTALLED IN AREAS THAT DO NOT EXCEED THE MANUFACTURE'S OPERATING TEMPERATURE RANGE BETWEEN 32°F AND 120°F.

CODE REGULATIONS

CALIFORNIA CODE REGULATIONS

APPLICABLE CODES

2007 BUILDING STANDARDS ADMINISTRATIVE CODE	TITLE 24 PART 1
2007 CALIFORNIA BUILDING CODE (CBC)	TITLE 24 PART 2
2007 CALIFORNIA ELECTRICAL CODE (CEC)	TITLE 24 PART 3
2007 CALIFORNIA MECHANICAL CODE (CMC)	TITLE 24 PART 4
2007 CALIFORNIA PLUMBING CODE (CPC)	TITLE 24 PART 5
2007 CALIFORNIA ENERGY CODE	TITLE 24 PART 6
2007 CALIFORNIA ELEVATOR SAFETY CONSTRUCTION CODE	TITLE 24 PART 7
2007 CALIFORNIA HISTORICAL BUILDING CODE	TITLE 24 PART 8
2007 CALIFORNIA FIRE CODE (CFC)	TITLE 24 PART 9
2007 CALIFORNIA REFERENCED STANDARDS CODE	TITLE 24 PART 12

APPLICABLE STANDARDS & GUIDELINES

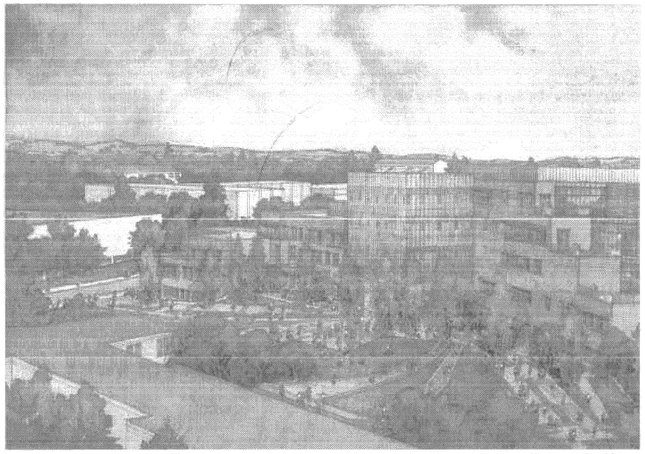
2007 AUTOMATIC SRINKLER SYSTEMS	NFPA 13
2007 STATIONARY PUMPS	NFPA 20
2007 NATIONAL FIRE ALARM CODES (CALIFORNIA AMENDED)	NFPA 72
2007 STANDARD FOR INSTALLATION OF AIR-CONDITIONING	NFPA90A
2007 STANDARD FOR INSTALLATION OF WARN AIR HEATING	NFPA 90B
2006 STANDARD FOR SMOKE-CONTROL SYSTEMS UTILIZING BARRIERS AND PRESSURE DIFFERENCES	NFPA 92A
2005 STANDARD FOR SMOKE MANAGEMENT SYSTEMS IN MALLS, ATRIA, AND LARGE SPACES	NFPA 92B

4

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CALIFORNIA 93407

FIRE ALARM & EMERGENCY COMMUNICATION SYSTEM

SITE PLAN



CENTER FOR SCIENCE

PROJECT DESCRIPTION

1. OCCUPANCY TYPE: A, B, AND H3
2. SYSTEM TYPE: CLASS B, ADDRESSABLE, MANUAL
3. METHOD OF COMMUNICATION: TELEPHONE
4. SCOPE OF WORK: FIRE ALARM & VOICE EVACUATION SYSTEMS

SEQUENCE OF OPERATIONS MATRIX

EVENT	ACTION: SUPERVISORY CONDITION AT FACU	TROUBLE CONDITION AT FACU	ALARM CONDITION AT FACU	ACTIVATE FIRE ALARM AUDIO/VISUAL DEVICES AND VOICE ALARM COMMUNICATION	DISPLAY TEXT ON LCD CONTROLLER UNIT	ACTIVATE SHUNT TRIP RELEASE FOR ELEVATOR	SHUTDOWN AIR HANDLER UNIT	ACTIVATE ELEVATOR RECALL	SHUTDOWN INDIVIDUAL ASSOCIATED DAMPERS	ACTIVATE SUPERVISORY SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	ACTIVATE TROUBLE SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	ACTIVATE ALARM SIGNAL TO RECEIVING STATION (CAMPUS POLICE)	DEACTIVATE MAGNETIC DOOR HOLDERS	BYPASS ALL ALARM OUTPUTS INCLUDING NOTIFICATION, SHUNTS, RELAY OUTPUTS FOR TESTING	OPEN ATRIUM DOORS WITH MOTORIZED DOOR OPERATORS	ACTIVATE ATRIUM PASSIVE SMOKE EVACUATION SYSTEM
FIRE ALARM CONTROL UNIT																
PANEL SUPERVISORY CONDITION (TEST BYBASS) ON ACM-24 AT	X				X						X				X	
PANEL TROUBLE CONDITION (AC POWER FAIL, LOW BATTERY, OPEN CIRCUIT, GROUND FAULT, ETC.)		X			X							X				
PANEL ALARM CONDITION			X	X	X		X			X			X			
MANUAL PULL STATION ACTIVATION			X	X	X					X			X			
SPOT SMOKE DETECTOR ACTIVATION			X	X	X					X			X			
DUCT SMOKE DETECTOR ACTIVATION			X	X	X				X	X			X			
AIR HANDLING UNIT DUCT SMOKE DETECTOR ACTIVATION			X	X	X		X						X			
SPRINKLER TAMPER SWITCH	X				X						X		X			
SPRINKLER WATER FLOW ACTIVATION			X	X	X					X			X			
FIRE PUMP RUNNING			X	X	X					X			X			
FIRE PUMP LOSS OF PH ASE	X				X						X					
FIRE PUMP PHASE REVERSAL	X				X						X		X			
HEAT DETECTOR ACTIVATION (ELEVATOR EQUIPMENT)			X	X	X	X				X			X			
ELEVATOR LOBBY/ EMR SMOKE / ELEVATOR HOISTWAYS			X	X	X			X		X			X			
SHUNT TRIP POWER SUPERVISION	X				X						X					
GENERAL ALARM (ANYWHERE WITHIN THE BUILDING)			X	X	X		X			X			X			
ATRIUM SMOKE CONTORL SYSTEM ALARM			X	X	X					X			X		X	X
BEAM SMOKE DETECTION WITHIN ATRIUM			X	X	X					X			X		X	X
PULL STATION WITHIN ATRIUM			X	X	X					X			X		X	X
SPRINKLER WATER FLOW WITHIN ATRIUM			X	X	X					X			X		X	X

2 3 4

SYMBOL LEGEND

	COUNT	FIRE ALARM SYMBOLS		MODEL #	CSFM LISTING #
6	31	F	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73	F	STROBE ONLY	SW	7320-1653:201
	165	F	SPEAKER/STROBE	SPWS	7320-1653:201
	6	F	SPEAKER ONLY	SPW	7320-1653:201
	7	WP F	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
5	0	H	HEAT DETECTOR	FST-851	7270-0028:196
5	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
2	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
2	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
6	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
6	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
6	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
6	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
5	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ	FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
4	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

DRAWING INDEX

1	COVER SHEET	FA 0.0
2	RISER DIAGRAM	FA 1.0
3	FIRST FLOOR WEST	FA 3.01W
4	SECOND FLOOR EAST	FA 3.02E
5	SECOND FLOOR WEST	FA 3.02W
6	THIRD FLOOR EAST	FA 3.03E
7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
12	SIXTH FLOOR EAST	FA 3.06E
13	SEVENTH FLOOR EAST	FA 3.07E
14	CALCULATIONS	FA 4.0
15	DETAILS	FA 5.0

AS-BUILT SET

COVER SHEET

Deep Blue Integration

Consulting - Design - Installation
Service - Monitoring

Deep Blue Integration, Inc
3442 Empresa Drive Suite C
San Luis Obispo, CA 93401
C-10, C-16 #943465 ACO#8864
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www.deepblueintegration.com

Revisions

SYMBOL	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRB # 093.1 & FI 99	4/11/2012	
3	SFM REVIEW COMMENTS	8/20/2012	
4	CRB 95.2	1/15/2013	
5	FA & SMOKE CONTROL SFM COMMENTS	4/3/2013	
6	AS-BUILT DRAWINGS	8/23/2013	

DATE: 08/23/2013
SCALE:
DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter
DRAWN BY: Derek Richardson
CHECKED BY: CURTIS STREETER, SET NICET IV #102972
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA
CSFM #18-40-03-0001

SHEET ID
FA-0

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	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
A	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

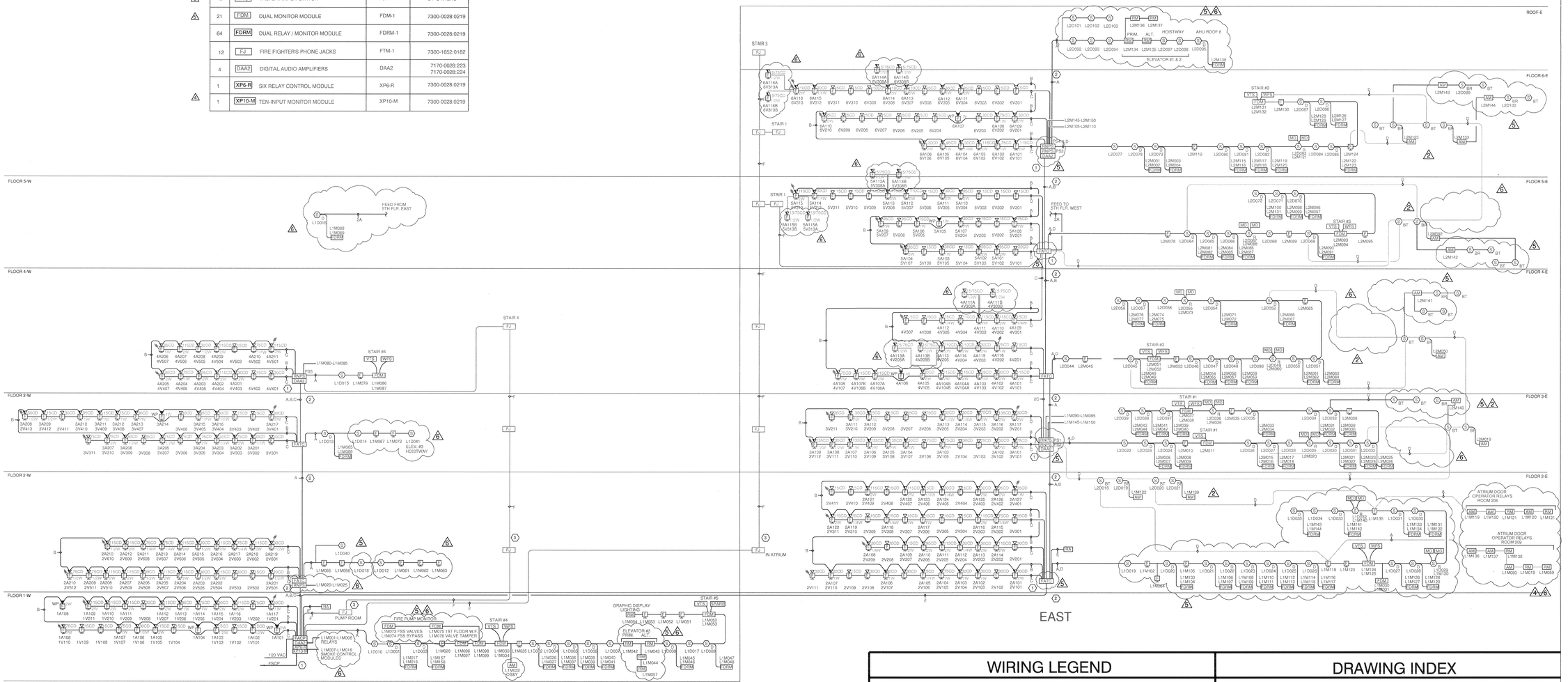
GENERAL NOTES:

1. The Notification Appliance Circuits vary between 14 AWG and 12 AWG, see voltage drops for correct sizing.
5 2. All smoke detectors shall be placed at least 1'-0" from fluorescent light fixtures to avoid unwanted alarms and in areas that will not exceed manufacture's specified operating temperature 32°F to 120°F.

SHEET NOTES:

1. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.
2. The riser going between floors will be in 2" conduit or larger.
3. 6.10.1.16* All circuits necessary for the operation of two-way telephone communication systems shall be installed using one of the following methods:
   (1) A 2-hour fire rated circuit integrity (CI) cable
   (2) A 2-hour fire rated cable system (electrical circuit protective system)
   (3) A 2-hour fire rated enclosure
   (4) Performance alternatives approved by the authority having jurisdiction
   (5) Buildings fully protected by an automatic sprinkler system installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, with the wiring or cables installed in metal raceways and in accordance with Article 760 of NFPA 70

A.6.10.1.16 One or more of the following means might be considered acceptable to provide a level of survivability consistent with the intent of this requirement:
   (1) Routing two-way telephone circuits separately
   (2) Using short-circuit fault tolerant circuits



FIRE ALARM RISER DIAGRAM
NTS

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
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12	SIXTH FLOOR EAST	FA 3.06E
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14	CALCULATIONS	FA 4.0
15	DETAILS	FA 5.0

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Revisions

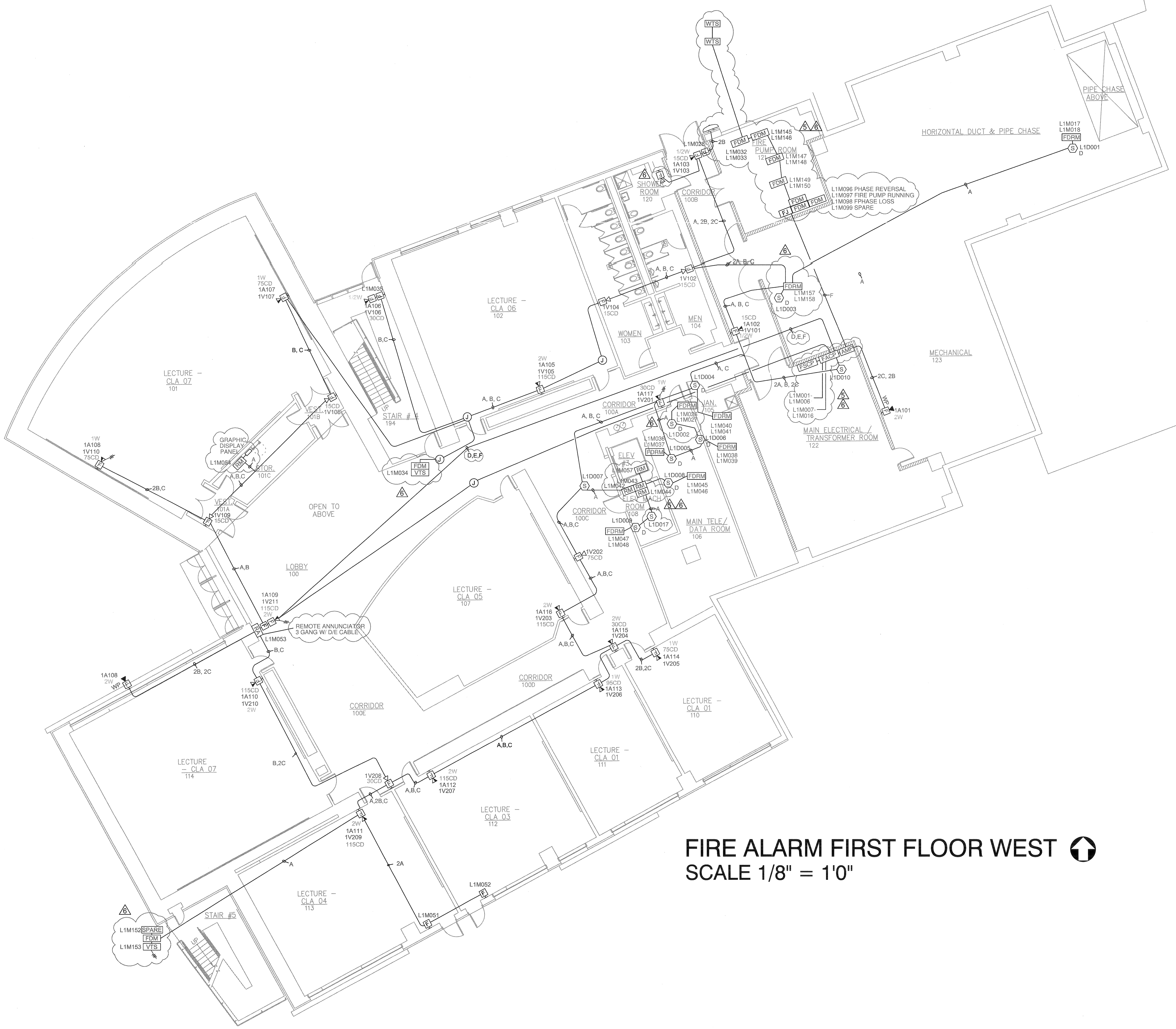
	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRS # 1093.1 & FI 99	5/18/2012	
3	SFM REVIEW COMMENTS	4/11/2012	
4	CRS 93.2	8/20/2012	
5	FA & SMOKE CONTROL SFM COMMENTS	1/15/2013	
6	AS-BUILT DRAWINGS	4/3/2013	
	SYMBOL	8/23/2013	

