Culminating Experience in Fire Protection Engineering

California Polytechnic State University – San Luis Obispo

elewexe – Building 172B

Anna Santoro | June 11th, 2020

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Keywords

1. RSET – Required Safe Egress Time
2. ASET – Available Safe Egress Time
3. Performance Based Analysis
4. Design Fire
5. Unenclosed Stair

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Abstract

California Polytechnic State University at San Luis Obispo recently finished constructing a new multimillion student housing project on campus. One of the six buildings, elewexe or 172B, from this housing complex was selected for a full evaluation of the fire and life safety systems using both prescriptive and performance based approaches. The building is a Type II-B four story dormitory with an R-2 occupancy classification.

For the prescriptive approach, the building was evaluated against the most current editions of the IBC and relevant NFPA code editions for building requirements, sprinkler design and fire alarm and detection. When looking at the building purely for code compliance, everything complies except for administrative controls. The building is constructed within the specifications of the IBC, the egress is adequate for the building, the sprinkler system has a proper design and a strong water supply without a fire pump, and the fire alarm and detection system meets the requirements listed in NFPA 72. One aspect of the building, that is also found in the other buildings within the housing community, is that there are unenclosed stairwells connecting four stories located within the core of the buildings. This is allowed per the 2013 version of the CBC due to an exception because the building is fully sprinklered. This exception causes a lot of emphasis to be put on the sprinklers operating in the event of a fire.

For the performance based analysis is composed of three design fires and a fire model within the report investigates one of the design fire scenarios occurring within the main core and the sprinklers not activating to see if the building design still meets the intent of the code. The results found that in such an event, the available safe egress time (ASET) was less than the required safe egress time (RSET), meaning that in the event that the sprinklers fail in a fire scenario in the core of the building, the building design fails in the intent of the code. Ways to remedy this include increasing administrative controls to limit the amount of fuel in the corridor, increasing testing and maintenance of the sprinkler system to ensure that it functions when needed, an impairment control policy, and adding compartmentation within the building to separate the core stairwell from the rest of the building.

Introduction

In Fall of 2018, California Polytechnic State University – San Luis Obispo opened a new housing community for first year on campus residents. Within this housing community there are seven buildings, of type II-B construction, fully sprinklered, ranging from three to five stories. The housing complex and the buildings were named in honor of and in partnership with the Northern Chumash, the Indigenous Peoples of San Luis Obispo County. The housing complex overall is known as yakʔitʸutʸu, and each resident hall is named after yak titʸu titʸu yak tiłhini Northern Chumash tribal locations throughout the Central Coast region. The building that has been analyzed for this report is named elewexe, however for this report, it will be referred to by its building number, 172B.

The codes that are primarily referenced in this analysis of 172B are the 2018 version of the International Building Code (IBC) and the 2018 version of NFPA codes such as: 13, 13R, 72, and 101. This building was designed and constructed under the 2013 California Building Code (CBC).

Building Layout

The yakʔitʸutʸu housing complex is composed of seven residential buildings, one parking garage, and a community center with a lecture hall. It is located on the southeast position of campus, near the Grand Avenue entrance, as seen in Figure 1. The pink building in Figure 1 is Building 172B.