DATE: 08/23/2013
SCALE:
DRAWING CODE: FA ALL DRAWINGS CP/CFS
DESIGNED BY: Curtis Streeter
DRAWN BY: Derek Richardson
CHECKED BY: CURTIS STREETER, SET NICET IV #102872
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID
FA 1.0



FIRE ALARM FIRST FLOOR WEST

SCALE 1/8" = 1'0"

SYMBOL LEGEND

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	165	SPEAKER/STROBE	SPWS	7320-1653:201
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	7	WP SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
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	64	S D SMOKE DETECTOR - DUCT	DNR	3242-1653:209
5	23	S BT BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
2	15	S BR BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
6	4	FATC FIRE ALARM TERMINAL CABINET	N/A	N/A
	32	END OF LINE RESISTOR	N/A	N/A
	2	RA REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD MAGNETIC DOOR HOLDER	N/A	BY OTHERS
6	21	AM ADDRESSABLE MODULE	FMM-1	7300-0028:0219
6	12	RM RELAY MODULE	FRM-1	7300-0028:219
	16	WFS WATER FLOW SWITCH	N/A	BY OTHERS
6	10	VTS VALVE TAMPER SWITCH	N/A	BY OTHERS
5	21	FDM DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2 DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
4	1	XP10-M TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

DRAWING INDEX

1	COVER SHEET	FA 0.0
2	RISER DIAGRAM	FA 1.0
3	FIRST FLOOR WEST	FA 3.01W
4	SECOND FLOOR EAST	FA 3.02E
5	SECOND FLOOR WEST	FA 3.02W
6	THIRD FLOOR EAST	FA 3.03E
7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
12	SIXTH FLOOR EAST	FA 3.06E
13	SEVENTH FLOOR EAST	FA 3.07E
14	CALCULATIONS	FA 4.0
15	DETAILS	FA 5.0

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Toll Free: 888◆6000◆DBI FAX: 805◆791◆2037
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Revisions

SYMBOL	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRB # 093.1 & FI 99	5/18/2012 4/11/2012	
3	SFM REVIEW COMMENTS	8/20/2012	
4	CRB 93.2	1/15/2013	
5	FA & SMOKE CONTROL SFM COMMENTS	4/3/2013	
6	AS-BUILT DRAWINGS	8/23/2013	

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV #102672

PROJECT ENGINEER: Integral Design Associates INC.

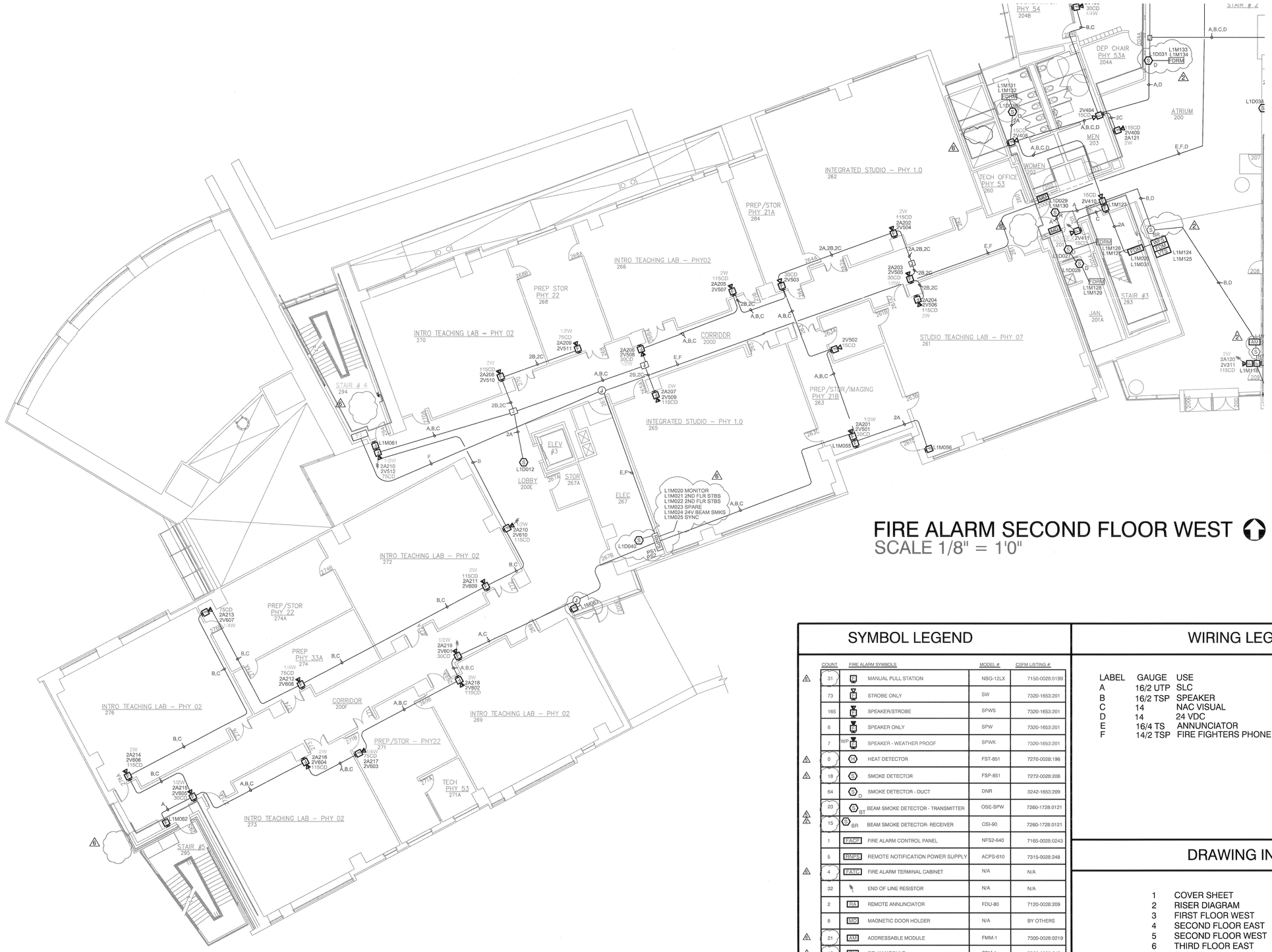
CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.01W

SHEET 3 OF 15



FIRE ALARM SECOND FLOOR WEST

SCALE 1/8" = 1'0"

SYMBOL LEGEND

	COUNT		FIRE ALARM SYMBOLS	MODEL #	CSFM LISTING #
⚠	31	M	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73		STROBE ONLY	SW	7320-1653:201
	165		SPEAKER/STROBE	SPWS	7320-1653:201
	6		SPEAKER ONLY	SPW	7320-1653:201
	7	WP	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
⚠	0	H	HEAT DETECTOR	FST-851	7270-0028:196
⚠	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
⚠	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
⚠	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
⚠	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
⚠	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
⚠	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
⚠	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
⚠	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ	FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
⚠	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

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7	THIRD FLOOR WEST	FA 3.03W
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6	AS-BUILT DRAWINGS	8/23/2013	

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV # 060972

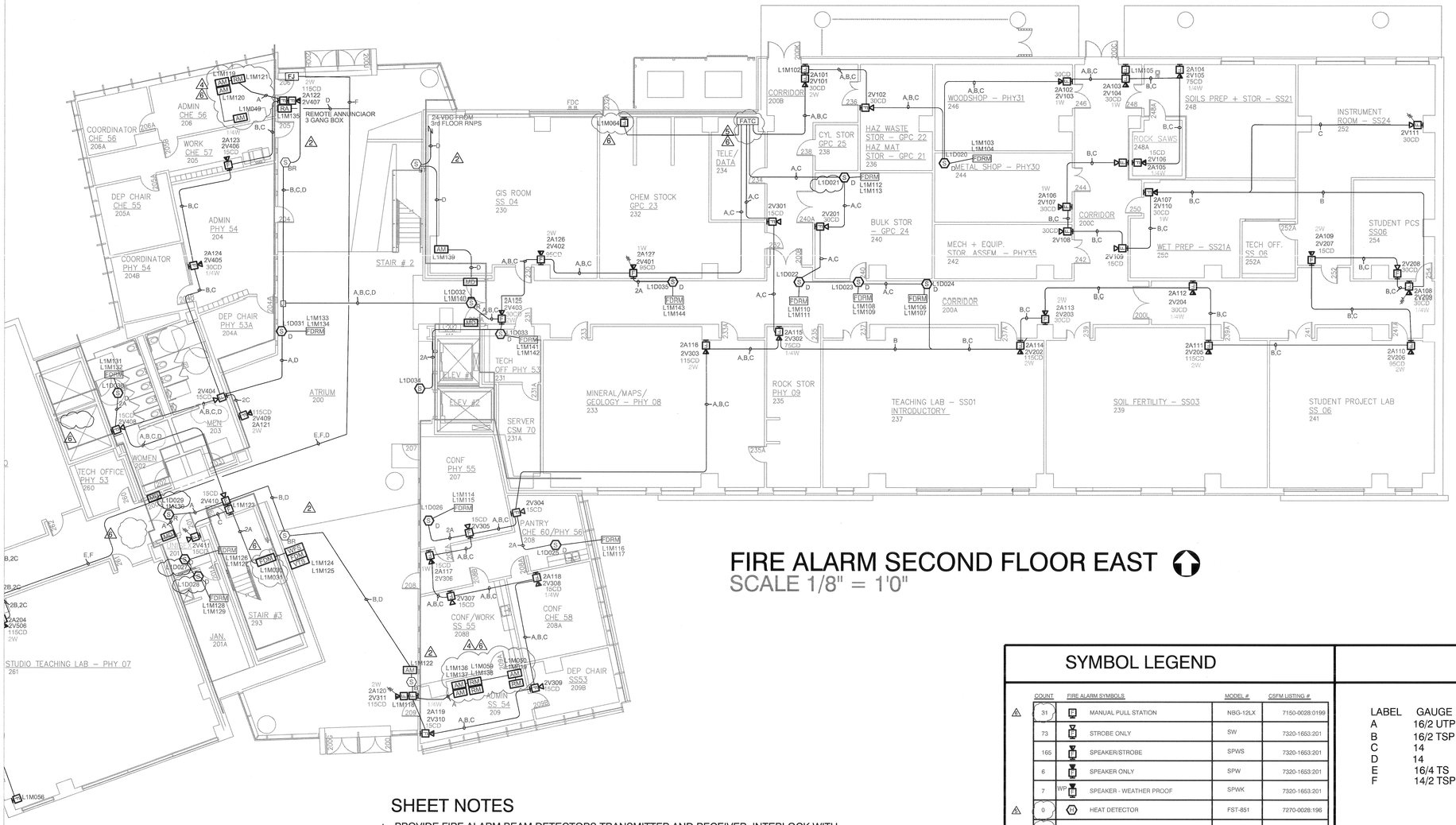
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.02W



FIRE ALARM SECOND FLOOR EAST

SCALE 1/8" = 1'0"

SHEET NOTES

1 PROVIDE FIRE ALARM BEAM DETECTORS TRANSMITTER AND RECEIVER. INTERLOCK WITH SMOKE EVACUATION SYSTEM SUCH THAT WHEN BEAM DETECTOR IS ACTIVATED, SMOKE EVACUATION SYSTEM IS ACTIVATED. REFER TO DETAIL 4 & 5/FA5.0.

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3 ACTIVATION OF AN ALARM ANYWHERE WITHIN THE BUILDING SHALL SHUT DOWN ALL AIR HANDLING UNITS.

4 ACTIVATION OF THE ATRIUM SMOKE CONTROL SYSTEM SHALL OPEN ALL ATRIUM DOORS WITH MOTORIZED DOOR OPERATORS.

SYMBOL LEGEND

	COUNT	FIRE ALARM SYMBOLS		MODEL #	CSFM LISTING #
⚠	31		MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73		STROBE ONLY	SW	7320-1653:201
	165		SPEAKER/STROBE	SPWS	7320-1653:201
	6		SPEAKER ONLY	SPW	7320-1653:201
	7	WP	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
⚠	0	H	HEAT DETECTOR	FST-851	7270-0028:196
⚠	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
⚠ ⚠	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
⚠ ⚠	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
⚠	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
⚠	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
⚠	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
⚠	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
⚠	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ	FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAAC	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
⚠	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

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Revisions

SYMBOL	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRB # F093.1 & F199	5/18/2012	
3	SFM REVIEW COMMENTS	4/11/2012	
4	CRB 93.2	8/20/2012	
5	FA & SMOKE CONTROL SFM COMMENTS	11/5/2013	
6	AS-BUILT DRAWINGS	4/3/2013	
		8/23/2013	

DESIGNED BY: Curtis Streeter
DRAWN BY: Derek Richardson
CHECKED BY: CURTIS STREETER, SET NICET IV #102872
PROJECT ENGINEER: Integral Design Associates INC.
DATE: 08/23/2013
SCALE:
DRAWING CODE: FA ALL DRAWINGS CPCFS

CENTER FOR SCIENCE AND MATHEMATICS
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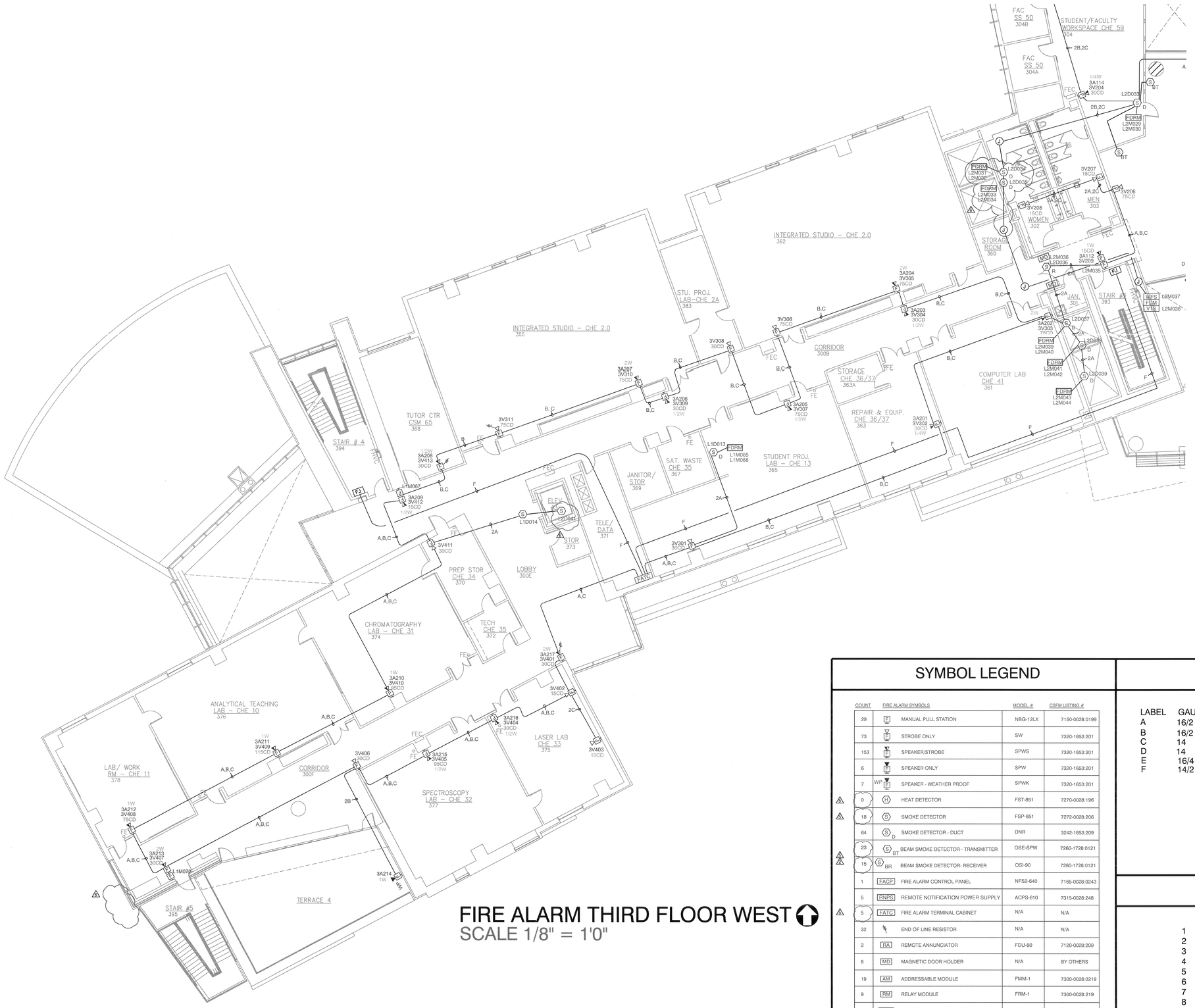
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.02E



FIRE ALARM THIRD FLOOR WEST
SCALE 1/8" = 1'0"

SYMBOL LEGEND

	COUNT		FIRE ALARM SYMBOLS	MODEL #	CSFM LISTING #
	29	F	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73	F	STROBE ONLY	SW	7320-1653:201
	153	F	SPEAKER/STROBE	SPWS	7320-1653:201
	6	F	SPEAKER ONLY	SPW	7320-1653:201
	7	WP F	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
4	0	H	HEAT DETECTOR	FST-851	7270-0028:196
4	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
4	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
4	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
4	5	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
	19	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
	9	RM	RELAY MODULE	FRM-1	7300-0028:219
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4	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
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	4	DAA2	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
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STYMROL

DATE: 08/23/2013
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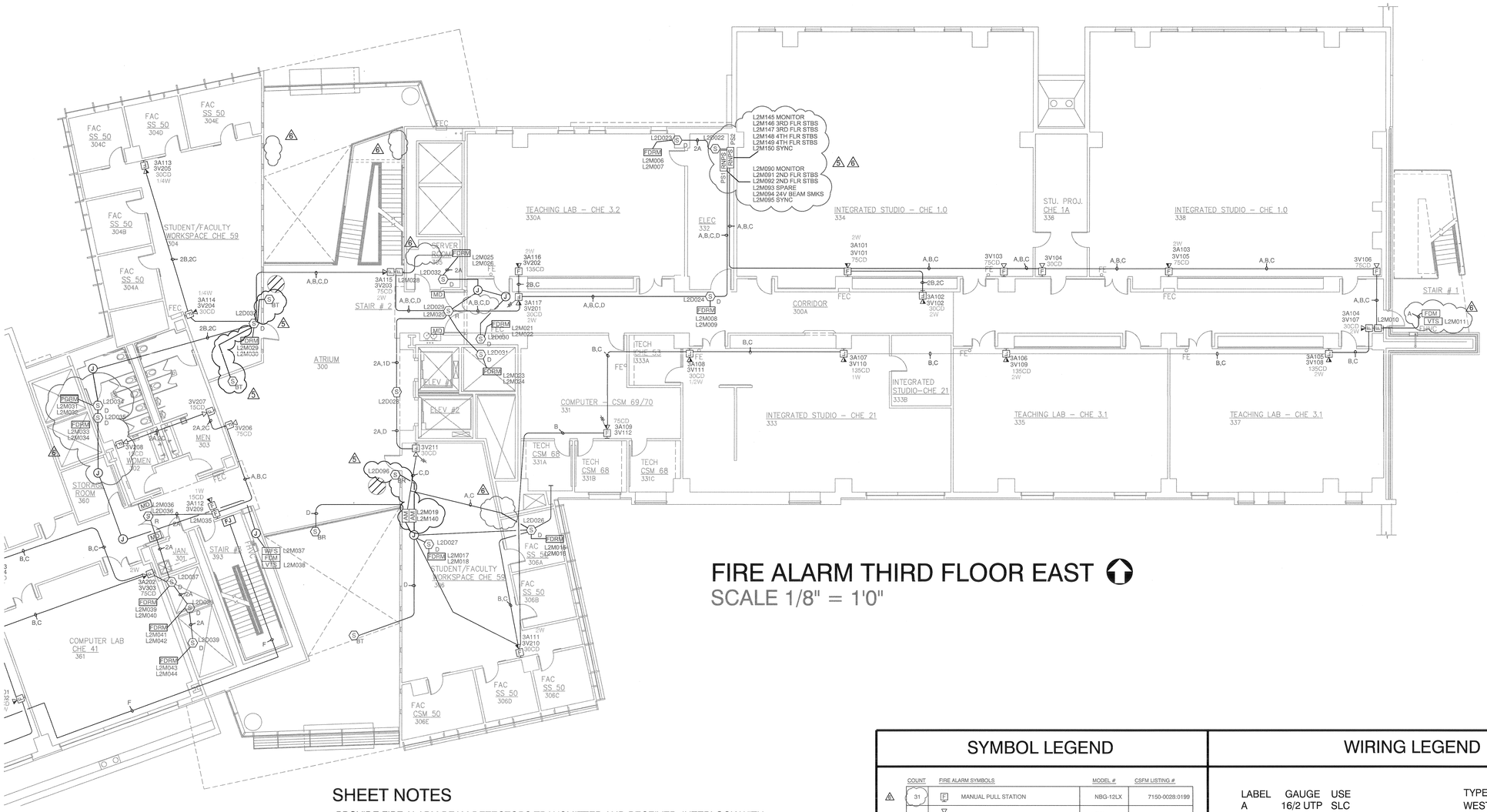

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2	CRB # 1093.1 & FI 99	5/18/2012 4/17/2012	
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6	AS-BUILT DRAWINGS	8/23/2013	

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER SET NICET IV # 182872

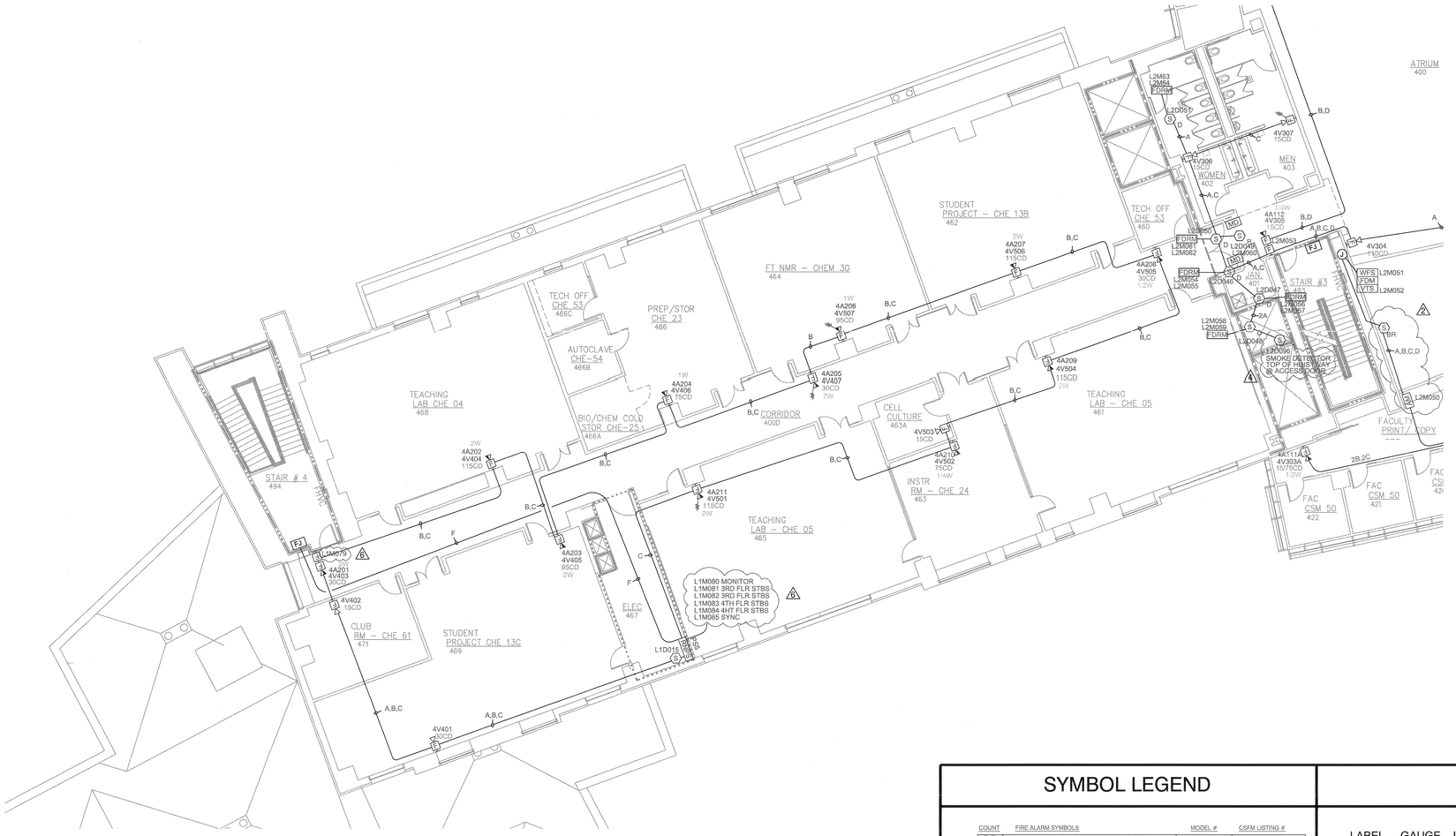
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.03E



FIRE ALARM FOURTH FLOOR WEST

SCALE 1/8" = 1'0"

SYMBOL LEGEND

	COUNT	FIRE ALARM SYMBOLS	MODEL #	CSFM LISTING #
	31	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73	STROBE ONLY	SW	7320-1653:201
	165	SPEAKER/STROBE	SPWS	7320-1653:201
	6	SPEAKER ONLY	SPW	7320-1653:201
	7	WP SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
4	0	HEAT DETECTOR	FST-851	7270-0028:196
4	18	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
4	23	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
4	15	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
4	4	FATC FIRE ALARM TERMINAL CABINET	N/A	N/A
	32	END OF LINE RESISTOR	N/A	N/A
	2	RA REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD MAGNETIC DOOR HOLDER	N/A	BY OTHERS
4	21	AM ADDRESSABLE MODULE	FMM-1	7300-0028:0219
4	12	RM RELAY MODULE	FRM-1	7300-0028:219
	16	WFS WATER FLOW SWITCH	N/A	BY OTHERS
4	10	VTS VALVE TAMPER SWITCH	N/A	BY OTHERS
4	21	FDM DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2 DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
4	1	XP10-M TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

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4	SECOND FLOOR EAST	FA 3.02E
5	SECOND FLOOR WEST	FA 3.02W
6	THIRD FLOOR EAST	FA 3.03E
7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
12	SIXTH FLOOR EAST	FA 3.06E
13	SEVENTH FLOOR EAST	FA 4.0
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DESIGNED BY: Curtis Streeter
DRAWN BY: Derek Richardson
CHECKED BY: CURTIS STREETER, SET NICET IV # 102672
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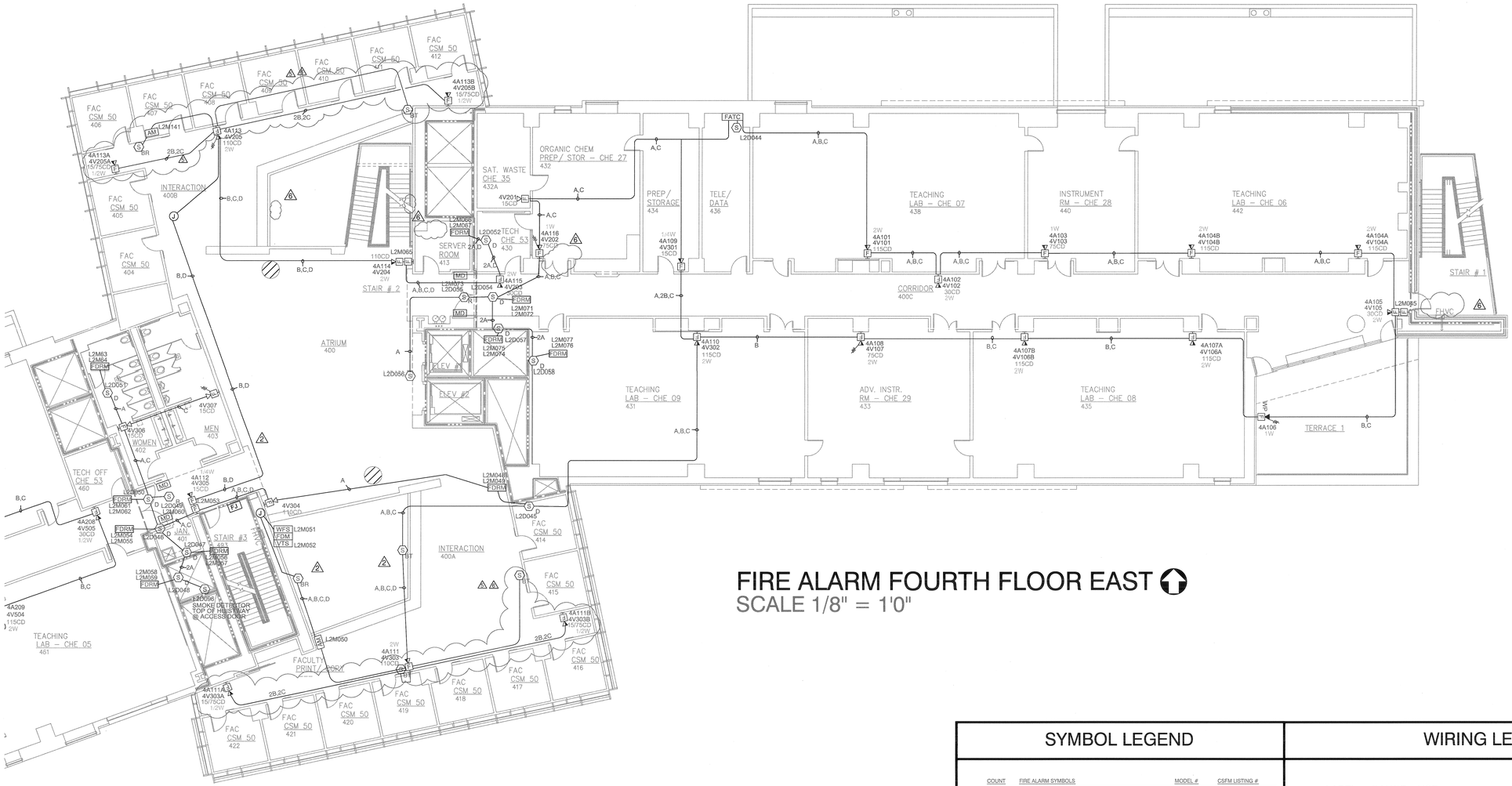

FIRE ALARM FOURTH FLOOR EAST

SCALE 1/8" = 1'0"

SHEET NOTES

1 PROVIDE FIRE ALARM BEAM DETECTORS TRANSMITTER AND RECEIVER. INTERLOCK WITH SMOKE EVACUATION SYSTEM SUCH THAT WHEN BEAM DETECTOR IS ACTIVATED, SMOKE EVACUATION SYSTEM IS ACTIVATED. REFER TO DETAIL 4 & 5/FA5.0.

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	165	F	SPEAKER/STROBE	SPWS	7320-1653:201
	6	F	SPEAKER ONLY	SPW	7320-1653:201
	7	WP F	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
⚠	0	H	HEAT DETECTOR	FST-851	7270-0028:196
⚠	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
⚠	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
⚠	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
⚠	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
⚠	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
⚠	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
⚠	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
⚠	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ	FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
⚠	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
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DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV # 102572

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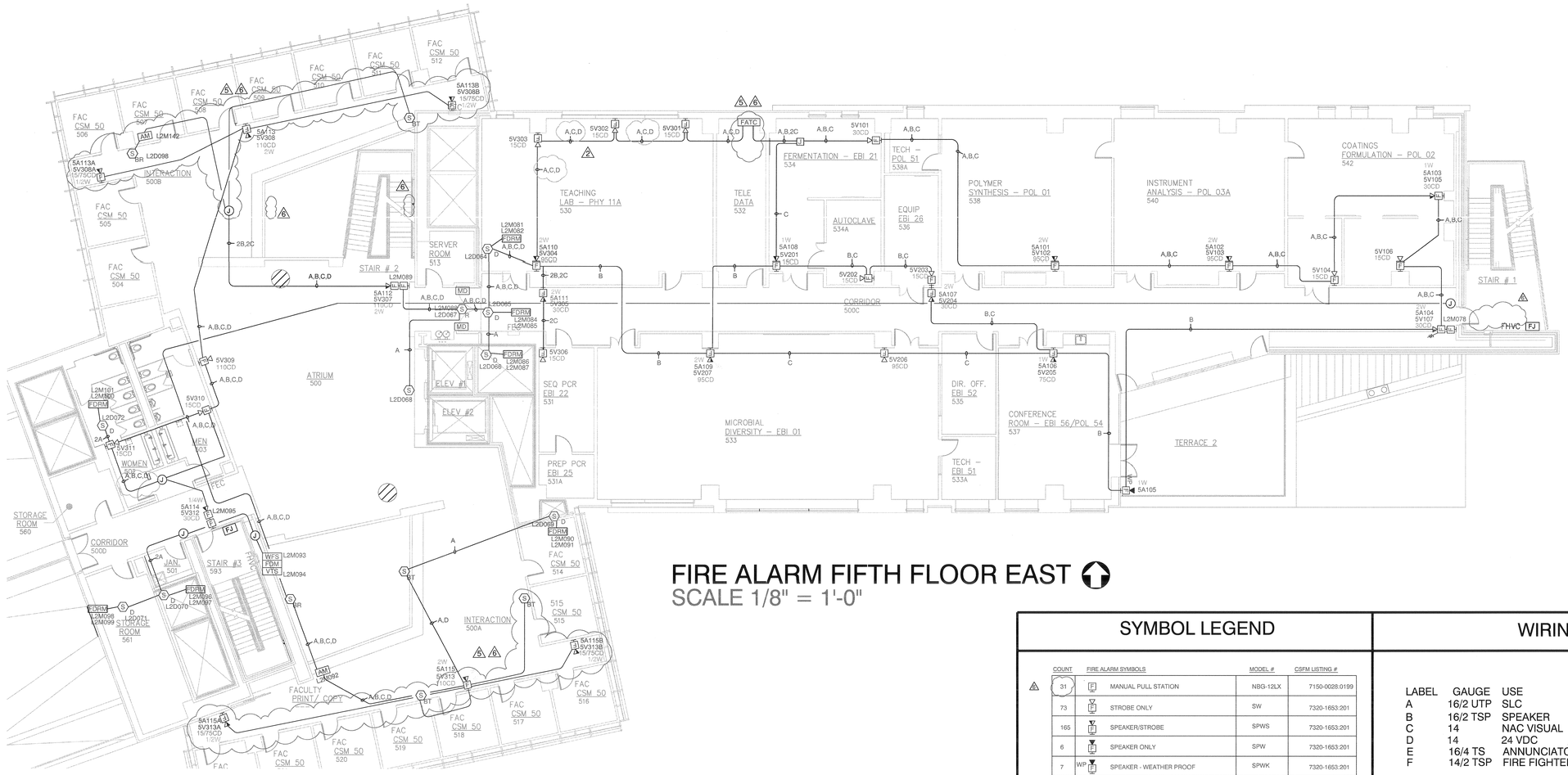

FIRE ALARM FIFTH FLOOR EAST

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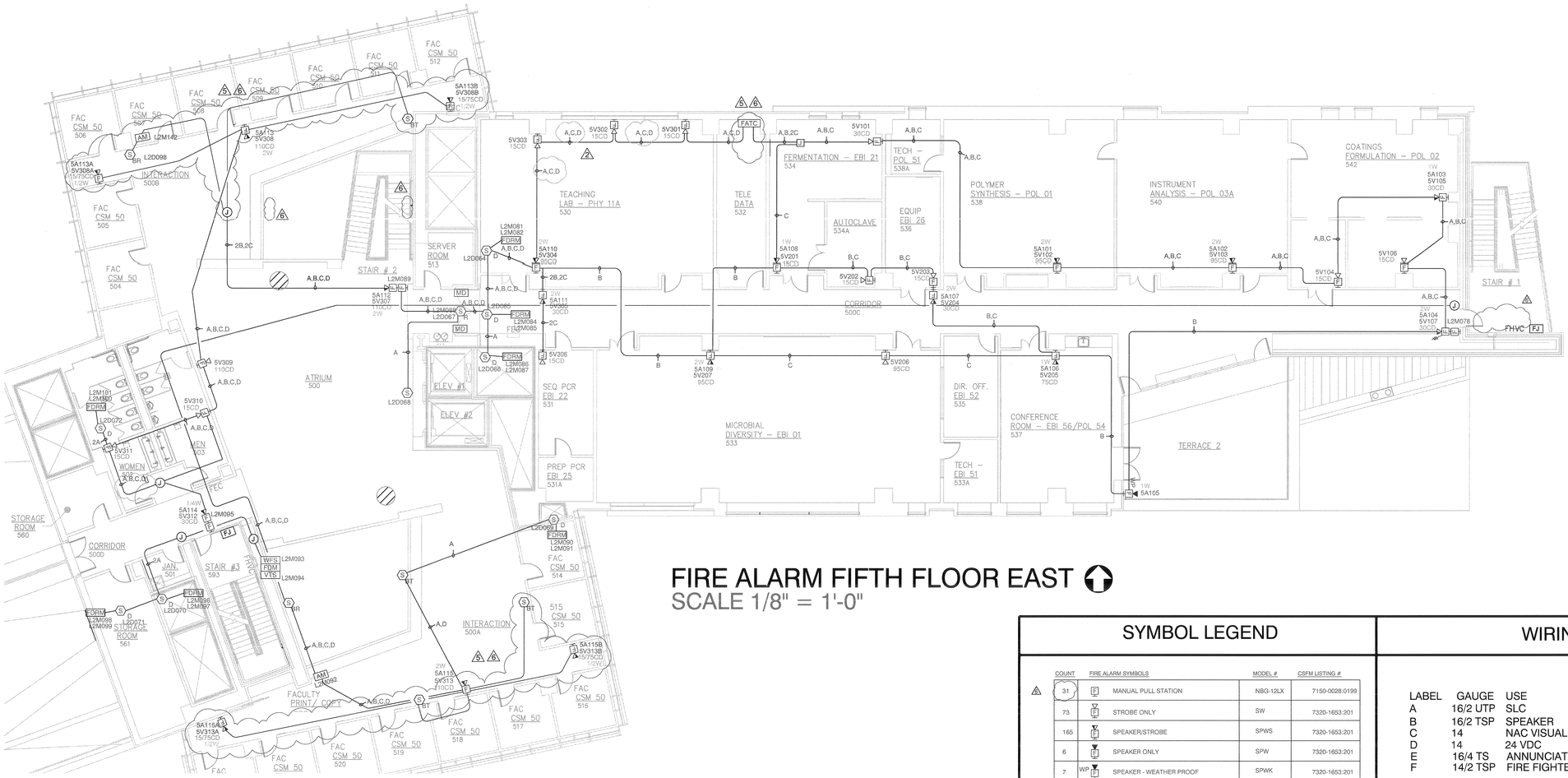

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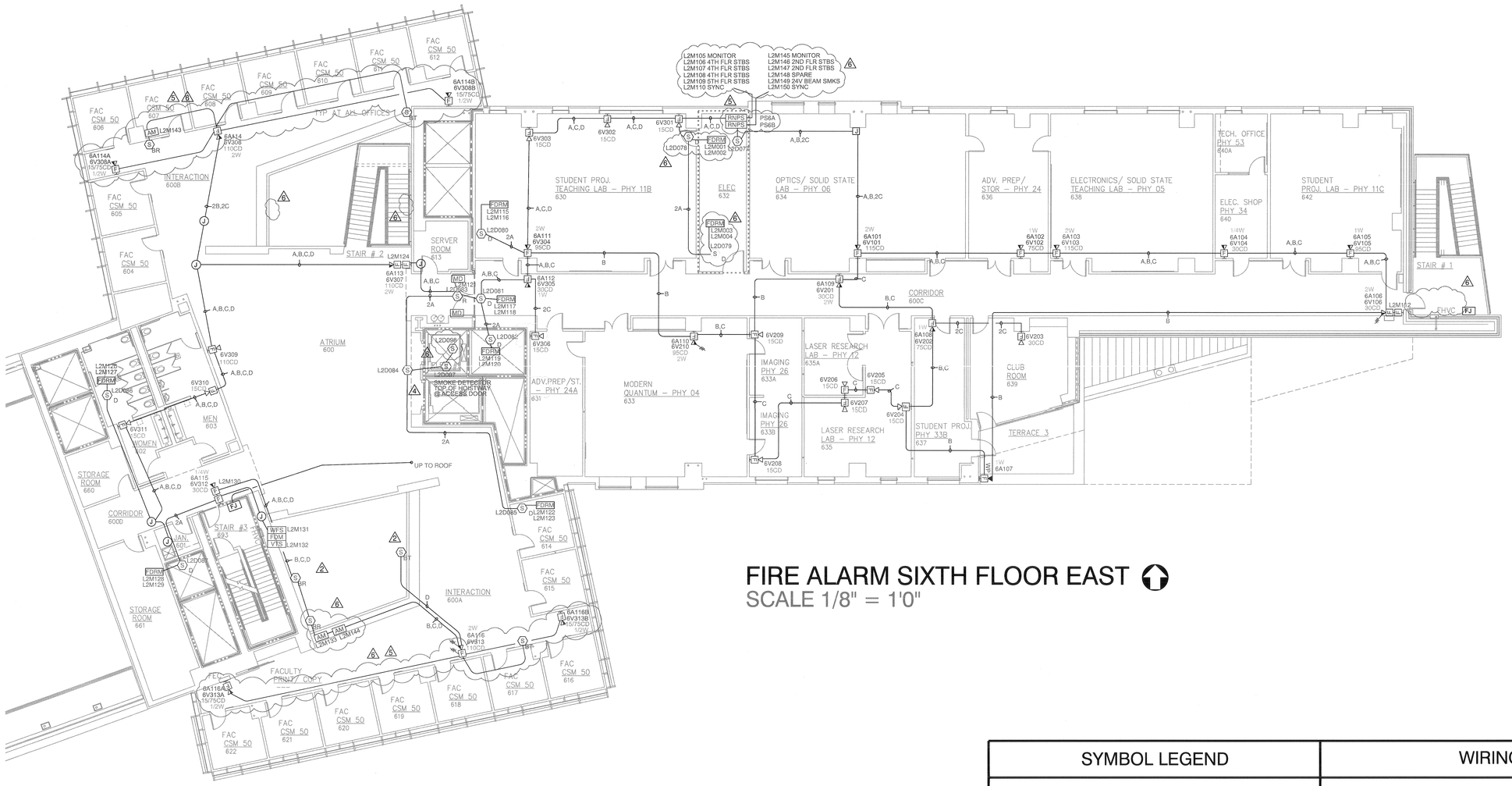

FIRE ALARM SIXTH FLOOR EAST

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SHEET NOTES

1 PROVIDE FIRE ALARM BEAM DETECTORS TRANSMITTER AND RECEIVER. INTERLOCK WITH SMOKE EVACUATION SYSTEM SUCH THAT WHEN BEAM DETECTOR IS ACTIVATED, SMOKE EVACUATION SYSTEM IS ACTIVATED. REFER TO DETAIL 4 & 5/FA5.0.

2 ACTIVATION OF A MANUAL PULL STATION, BEAM DETECTOR OR SPRINKLER WATER FLOW WITHIN THE ATRIUM SHALL ACTIVATE ATRIUM SMOKE EVACUATION SYSTEM. SMOKE EVACUATION SYSTEM SHALL FUNCTION AS DIRECTED BY MECHANICAL DOCUMENTS. REFER TO DETAIL 9/M5.05 FOR ADDITIONAL INFORMATION.

3 ACTIVATION OF AN ALARM ANYWHERE WITHIN THE BUILDING SHALL SHUT DOWN ALL AIR HANDLING UNITS.

4 ACTIVATION OF THE ATRIUM SMOKE CONTROL SYSTEM SHALL OPEN ALL ATRIUM DOORS WITH MOTORIZED DOOR OPERATORS.

SYMBOL LEGEND

	COUNT	FIRE ALARM SYMBOLS		MODEL #	CSFM LISTING #
4	31	F	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
	73	F	STROBE ONLY	SW	7320-1653:201
	165	F	SPEAKER/STROBE	SPWS	7320-1653:201
	6	F	SPEAKER ONLY	SPW	7320-1653:201
	7	WP F	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
4	0	H	HEAT DETECTOR	FST-851	7270-0028:196
4	18	S	SMOKE DETECTOR	FSP-851	7272-0028:206
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
2 4	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
2 4	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
4	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
4	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
4	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
4	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
4	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
	12	FJ	FIRE FIGHTER'S PHONE JACKS	FTM-1	7300-1652:0182
	4	DAA2	DIGITAL AUDIO AMPLIFIERS	DAA2	7170-0028:223 7170-0028:224
	1	XP6-R	SIX RELAY CONTROL MODULE	XP6-R	7300-0028:0219
4	1	XP10-M	TEN-INPUT MONITOR MODULE	XP10-M	7300-0028:0219

WIRING LEGEND

LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
A	16/2 UTP	SLC	WEST PENN D990
B	16/2 TSP	SPEAKER	WEST PENN D991
C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

DRAWING INDEX

1	COVER SHEET	FA 0.0
2	RISER DIAGRAM	FA 1.0
3	FIRST FLOOR WEST	FA 3.01W
4	SECOND FLOOR EAST	FA 3.02E
5	SECOND FLOOR WEST	FA 3.02W
6	THIRD FLOOR EAST	FA 3.03E
7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
12	SIXTH FLOOR EAST	FA 3.06E
13	SEVENTH FLOOR EAST	FA 3.07E
14	CALCULATIONS	FA 4.0
15	DETAILS	FA 5.0

Deep Blue Integration

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Service - Monitoring

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3442 Empresa Drive Suite C
San Luis Obispo, CA 93401
C-10, C-16 #943465 ACO#6864
Toll Free: 888◆6000◆DBI FAX: 805◆791◆2037
www.deepblueintegration.com

Revisions

SYMBOL	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRB # 093.1 & FI 99	5/18/2012	
3	SFM REVIEW COMMENTS	4/11/2012	
4	CRB 93.2	8/20/2012	
5	FA & SMOKE CONTROL SFM COMMENTS	1/15/2013	
6	AS-BUILT DRAWINGS	4/3/2013	
		8/23/2013	

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV #120272

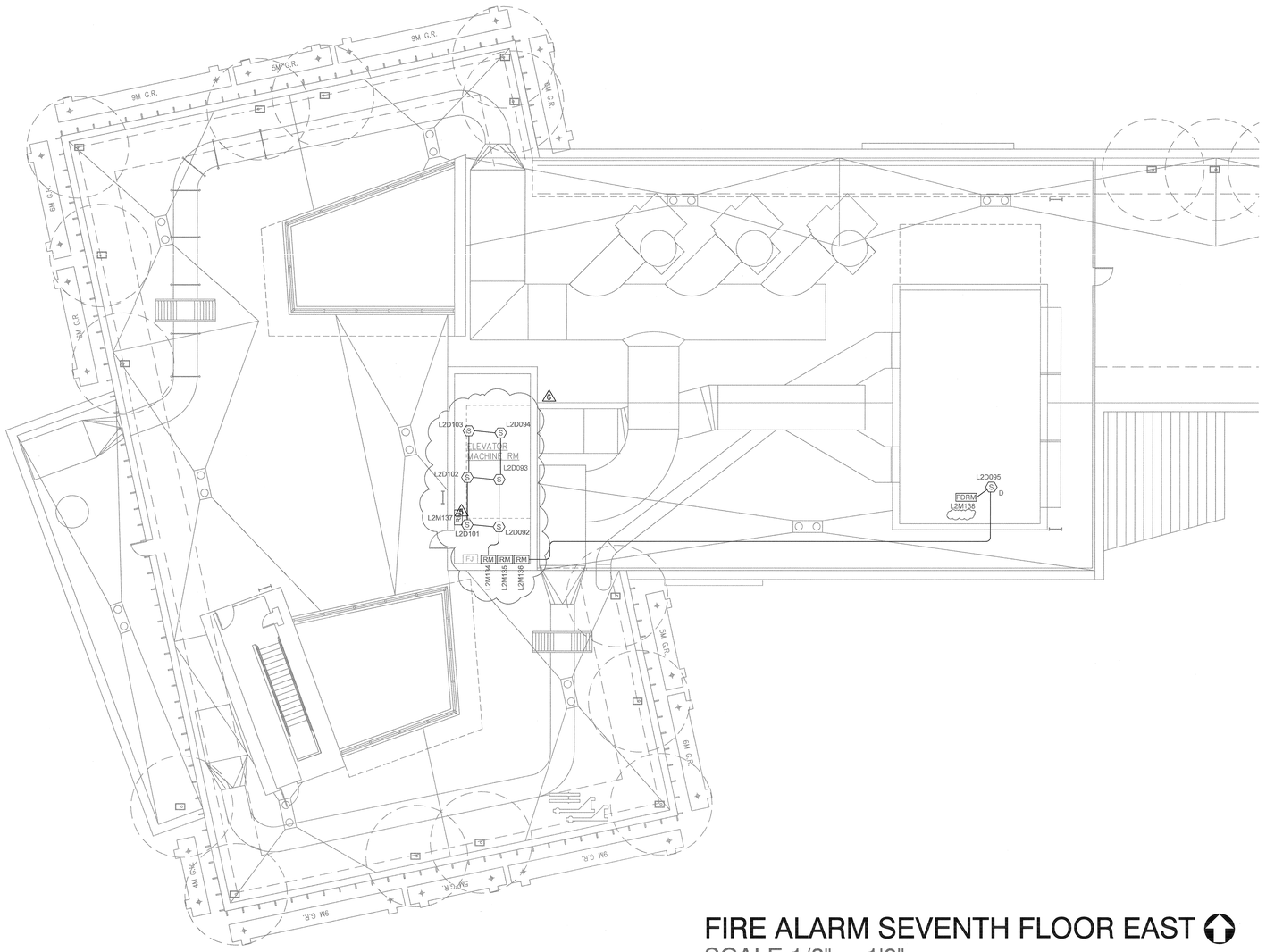
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.06E



FIRE ALARM SEVENTH FLOOR EAST

SCALE 1/8" = 1'0"

SYMBOL LEGEND

	COUNT		FIRE ALARM SYMBOLS	MODEL #	CSFM LISTING #
⚠	31	F	MANUAL PULL STATION	NBG-12LX	7150-0028:0199
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	165	F	SPEAKER/STROBE	SPWS	7320-1653:201
	6	F	SPEAKER ONLY	SPW	7320-1653:201
	7	WP F	SPEAKER - WEATHER PROOF	SPWK	7320-1653:201
⚠	0	H	HEAT DETECTOR	FST-851	7270-0028:196
⚠	18	S	SMOKE DETECTOR	FSP-851	7272-0028:208
	64	S D	SMOKE DETECTOR - DUCT	DNR	3242-1653:209
⚠ ⚠	23	S BT	BEAM SMOKE DETECTOR - TRANSMITTER	OSE-SPW	7260-1728:0121
	15	S BR	BEAM SMOKE DETECTOR- RECEIVER	OSI-90	7260-1728:0121
	1	FACP	FIRE ALARM CONTROL PANEL	NFS2-640	7165-0028:0243
	5	RNPS	REMOTE NOTIFICATION POWER SUPPLY	ACPS-610	7315-0028:248
⚠	4	FATC	FIRE ALARM TERMINAL CABINET	N/A	N/A
	32		END OF LINE RESISTOR	N/A	N/A
	2	RA	REMOTE ANNUNCIATOR	FDU-80	7120-0028:209
	8	MD	MAGNETIC DOOR HOLDER	N/A	BY OTHERS
⚠	21	AM	ADDRESSABLE MODULE	FMM-1	7300-0028:0219
⚠	12	RM	RELAY MODULE	FRM-1	7300-0028:219
	16	WFS	WATER FLOW SWITCH	N/A	BY OTHERS
⚠	10	VTS	VALVE TAMPER SWITCH	N/A	BY OTHERS
⚠	21	FDM	DUAL MONITOR MODULE	FDM-1	7300-0028:0219
	64	FDRM	DUAL RELAY / MONITOR MODULE	FDRM-1	7300-0028:0219
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LABEL	GAUGE	USE	TYPE (OR EQUIVALENT)
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C	14	NAC VISUAL	THHN
D	14	24 VDC	THHN
E	16/4 TS	ANNUNCIATOR	WEST PENN 993
F	14/2 TSP	FIRE FIGHTERS PHONE	WEST PENN D995

DRAWING INDEX

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7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
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6	AS-BUILT DRAWINGS	4/3/2013	
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SYMBOL

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV #102872

PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 3.07E

VOLTAGE DROP CALCULATIONS

WEST

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS5- Circuit 4V4
Area Covered: 4th Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.897
Distance from source to 1st device: 50 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
4V401	50	23.72	0.275	1.15%	0.094	System Sensor	SCR	ST	30
4V402	40	23.53	0.473	1.97%	0.066	System Sensor	SCR	ST	15
4V403	10	23.48	0.518	2.16%	0.094	System Sensor	SCR	ST	30
4V404	40	23.32	0.676	2.82%	0.210	System Sensor	SCR	ST	115
4V405	20	23.27	0.729	3.04%	0.181	System Sensor	SCR	ST	95
4V406	45	23.20	0.799	3.33%	0.158	System Sensor	SCR	ST	75
4V407	30	23.18	0.816	3.40%	0.094	System Sensor	SCR	ST	30
END	0	23.18	0.816	3.40%	0.000				
END	0	23.18	0.816	3.40%	0.000				
END	0	23.18	0.816	3.40%	0.000				
END	0	23.18	0.816	3.40%	0.000				
END	0	23.18	0.816	3.40%	0.000				
Totals	235	End of Line Voltage		23.18	0.897				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.897	235	0.82
End of Line Voltage		23.18
Percent Drop		3.40%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS5- Circuit 4V5
Area Covered: 4th Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.129
Distance from source to 1st device: 37 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
4V501	37	23.74	0.256	1.07%	0.210	System Sensor	SCR	ST	115
4V502	50	23.46	0.539	2.24%	0.158	System Sensor	SCR	ST	75
4V503	7	23.43	0.571	2.38%	0.066	System Sensor	SCR	ST	15
4V504	25	23.32	0.678	2.83%	0.210	System Sensor	SCR	ST	115
4V505	40	23.20	0.797	3.32%	0.094	System Sensor	SCR	ST	30
4V506	30	23.13	0.869	3.62%	0.210	System Sensor	SCR	ST	115
4V507	35	23.09	0.908	3.78%	0.181	System Sensor	SCR	ST	95
END	0	23.09	0.908	3.78%	0.000				
END	0	23.09	0.908	3.78%	0.000				
END	0	23.09	0.908	3.78%	0.000				
END	0	23.09	0.908	3.78%	0.000				
END	0	23.09	0.908	3.78%	0.000				
END	0	23.09	0.908	3.78%	0.000				
Totals	224	End of Line Voltage		23.09	1.129				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.129	224	0.91
End of Line Voltage		23.09
Percent Drop		3.78%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS5- Circuit 3V3
Area Covered: 3rd Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.418
Distance from source to 1st device: 17 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
3V301	17	23.85	0.148	0.62%	0.094	System Sensor	SCR	ST	30
3V302	65	23.32	0.676	2.82%	0.094	System Sensor	SCR	ST	30
3V303	50	22.95	1.054	4.39%	0.158	System Sensor	SCR	ST	75
3V304	20	22.81	1.186	4.94%	0.094	System Sensor	SCR	ST	30
3V305	30	22.63	1.366	5.69%	0.158	System Sensor	SCR	ST	75
3V306	30	22.48	1.517	6.32%	0.158	System Sensor	SCR	ST	75
3V307	20	22.40	1.598	6.66%	0.158	System Sensor	SCR	ST	75
3V308	30	22.31	1.691	7.05%	0.094	System Sensor	SCR	ST	30
3V309	25	22.25	1.754	7.31%	0.094	System Sensor	SCR	ST	30
3V310	15	22.22	1.783	7.43%	0.158	System Sensor	SCR	ST	75
3V311	35	22.18	1.817	7.57%	0.158	System Sensor	SCR	ST	75
END		22.18	1.817	7.57%	0.000				
END		22.18	1.817	7.57%	0.000				
Totals	337	End of Line Voltage		22.18	1.418				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.418	337	1.82
End of Line Voltage		22.18
Percent Drop		7.57%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS5- Circuit 3V4
Area Covered: 3rd Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.492
Distance from source to 1st device: 40 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
3V401	40	23.63	0.366	1.53%	0.094	System Sensor	SCR	ST	30
3V402	12	23.53	0.469	1.96%	0.066	System Sensor	SCR	ST	15
3V403	12	23.43	0.568	2.36%	0.066	System Sensor	SCR	ST	15
3V404	40	23.12	0.879	3.66%	0.094	System Sensor	SCR	ST	30
3V405	20	22.98	1.022	4.26%	0.181	System Sensor	SCR	ST	95
3V406	25	22.83	1.175	4.89%	0.094	System Sensor	SCR	ST	30
3V407	50	22.55	1.450	6.04%	0.094	System Sensor	SCR	ST	30
3V408	15	22.48	1.524	6.35%	0.158	System Sensor	SCR	ST	75
3V409	40	22.32	1.682	7.01%	0.210	System Sensor	SCR	ST	115
3V410	30	22.24	1.762	7.34%	0.181	System Sensor	SCR	ST	95
3V411	50	22.16	1.840	7.67%	0.094	System Sensor	SCR	ST	30
3V412	20	22.14	1.860	7.75%	0.066	System Sensor	SCR	ST	15
3V413	20	22.13	1.872	7.80%	0.094	System Sensor	SCR	ST	30
Totals	374	End of Line Voltage		22.13	1.492				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.492	374	1.87
End of Line Voltage		22.13
Percent Drop		7.80%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier FACP- Circuit 2V5
Area Covered: 2nd Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.808
Distance from source to 1st device: 60 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V501	60	23.33	0.666	2.78%	0.094	System Sensor	SCR	ST	30
2V502	23	23.09	0.908	3.78%	0.066	System Sensor	SCR	ST	15
2V503	25	22.84	1.161	4.84%	0.094	System Sensor	SCR	ST	30
2V504	30	22.55	1.447	6.03%	0.210	System Sensor	SCR	ST	115
2V505	13	22.45	1.547	6.45%	0.094	System Sensor	SCR	ST	30
2V506	8	22.40	1.598	6.66%	0.210	System Sensor	SCR	ST	115
2V507	68	22.06	1.945	8.10%	0.210	System Sensor	SCR	ST	115
2V508	11	22.01	1.994	8.31%	0.094	System Sensor	SCR	ST	30
2V509	46	21.86	2.143	8.93%	0.210	System Sensor	SCR	ST	115
2V510	48	21.76	2.236	9.32%	0.210	System Sensor	SCR	ST	115
2V511	20	21.74	2.256	9.40%	0.158	System Sensor	SCR	ST	75
2V512	60	21.74	2.256	9.40%	0.158	System Sensor	SCR	ST	75
END		21.74	2.256	9.40%					
Totals	412	End of Line Voltage		21.74	1.808				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.808	412	2.26
End of Line Voltage		21.74
Percent Drop		9.40%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier FACP- Circuit 2V6
Area Covered: 2nd Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.712
Distance from source to 1st device: 40 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V601	40	23.58	0.420	1.75%	0.094	System Sensor	SCR	ST	30
2V602	30	23.28	0.719	2.99%	0.210	System Sensor	SCR	ST	115
2V603	30	23.02	0.978	4.07%	0.158	System Sensor	SCR	ST	75
2V604	25	22.83	1.170	4.87%	0.210	System Sensor	SCR	ST	115
2V605	30	22.64	1.361	5.67%	0.094	System Sensor	SCR	ST	30
2V606	20	22.52	1.477	6.16%	0.210	System Sensor	SCR	ST	115
2V607	60	22.25	1.749	7.29%	0.158	System Sensor	SCR	ST	75
2V608	40	22.11	1.891	7.88%	0.158	System Sensor	SCR	ST	75
2V609	50	21.98	2.020	8.41%	0.210	System Sensor	SCR	ST	115
2V610	25	21.95	2.052	8.55%	0.210	System Sensor	SCR	ST	115
END		21.95	2.052	8.55%	0.000				
END		21.95	2.052	8.55%	0.000				
END		21.95	2.052	8.55%	0.000				
Totals	350	End of Line Voltage		21.95	1.712				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.712	350	2.05
End of Line Voltage		21.95
Percent Drop		8.55%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier FACP- Circuit 1V1
Area Covered: 1st Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.016
Distance from source to 1st device: 30 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
1V101	30	23.81	0.187	0.78%	0.066	System Sensor	SCR	ST	15
1V102	20	23.70	0.304	1.27%	0.066	System Sensor	SCR	ST	15
1V103	30	23.53	0.467	1.94%	0.066	System Sensor	SCR	ST	15
1V104	50	23.28	0.718	2.99%	0.066	System Sensor	SCR	ST	15
1V105	50	23.05	0.949	3.95%	0.210	System Sensor	SCR	ST	115
1V106	35	22.93	1.065	4.44%	0.094	System Sensor	SCR	ST	30
1V107	30	22.85	1.148	4.78%	0.158	System Sensor	SCR	ST	75
1V108	35	22.79	1.210	5.04%	0.066	System Sensor	SCR	ST	15
1V109	40	22.74	1.265	5.27%	0.066	System Sensor	SCR	ST	15
1V110	35	22.70	1.299	5.41%	0.158	System Sensor	SCR	ST	75
END		22.70	1.299	5.41%	0.000				
END		22.70	1.299	5.41%	0.000				
END		22.70	1.299	5.41%	0.000				
Totals	355	End of Line Voltage		22.70	1.016				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.016	355	1.30
End of Line Voltage		22.70
Percent Drop		5.41%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier FACP- Circuit 1V2
Area Covered: 1st Floor West
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.829
Distance from source to 1st device: 40 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
1V201	40	23.55	0.449	1.87%	0.094	System Sensor	SCR	ST	30
1V202	45	23.07	0.929	3.87%	0.158	System Sensor	SCR	ST	75
1V203	15	22.93	1.074	4.47%	0.210	System Sensor	SCR	ST	115
1V204	15	22.80	1.200	5.00%	0.094	System Sensor	SCR	ST	30
1V205	15	22.68	1.317	5.49%	0.158	System Sensor	SCR	ST	75
1V206	15	22.58	1.420	5.92%	0.181	System Sensor	SCR	ST	95
1V207	40	22.35	1.649	6.87%	0.210	System Sensor	SCR	ST	115
1V208	10	22.31	1.694	7.06%	0.094	System Sensor	SCR	ST	30
1V209	10	22.27	1.732	7.22%	0.210	System Sensor	SCR	ST	115
1V210	35	22.18	1.822	7.59%	0.210	System Sensor	SCR	ST	115
1V211	15	22.16	1.842	7.67%	0.210	System Sensor	SCR	ST	115
END		22.16	1.842	7.67%	0.000				
END		22.16	1.842	7.67%	0.000				
Totals	255	End of Line Voltage		22.16	1.829				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.829	255	1.84
End of Line Voltage		22.16
Percent Drop		7.67%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

EAST

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS4- Circuit 6V1
Area Covered: 6th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.947
Distance from source to 1st device: 50 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
6V101	50	23.71	0.291	1.21%	0.210	System Sensor	SCR	ST	115
6V102	32	23.56	0.436	1.81%	0.158	System Sensor	SCR	ST	75
6V103	10	23.53	0.471	1.96%	0.210	System Sensor	SCR	ST	115
6V104	32	23.46	0.544	2.26%	0.094	System Sensor	SCR	ST	30
6V105	25	23.41	0.586	2.44%	0.181	System Sensor	SCR	ST	95
6V106	20	23.40	0.597	2.49%	0.094	System Sensor	SCR	ST	30
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
END		23.40	0.597	2.49%					
Totals	169	End of Line Voltage		23.40	0.947				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.947	169	0.60
End of Line Voltage		23.40
Percent Drop		2.49%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS4- Circuit 6V2
Area Covered: 6th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.923
Distance from source to 1st device: 62 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
6V201	62	23.65	0.351	1.46%	0.094	System Sensor	SCR	ST	30
6V202	30	23.50	0.504	2.10%	0.158	System Sensor	SCR	ST	75
6V203	20	23.41	0.586	2.44%	0.094	System Sensor	SCR	ST	30
6V204	45	23.25	0.746	3.11%	0.066	System Sensor	SCR	ST	15
6V205	10	23.22	0.777	3.24%	0.066	System Sensor	SCR	ST	15
6V206	10	23.20	0.805	3.35%	0.066	System Sensor	SCR	ST	15
6V207	5	23.18	0.816	3.40%	0.066	System Sensor	SCR	ST	15
6V208	30	23.13	0.874	3.64%	0.066	System Sensor	SCR	ST	15
6V209	30	23.08	0.919	3.83%	0.066	System Sensor	SCR	ST	15
6V210	15	23.06	0.936	3.90%	0.181	System Sensor	SCR	ST	95
END		23.06	0.936	3.90%					
END		23.06	0.936	3.90%					
END		23.06	0.936	3.90%					
Totals	257	End of Line Voltage		23.06	0.923				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.923	257	0.94
End of Line Voltage		23.06
Percent Drop		3.90%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS4- Circuit 6V3
Area Covered: 6th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.573
Distance from source to 1st device: 12 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
6V301	12	23.88	0.116	0.48%	0.066	System Sensor	SCR	ST	15
6V302	12	23.77	0.227	0.95%	0.066	System Sensor	SCR	ST	15
6V303	12	23.67	0.333	1.39%	0.066	System Sensor	SCR	ST	15
6V304	20	23.50	0.502	2.09%	0.181	System Sensor	SCR	ST	95
6V305	10	23.42	0.575	2.40%	0.094	System Sensor	SCR	ST	30
6V306	10	23.36	0.643	2.68%	0.066	System Sensor	SCR	ST	15
6V307	25	23.20	0.802	3.34%	0.202	System Sensor	SCR	ST	110
6V308	75	22.82	1.185	4.94%	0.202	System Sensor	SCR	ST	110
6V309	30	22.62	1.378	5.74%	0.202	System Sensor	SCR	ST	110
6V310	15	22.58	1.417	5.91%	0.066	System Sensor	SCR	ST	15
6V311	20	22.54	1.462	6.09%	0.066	System Sensor	SCR	ST	15
6V312	25	22.49	1.507	6.28%	0.094	System Sensor	SCR	ST	30
6V313	80	22.39	1.607	6.69%	0.202	System Sensor	SCR	ST	110
Totals	366	End of Line Voltage		22.39	1.573				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.573	366	1.61
End of Line Voltage		22.39
Percent Drop		6.69%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS3- Circuit 5V1
Area Covered: 5th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.776
Distance from source to 1st device: 48 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
5V101	28	23.87	0.133	0.56%	0.094	System Sensor	SCR	ST	30
5V102	64	23.60	0.401	1.67%	0.181	System Sensor	SCR	ST	95
5V103	32	23.50	0.500	2.08%	0.181	System Sensor	SCR	ST	95
5V104	25	23.45	0.549	2.29%	0.066	System Sensor	SCR	ST	15
5V105	14	23.43	0.571	2.38%	0.094	System Sensor	SCR	ST	30
5V106	18	23.41	0.588	2.45%	0.066	System Sensor	SCR	ST	15
5V107	18	23.40	0.599	2.50%	0.094	System Sensor	SCR	ST	30
END		23.40	0.599	2.50%	0.000				
END		23.40	0.599	2.50%	0.000				
END		23.40	0.599	2.50%	0.000				
END		23.40	0.599	2.50%	0.000				
END		23.40	0.599	2.50%	0.000				
END		23.40	0.599	2.50%	0.000				
Totals	219	End of Line Voltage		23.40	0.776				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.776	219	0.60
End of Line Voltage		23.40
Percent Drop		2.50%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS3- Circuit 5V2
Area Covered: 5th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.812
Distance from source to 1st device: 35 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
5V201	35	23.83	0.174	0.73%	0.066	System Sensor	SCR	ST	15
5V202	20	23.73	0.266	1.11%	0.066	System Sensor	SCR	ST	15
5V203	15	23.67	0.329	1.37%	0.066	System Sensor	SCR	ST	15
5V204	5	23.65	0.348	1.45%	0.094	System Sensor	SCR	ST	30
5V205	20	23.59	0.411	1.71%	0.158	System Sensor	SCR	ST	75
5V206	33	23.52	0.485	2.02%	0.181	System Sensor	SCR	ST	95
5V207	33	23.48	0.521	2.17%	0.181	System Sensor	SCR	ST	95
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
Totals	161	End of Line Voltage		23.48	0.812				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.812	161	0.52
End of Line Voltage		23.48
Percent Drop		2.17%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS3- Circuit 5V3
Area Covered: 5th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.573
Distance from source to 1st device: 15 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
5V301	15	23.86	0.145	0.60%	0.066	System Sensor	SCR	ST	15
5V302	15	23.72	0.284	1.18%	0.066	System Sensor	SCR	ST	15
5V303	15	23.58	0.416	1.73%	0.066	System Sensor	SCR	ST	15
5V304	25	23.37	0.627	2.61%	0.181	System Sensor	SCR	ST	95
5V305	8	23.31	0.686	2.86%	0.094	System Sensor	SCR	ST	30
5V306	15	23.21	0.787	3.28%	0.066	System Sensor	SCR	ST	15
5V307	60	22.83	1.168	4.87%	0.202	System Sensor	SCR	ST	110
5V308	70	22.47	1.526	6.36%	0.202	System Sensor	SCR	ST	110
5V309	45	22.30	1.700	7.08%	0.202	System Sensor	SCR	ST	110
5V310	10	22.27	1.726	7.19%	0.066	System Sensor	SCR	ST	15
5V311	20	22.23	1.771	7.38%	0.066	System Sensor	SCR	ST	15
5V312	30	22.17	1.825	7.61%	0.094	System Sensor	SCR	ST	30
5V313	80	22.08	1.924	8.02%	0.202	System Sensor	SCR	ST	110
Totals	408	End of Line Voltage		22.08	1.573				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.573	408	1.92
End of Line Voltage		22.08
Percent Drop		8.02%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS2- Circuit 4V1
Area Covered: 4th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.250
Distance from source to 1st device: 50 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
4V101	50	23.62	0.384	1.60%	0.210	System Sensor	SCR	ST	115
4V102	20	23.49	0.511	2.13%	0.094	System Sensor	SCR	ST	30
4V103	25	23.34	0.657	2.74%	0.158	System Sensor	SCR	ST	75
4V104	46	23.12	0.879	3.66%	0.210	System Sensor	SCR	ST	115
4V105	41	22.98	1.025	4.27%	0.210	System Sensor	SCR	ST	115
4V106	120	22.70	1.296	5.40%	0.210	System Sensor	SCR	ST	115
4V107	53	22.65	1.347	5.61%	0.158	System Sensor	SCR	ST	75
END		22.65	1.347	5.61%	0.000				
END		22.65	1.347	5.61%	0.000				
END		22.65	1.347	5.61%	0.000				
END		22.65	1.347	5.61%	0.000				
END		22.65	1.347	5.61%	0.000				
END		22.65	1.347	5.61%	0.000				
Totals	355	End of Line Voltage		22.65	1.250				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.250	355	1.35
End of Line Voltage		22.65
Percent Drop		5.61%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS2- Circuit 4V2
Area Covered: 4th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.722
Distance from source to 1st device: 60 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
4V201	60	23.73	0.266	1.11%	0.066	System Sensor	SCR	ST	15
4V202	15	23.67	0.326	1.36%	0.158	System Sensor	SCR	ST	75
4V203	15	23.63	0.372	1.55%	0.094	System Sensor	SCR	ST	30
4V204	25	23.57	0.434	1.81%	0.202	System Sensor	SCR	ST	110
4V205	70	23.48	0.521	2.17%	0.202	System Sensor	SCR	ST	110
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
END		23.48	0.521	2.17%	0.000				
Totals	185	End of Line Voltage		23.48	0.722				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.722	185	0.52
End of Line Voltage		23.48
Percent Drop		2.17%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS3- Circuit 4V3
Area Covered: 4th Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 0.878
Distance from source to 1st device: 37 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
4V301	37	23.80	0.199	0.83%	0.066	System Sensor	SCR	ST	15
4V302	17	23.72	0.284	1.18%	0.210	System Sensor	SCR	ST	115
4V303	104	23.33	0.669	2.79%	0.202	System Sensor	SCR	ST	110
4V304	70	23.16	0.841	3.50%	0.202	System Sensor	SCR	ST	110
4V305	20	23.14	0.865	3.60%	0.066	System Sensor	SCR	ST	15
4V306	30	23.11	0.889	3.70%	0.066	System Sensor	SCR	ST	15
4V307	20	23.10	0.897	3.74%	0.066	System Sensor	SCR	ST	15
END		23.10	0.897	3.74%	0.000				
END		23.10	0.897	3.74%	0.000				
END		23.10	0.897	3.74%	0.000				
END		23.10	0.897	3.74%	0.000				
END		23.10	0.897	3.74%	0.000				
END		23.10	0.897	3.74%	0.000				
Totals	298	End of Line Voltage		23.10	0.878				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
0.878	298	0.90
End of Line Voltage		23.10
Percent Drop		3.74%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS2- Circuit 3V1
Area Covered: 3rd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.920
Distance from source to 1st device: 48 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
3V101	48	23.43	0.566	2.36%	0.158	System Sensor	SCR	ST	75
3V102	8	23.35	0.652	2.72%	0.094	System Sensor	SCR	ST	30
3V103	38	22.96	1.042	4.34%	0.158	System Sensor	SCR	ST	75
3V104	8	22.88	1.116	4.65%	0.094	System Sensor	SCR	ST	30
3V105	25	22.67	1.333	5.55%	0.158	System Sensor	SCR	ST	75
3V106	40	22.36	1.642	6.84%	0.158	System Sensor	SCR	ST	75
3V107	11	22.28	1.716	7.15%	0.094	System Sensor	SCR	ST	30
3V108	15	22.19	1.809	7.54%	0.228	System Sensor	SCRH	ST	135
3V109	65	21.88	2.120	8.83%	0.228	System Sensor	SCRH	ST	135
3V110	33	21.77	2.231	9.30%	0.228	System Sensor	SCRH	ST	135
3V111	30	21.71	2.290	9.54%	0.094	System Sensor	SCR	ST	30
3V112	33	21.66	2.336	9.74%	0.228	System Sensor	SCRH	ST	135
END		21.66	2.336	9.74%	0.000				
Totals	354	End of Line Voltage		21.66	1.920				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.920	354	2.34
End of Line Voltage		21.66
Percent Drop		9.74%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS2- Circuit 3V2
Area Covered: 3rd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.212
Distance from source to 1st device: 80 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
3V201	80	23.40	0.595	2.48%	0.094	System Sensor	SCR	ST	30
3V202	10	23.34	0.664	2.77%	0.228	System Sensor	SCRH	ST	135
3V203	40	23.12	0.883	3.68%	0.158	System Sensor	SCR	ST	75
3V204	50	22.89	1.107	4.61%	0.094	System Sensor	SCR	ST	30
3V205	32	22.77	1.233	5.14%	0.094	System Sensor	SCR	ST	30
3V206	65	22.55	1.450	6.04%	0.158	System Sensor	SCR	ST	75
3V207	8	22.53	1.469	6.12%	0.066	System Sensor	SCR	ST	15
3V208	20	22.49	1.508	6.28%	0.066	System Sensor	SCR	ST	15
3V209	40	22.43	1.570	6.54%	0.066	System Sensor	SCR	ST	15
3V210	75	22.34	1.657	6.90%	0.094	System Sensor	SCR	ST	30
3V211	65	22.31	1.694	7.06%	0.094	System Sensor	SCR	ST	30
END		22.31	1.694	7.06%					
END		22.31	1.694	7.06%	0.000				
Totals	485	End of Line Voltage		22.31	1.212				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.212	485	1.69
End of Line Voltage		22.31
Percent Drop		7.06%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS1- Circuit 2V1
Area Covered: 2nd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.042
Distance from source to 1st device: 20 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V101	20	23.87	0.128	0.53%	0.094	System Sensor	SCR	ST	30
2V102	20	23.76	0.244	1.02%	0.094	System Sensor	SCR	ST	30
2V103	45	23.52	0.480	2.00%	0.094	System Sensor	SCR	ST	30
2V104	12	23.46	0.536	2.23%	0.094	System Sensor	SCR	ST	30
2V105	12	23.41	0.585	2.44%	0.066	System Sensor	SCR	ST	15
2V106	25	23.32	0.677	2.82%	0.158	System Sensor	SCR	ST	75
2V107	20	23.27	0.732	3.05%	0.094	System Sensor	SCR	ST	30
2V108	5	23.26	0.742	3.09%	0.094	System Sensor	SCR	ST	30
2V109	15	23.23	0.766	3.19%	0.066	System Sensor	SCR	ST	15
2V110	15	23.22	0.783	3.26%	0.094	System Sensor	SCR	ST	30
2V111	70	23.18	0.824	3.43%	0.094	System Sensor	SCR	ST	30
END		23.18	0.824	3.43%	0.000				
END		23.18	0.824	3.43%	0.000				
Totals	259	End of Line Voltage		23.18	1.042				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.042	259	0.82
End of Line Voltage		23.18
Percent Drop		3.43%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS1- Circuit 2V2
Area Covered: 2nd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.137
Distance from source to 1st device: 35 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V201	35	23.76	0.244	1.02%	0.094	System Sensor	SCR	ST	30
2V202	60	23.37	0.629	2.62%	0.210	System Sensor	SCR	ST	115
2V203	15	23.29	0.705	2.94%	0.094	System Sensor	SCR	ST	30
2V204	40	23.11	0.887	3.70%	0.094	System Sensor	SCR	ST	30
2V205	15	23.05	0.946	3.94%	0.210	System Sensor	SCR	ST	115
2V206	40	22.95	1.053	4.39%	0.181	System Sensor	SCR	ST	95
2V207	33	22.90	1.105	4.60%	0.066	System Sensor	SCR	ST	15
2V208	20	22.87	1.128	4.70%	0.094	System Sensor	SCR	ST	30
2V209	5	22.87	1.130	4.71%	0.094	System Sensor	SCR	ST	30
END		22.87	1.130	4.71%	0.000				
END		22.87	1.130	4.71%	0.000				
END		22.87	1.130	4.71%	0.000				
END		22.87	1.130	4.71%	0.000				
Totals	263	End of Line Voltage		22.87	1.137				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.137	263	1.13
End of Line Voltage		22.87
Percent Drop		4.71%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS1- Circuit 2V3
Area Covered: 2nd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.106
Distance from source to 1st device: 22 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V301	22	23.85	0.149	0.62%	0.066	System Sensor	SCR	ST	15
2V302	22	23.71	0.290	1.21%	0.158	System Sensor	SCR	ST	75
2V303	15	23.63	0.371	1.55%	0.210	System Sensor	SCR	ST	115
2V304	55	23.40	0.598	2.49%	0.066	System Sensor	SCR	ST	15
2V305	10	23.36	0.635	2.65%	0.066	System Sensor	SCR	ST	15
2V306	10	23.33	0.668	2.79%	0.066	System Sensor	SCR	ST	15
2V307	10	23.30	0.698	2.91%	0.066	System Sensor	SCR	ST	15
2V308	17	23.26	0.740	3.08%	0.066	System Sensor	SCR	ST	15
2V309	25	23.21	0.793	3.30%	0.066	System Sensor	SCR	ST	15
2V310	30	23.16	0.843	3.51%	0.066	System Sensor	SCR	ST	15
2V311	5	23.15	0.850	3.54%	0.210	System Sensor	SCR	ST	115
END		23.15	0.850	3.54%	0.000				
END		23.15	0.850	3.54%	0.000				
Totals	221	End of Line Voltage		23.15	1.106				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.106	221	0.85
End of Line Voltage		23.15
Percent Drop		3.54%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Fire Alarm Voltage Drop Calculations
Project Name: Cal Poly Building 52: Computer Math and Science
Panel / Circuit #: Notifier RNPS, PS1- Circuit 2V4
Area Covered: 2nd Floor East
Nominal System Voltage: 24
Minimum Device Voltage: 20
Total Circuit Current: 1.300
Distance from source to 1st device: 22 — Wire Gauge: 14 — Ohm's Per 1000: 3.07
Wire Gauge for balance of circuit: 14 — 3.07

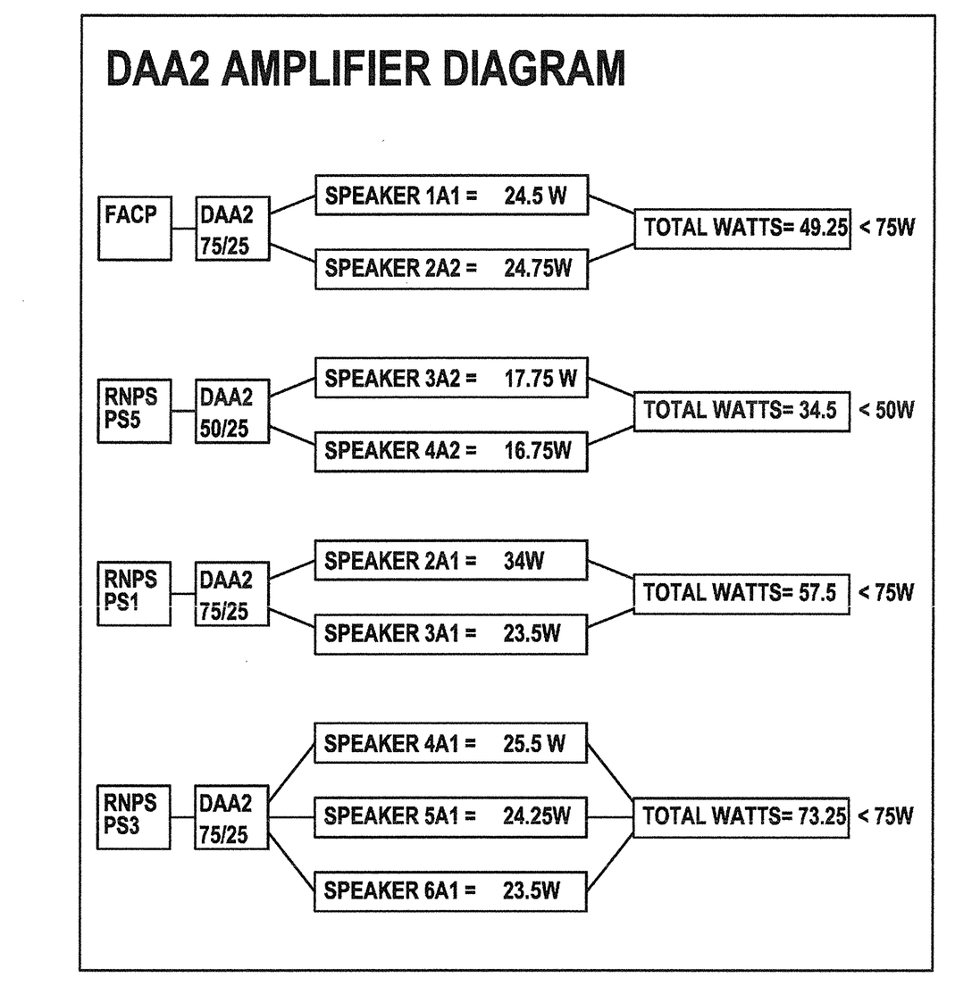
Device Number	Distance from previous device	Voltage At Device	Drop from source	Percent Drop	Current in amps	Device Model #		Device Type	Candela Rating
2V401	22	23.82	0.176	0.73%	0.181	System Sensor	SCR	ST	95
2V402	22	23.67	0.327	1.36%	0.181	System Sensor	SCR	ST	95
2V403	15	23.59	0.413	1.72%	0.094	System Sensor	SCR	ST	30
2V404	55	23.30	0.698	2.91%	0.066	System Sensor	SCR	ST	15
2V405	10	23.25	0.746	3.11%	0.094	System Sensor	SCR	ST	30
2V406	10	23.21	0.788	3.28%	0.066	System Sensor	SCR	ST	15
2V407	10	23.17	0.826	3.44%	0.210	System Sensor	SCR	ST	115
2V408	17	23.13	0.868	3.62%	0.066	System Sensor	SCR	ST	15
2V409	25	23.08	0.921	3.84%	0.210	System Sensor	SCR	ST	115
2V410	30	23.05	0.945	3.94%	0.066	System Sensor	SCR	ST	15
2V411	5	23.05	0.947	3.95%	0.066	System Sensor	SCR	ST	15
END		23.05	0.947	3.95%	0.000				
END		23.05	0.947	3.95%	0.000				
Totals	221	End of Line Voltage		23.05	1.300				

Point to Point Method
CIRCUIT IS WITHIN LIMITS

Totals Current	Distance	Voltage Drop
1.300	221	0.95
End of Line Voltage		23.05
Percent Drop		3.95%

Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors
Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device must not be lower than
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

SPEAKER CALCULATIONS



BATTERY CALCULATIONS

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: FACP Notifier NFS-640 — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
FACP	Fire Alarm Control Unit	0.2850	X	1	=	0.2850	0.2850	X	1	=	0.2850
UDACT	Universal Dialer	0.0400	X	1	=	0.0400	0.1000	X	1	=	0.1000
FDU-80	Remote Annunciator	0.0643	X	2	=	0.1286	0.0643	X	2	=	0.1286
APS-6	Power Supply Amp	0.0000	X	1	=	0.0000	0.0250	X	1	=	0.0250
OSE-SPW	Beam Smoke Emitter	0.0035	X	10	=	0.0350	0.0035	X	10	=	0.0350
OSI-90	Beam Smoke Imager	0.0310	X	10	=	0.3100	0.0310	X	10	=	0.3100
PULL	Manual Pull (addressable)	0.0004	X	29	=	0.0116	0.0004	X	29	=	0.0116
FRM-1	Relay Module	0.0017	X	9	=	0.0153	0.0022	X	9	=	0.0198
FSP-851	Smoke Detector	0.0003	X	16	=	0.0048	0.0003	X	16	=	0.0048
FDM-1	Dual Monitor Module	0.0008	X	18	=	0.0144	0.0064	X	18	=	0.1152
SPK	Speaker Only	0.0000	X	3	=	0.0000	0.0008	X	3	=	0.0024
SR	Strobe Only 15CD	0.0000	X	7	=	0.0000	0.0660	X	7	=	0.4620
SR	Strobe Only 30CD	0.0000	X	6	=	0.0000	0.0940	X	6	=	0.5640
SR	Strobe Only 75CD	0.0000	X	2	=	0.0000	0.1580	X	2	=	0.3160
FTM-1	Fire Fighter Phone Jack	0.0075	X	12	=	0.0900	0.0075	X	12	=	0.0900
XP6-R	Six Relay Control Module	0.0015	X	1	=	0.0015	0.0320	X	1	=	0.0320
XP10-M	10-input Monitor Module	0.0035	X	1	=	0.0035	0.0550	X	1	=	0.0550
SPSR	Speaker Strobes 15CD	0.0000	X	3	=	0.0000	0.0710	X	3	=	0.2130
SPSR	Speaker Strobes 30CD	0.0000	X	14	=	0.0000	0.0960	X	14	=	1.3440
SPSR	Speaker Strobes 75CD	0.0000	X	14	=	0.0000	0.1530	X	14	=	2.1420
SPSR	Speaker Strobes 95CD	0.0000	X	3	=	0.0000	0.1760	X	3	=	0.5280
SPSR	Speaker Strobes 115CD	0.0000	X	16	=	0.0000	0.2050	X	16	=	3.2800
FST-851	Heat Detector (addressable)	0.0004	X	4	=	0.0016	0.0004	X	4	=	0.0016
FMM-1	Monitor Module	0.0037	X	19	=	0.0703	0.0037	X	19	=	0.0703
FDRM-1	Dual Relay/Monitor Module	0.0013	X	64	=	0.0832	0.0240	X	64	=	1.5360
DNR	Duct Smoke Detectors	0.0003	X	64	=	0.0192	0.0003	X	64	=	0.0192
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		1.1140			TOTAL SYSTEM ALARM CURRENT (AMPS)		11.6905

REQUIRED STANDBY TIME (HRS)		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS)		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	1.1140	=	26.7348	0.250	X	11.6905	=	2.9226

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
26.73	+	2.9226	=	29.6574	29.6574	+	20%	=	35.6

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: RNPS 3- 5TH FLOOR EAST — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
RNPS	Remote Power Supply	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
SPK	Speaker Only	0.0000	X	1	=	0.0000	0.0008	X	1	=	0.0008
SR	Strobe Only 15CD	0.0000	X	15	=	0.0000	0.0660	X	15	=	0.9900
SR	Strobe Only 30CD	0.0000	X	6	=	0.0000	0.0940	X	6	=	0.5640
SR	Strobe Only 75CD	0.0000	X	1	=	0.0000	0.1580	X	1	=	0.1580
SR	Strobe Only 95CD	0.0000	X	5	=	0.0000	0.1810	X	1	=	0.1810
SR	Strobe Only 110CD	0.0000	X	6	=	0.0000	0.2020	X	6	=	1.2120
SR	Strobe Only 115CD	0.0000	X	1	=	0.0000	0.2100	X	1	=	0.2100
SRH	Strobe Only 135CD	0.0000	X	0	=	0.0000	0.2280	X	0	=	0.0000
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.1300			TOTAL SYSTEM ALARM CURRENT (AMPS)		3.4458

REQUIRED STANDBY TIME (HRS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.1300	=	3.1200	0.250	X	3.4458	=	0.8615

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
3.12	+	0.8615	=	3.9815	3.9815	+	20%	=	4.8

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: RNPS 1- 2ND FLOOR EAST — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
RNPS	Remote Power Supply	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
SPK	Speaker Only	0.0000	X	0	=	0.0000	0.0008	X	0	=	0.0000
SR	Strobe Only 15CD	0.0000	X	16	=	0.0000	0.0660	X	16	=	1.0560
SR	Strobe Only 30CD	0.0000	X	16	=	0.0000	0.0940	X	16	=	1.5040
SR	Strobe Only 75CD	0.0000	X	2	=	0.0000	0.1580	X	2	=	0.3160
SR	Strobe Only 95CD	0.0000	X	3	=	0.0000	0.1810	X	1	=	0.1810
SR	Strobe Only 115CD	0.0000	X	6	=	0.0000	0.2100	X	6	=	1.2600
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.1300			TOTAL SYSTEM ALARM CURRENT (AMPS)		4.4470

REQUIRED STANDBY TIME (HRS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.1300	=	3.1200	0.250	X	4.4470	=	1.1118

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
3.12	+	1.1118	=	4.2318	4.2318	+	20%	=	5.1

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: RNPS 4- 6TH FLOOR EAST — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
RNPS	Remote Power Supply	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
SPK	Speaker Only	0.0000	X	1	=	0.0000	0.0008	X	1	=	0.0008
SR	Strobe Only 15CD	0.0000	X	12	=	0.0000	0.0660	X	12	=	0.7920
SR	Strobe Only 30CD	0.0000	X	6	=	0.0000	0.0940	X	6	=	0.5640
SR	Strobe Only 75CD	0.0000	X	2	=	0.0000	0.1580	X	2	=	0.3160
SR	Strobe Only 95CD	0.0000	X	3	=	0.0000	0.1810	X	1	=	0.1810
SR	Strobe Only 110CD	0.0000	X	4	=	0.0000	0.2020	X	4	=	0.8080
SR	Strobe Only 115CD	0.0000	X	2	=	0.0000	0.2100	X	2	=	0.4200
SRH	Strobe Only 135CD	0.0000	X	0	=	0.0000	0.2280	X	0	=	0.0000
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.1300			TOTAL SYSTEM ALARM CURRENT (AMPS)		3.2118

REQUIRED STANDBY TIME (HRS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.1300	=	3.1200	0.250	X	3.2118	=	0.8030

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
3.12	+	0.8030	=	3.9230	3.9230	+	20%	=	4.7

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: RNPS 2- 3RD & 4TH FLOOR EAST — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
RNPS	Remote Power Supply	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
SPK	Speaker Only	0.0000	X	1	=	0.0000	0.0008	X	1	=	0.0008
SR	Strobe Only 15CD	0.0000	X	4	=	0.0000	0.0660	X	4	=	0.2640
SR	Strobe Only 30CD	0.0000	X	12	=	0.0000	0.0940	X	12	=	1.1280
SR	Strobe Only 75CD	0.0000	X	9	=	0.0000	0.1580	X	9	=	1.4220
SR	Strobe Only 95CD	0.0000	X	0	=	0.0000	0.1810	X	1	=	0.1810
SR	Strobe Only 110CD	0.0000	X	2	=	0.0000	0.2020	X	2	=	0.4040
SR	Strobe Only 115CD	0.0000	X	5	=	0.0000	0.2100	X	5	=	1.0500
SRH	Strobe Only 135CD	0.0000	X	5	=	0.0000	0.2280	X	5	=	1.1400
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.1300			TOTAL SYSTEM ALARM CURRENT (AMPS)		5.7198

REQUIRED STANDBY TIME (HRS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.1300	=	3.1200	0.250	X	5.7198	=	1.4300

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
3.12	+	1.4300	=	4.5500	4.5500	+	20%	=	5.5

Fire Alarm Control Panel Battery Calculation
Battery Calculations for: RNPS 5- 4TH FLOOR WEST — Project: Cal Poly Building 52

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
RNPS	Remote Power Supply	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
SPK	Speaker Only	0.0000	X	1	=	0.0000	0.0008	X	1	=	0.0008
SR	Strobe Only 15CD	0.0000	X	5	=	0.0000	0.0660	X	5	=	0.3300
SR	Strobe Only 30CD	0.0000	X	16	=	0.0000	0.0940	X	16	=	1.5040
SR	Strobe Only 75CD	0.0000	X	8	=	0.0000	0.1580	X	8	=	1.2640
SR	Strobe Only 95CD	0.0000	X	4	=	0.0000	0.1810	X	1	=	0.1810
SR	Strobe Only 110CD	0.0000	X	0	=	0.0000	0.2020	X	0	=	0.0000
SR	Strobe Only 115CD	0.0000	X	5	=	0.0000	0.2100	X	5	=	1.0500
SRH	Strobe Only 135CD	0.0000	X	0	=	0.0000	0.2280	X	0	=	0.0000
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.1300			TOTAL SYSTEM ALARM CURRENT (AMPS)		4.4598

REQUIRED STANDBY TIME (HRS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) UFC 4-021-01 & UFC3-600-10N		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.1300	=	3.1200	0.250	X	4.4598	=	1.1150

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
3.12	+	1.1150	=	4.2350	4.2350	+	20%	=	5.1

DRAWING INDEX

1	COVER SHEET	FA 0.0
2	RISER DIAGRAM	FA 1.0
3	FIRST FLOOR WEST	FA 3.01W
4	SECOND FLOOR EAST	FA 3.02E
5	SECOND FLOOR WEST	FA 3.02W
6	THIRD FLOOR EAST	FA 3.03E
7	THIRD FLOOR WEST	FA 3.03W
8	FOURTH FLOOR EAST	FA 3.04E
9	FOURTH FLOOR WEST	FA 3.04W
10	FIFTH FLOOR EAST	FA 3.05E
11	FIFTH FLOOR WEST	FA 3.05W
12	SIXTH FLOOR EAST	FA 3.06E
13	SEVENTH FLOOR EAST	FA 3.07E
14	CALCULATIONS	FA 4.0
15	DETAILS	FA 5.0

CALCULATIONS

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Revisions

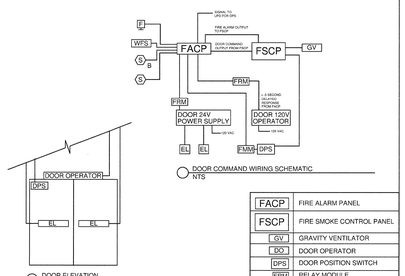
SYMBOL	DESCRIPTION	DATE	APPR.
1	REVIEW COMMENTS	6/14/2011	
2	CRB # 093.1 & FI 99	5/18/2012 4/11/2012	
3	SFM REVIEW COMMENTS	8/20/2012	
4	CRB 93.2	1/15/2013	
5	FA & SMOKE CONTROL SFM COMMENTS	4/3/2013	
6	AS-BUILT DRAWINGS	8/23/2013	

DATE: 08/23/2013
SCALE:
DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter
DRAWN BY: Derek Richardson
CHECKED BY: CURTIS STREETER, SET NICET IV #102672
PROJECT ENGINEER: Integral Design Associates INC.

CENTER FOR SCIENCE AND MATHEMATICS
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
SAN LUIS OBISPO, CA
CSFM #18-40-03-0001

SHEET ID
FA 4.0
SHEET 14 OF 15

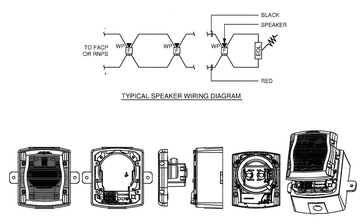


DOOR COMMAND WIRING SCHEMATIC
NTS

DOOR ELEVATION
NTS

FACP	FIRE ALARM PANEL
FSCP	FIRE SMOKE CONTROL PANEL
GV	GRAVITY VENTILATOR
DO	DOOR OPERATOR
DPS	DOOR POSITION SWITCH
FRM	RELAY MODULE
FMM	MONITOR MODULE
EL	ELECTRIC LOCK

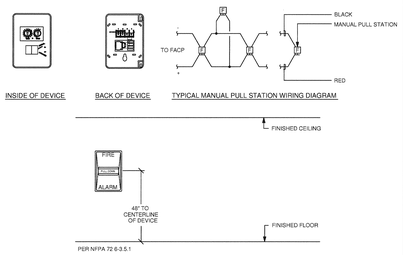
DETAIL 17 / FA-5



TYPICAL SPEAKER WIRING DIAGRAM

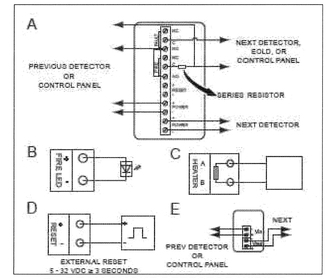
WP F

13 WALL SPEAKER OUTDOOR
SCALE 1:2

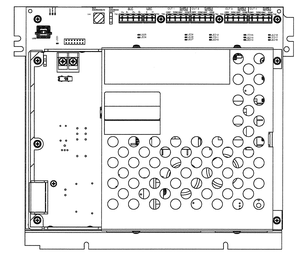


F

9 ADDRESSABLE MANUAL PULL STATION INSTALLATION
NOT TO SCALE

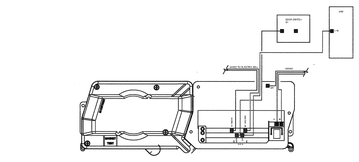


5 BEAM SMOKE DETECTOR WIRING
NOT TO SCALE



RNPS

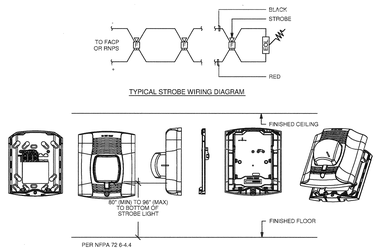
0 ACPS-610 POWER SUPPLY
NOT TO SCALE



TYP. SFD RELAY / POSITION INDICATION WIRING
NTS

TYP. SFD RELAY/SWITCH BOX LAYOUT
NTS

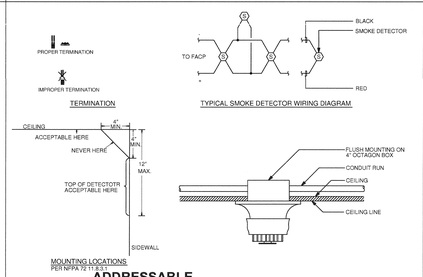
DETAIL 18 / FA-5 | CAL POLY CENTER FOR SCIENCE BLDG 52 | SMOKE FIRE DAMPER RELAY DETAIL | DATE: 11/01/12



TYPICAL STROBE WIRING DIAGRAM

F

14 WALL STROBE INSTALLATION
NOT TO SCALE



TYPICAL SMOKE DETECTOR WIRING DIAGRAM

S

10 ADDRESSABLE SMOKE DETECTOR INSTALLATION
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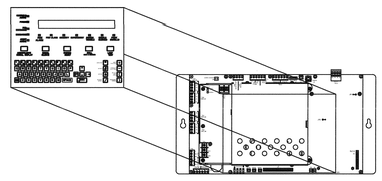
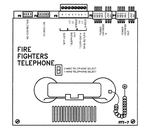


6 NFS2-640 PANEL
NOT TO SCALE

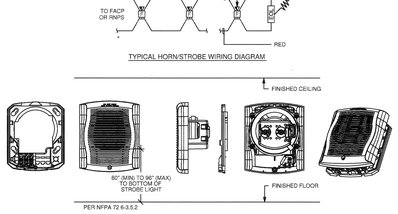


FJ

2 FFT-7 FIRE FIGHTER TELEPHONE
NOT TO SCALE

DUCT SMOKE DETECTOR WIRING DIAGRAM 120VAC TO 24VDC BELL
NTS

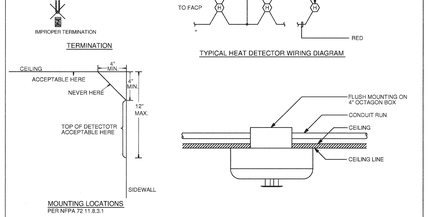
DETAIL 19 / FA-5 | REF. CWA 465 | CAL POLY CENTER FOR SCIENCE BLDG 52 | HVAC UNIT TEMP. DUCT DETECTOR SHUNT | DATE: 12/06/12



TYPICAL HORN/STROBE WIRING DIAGRAM

F

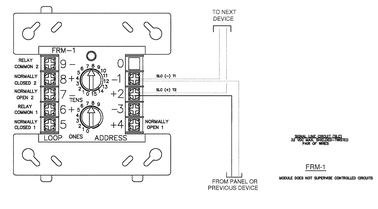
15 WALL SPEAKER STROBE INSTALLATION
SCALE 1:2



TYPICAL HEAT DETECTOR WIRING DIAGRAM

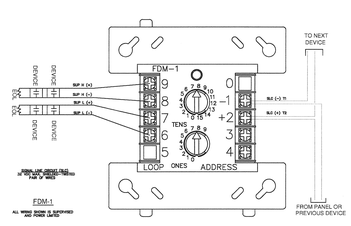
H

11 ADDRESSABLE HEAT DETECTOR INSTALLATION
NOT TO SCALE



RM

7 FRM-1 MODULE
NOT TO SCALE



FDM

3 FDM-1 MODULE
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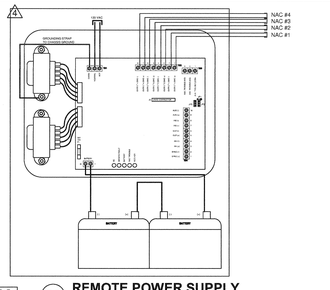

RNPS

20 REMOTE POWER SUPPLY
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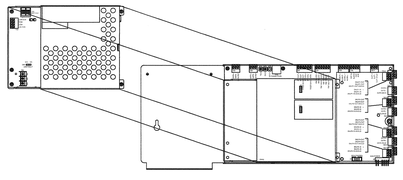
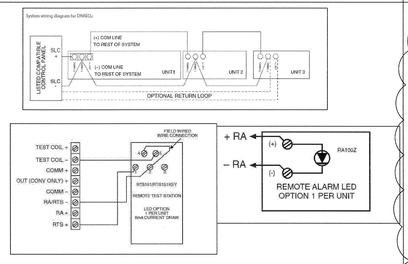


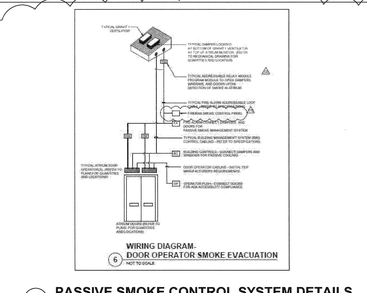
DAA2

16 DAA2 SERIES AUDIO AMPLIFIER
NOT TO SCALE

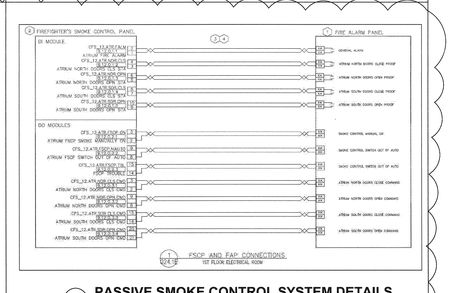


S D

12 DUCT DETECTOR WIRING
NOT TO SCALE



8 PASSIVE SMOKE CONTROL SYSTEM DETAILS
NOT TO SCALE



4 PASSIVE SMOKE CONTROL SYSTEM DETAILS
NOT TO SCALE

DETAILS

Deep Blue Integration

Consulting - Design - Installation
Service - Monitoring

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www.deepblueintegration.com

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4		CRB 93.2	8/20/2012	
5		FA & SMOKE CONTROL SFM COMMENTS	1/15/2013	
6		AS-BUILT DRAWINGS	4/3/2013	
			8/23/2013	

DATE: 08/23/2013

SCALE:

DRAWING CODE: FA ALL DRAWINGS CPCFS

DESIGNED BY: Curtis Streeter

DRAWN BY: Derek Richardson

CHECKED BY: CURTIS STREETER, SET NICET IV #102672

PROJECT ENGINEER: Integral Design Associates INC.

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SAN LUIS OBISPO, CA

CSFM #18-40-03-0001

SHEET ID

FA 5.0

SHEET 15 OF 15