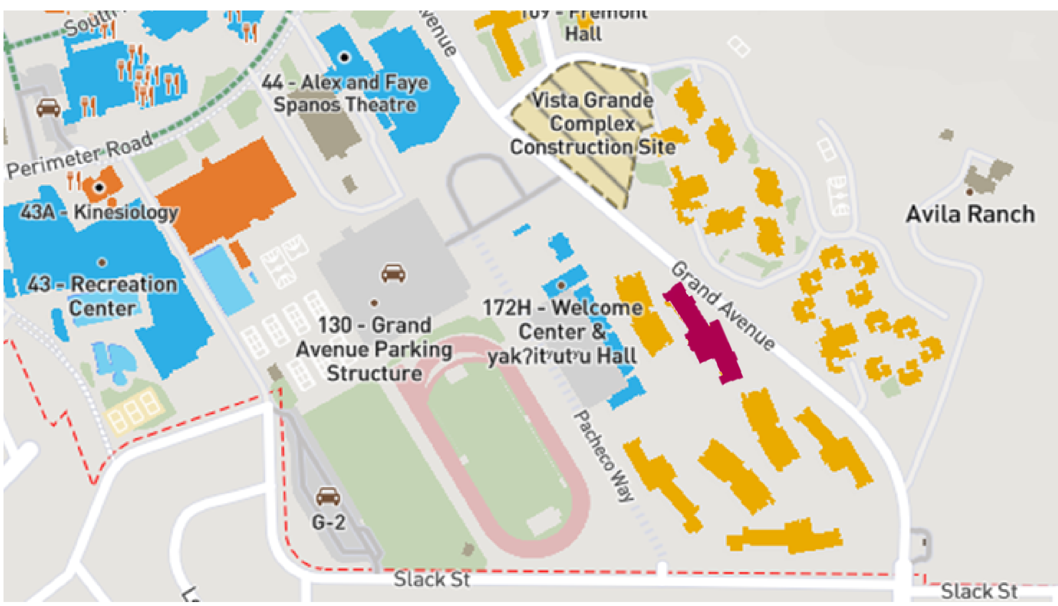


Figure 1 - Site map of yakʔitʸutʸu complex

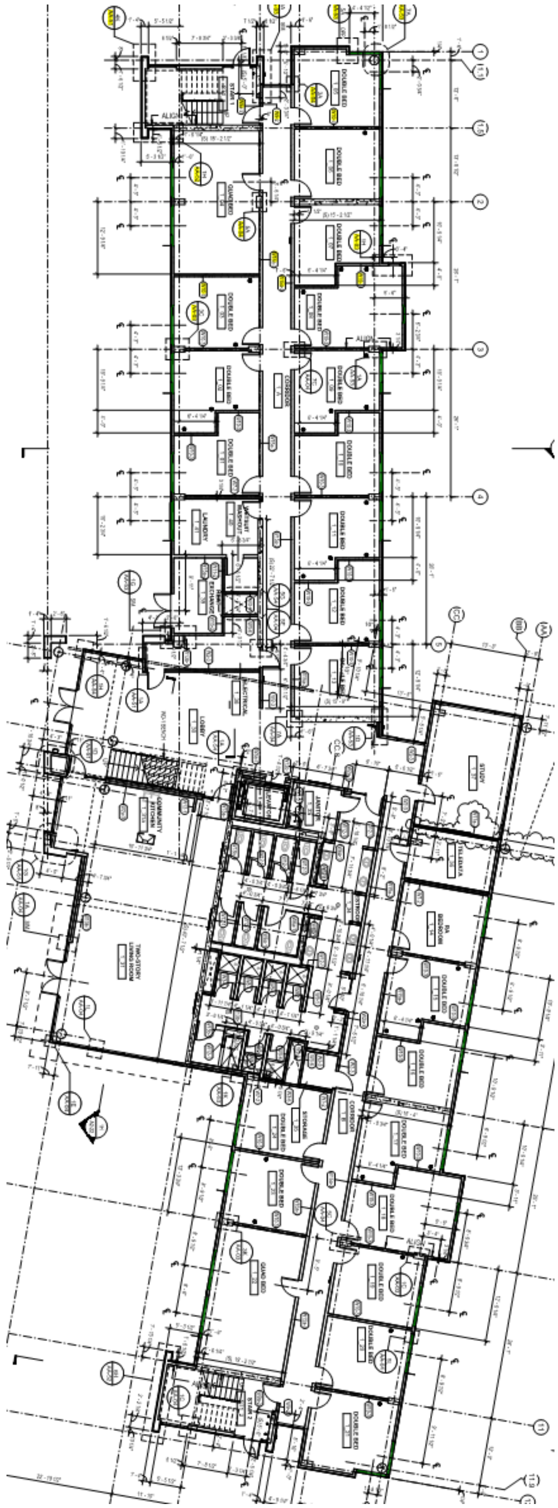


Figure 2 - First Floor Building Layout

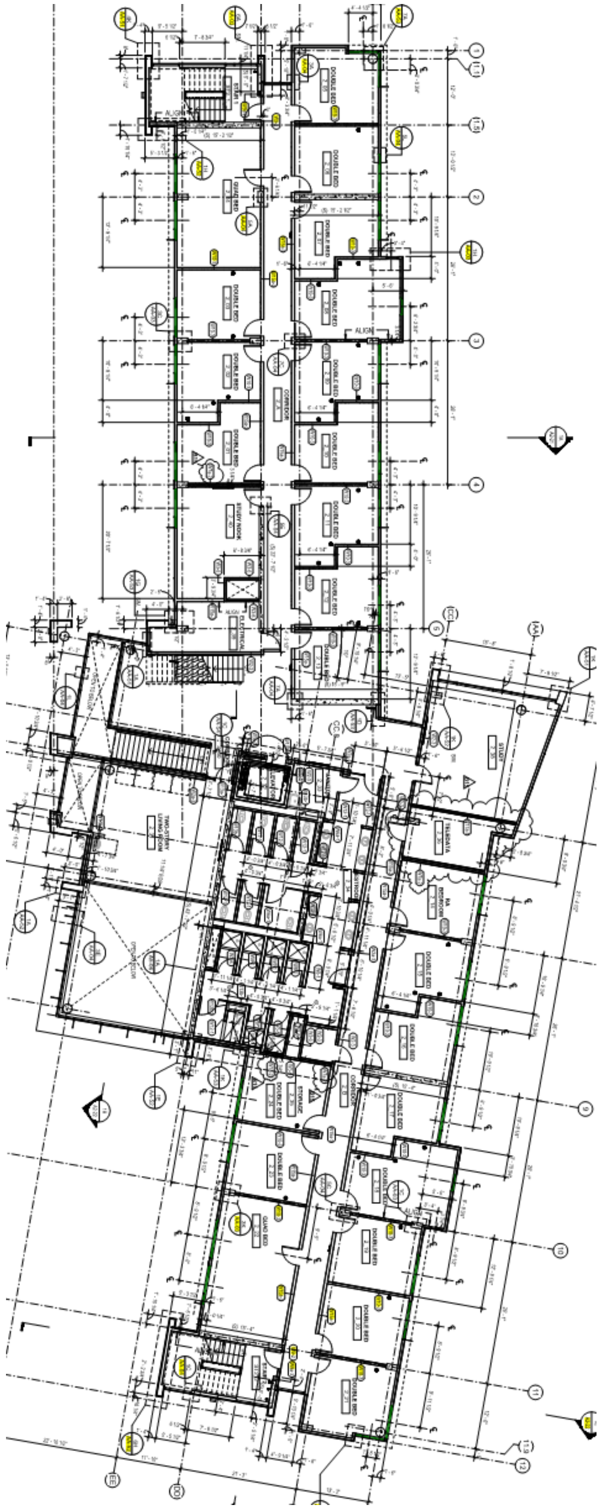


Figure 3 - Second Floor Building Layout

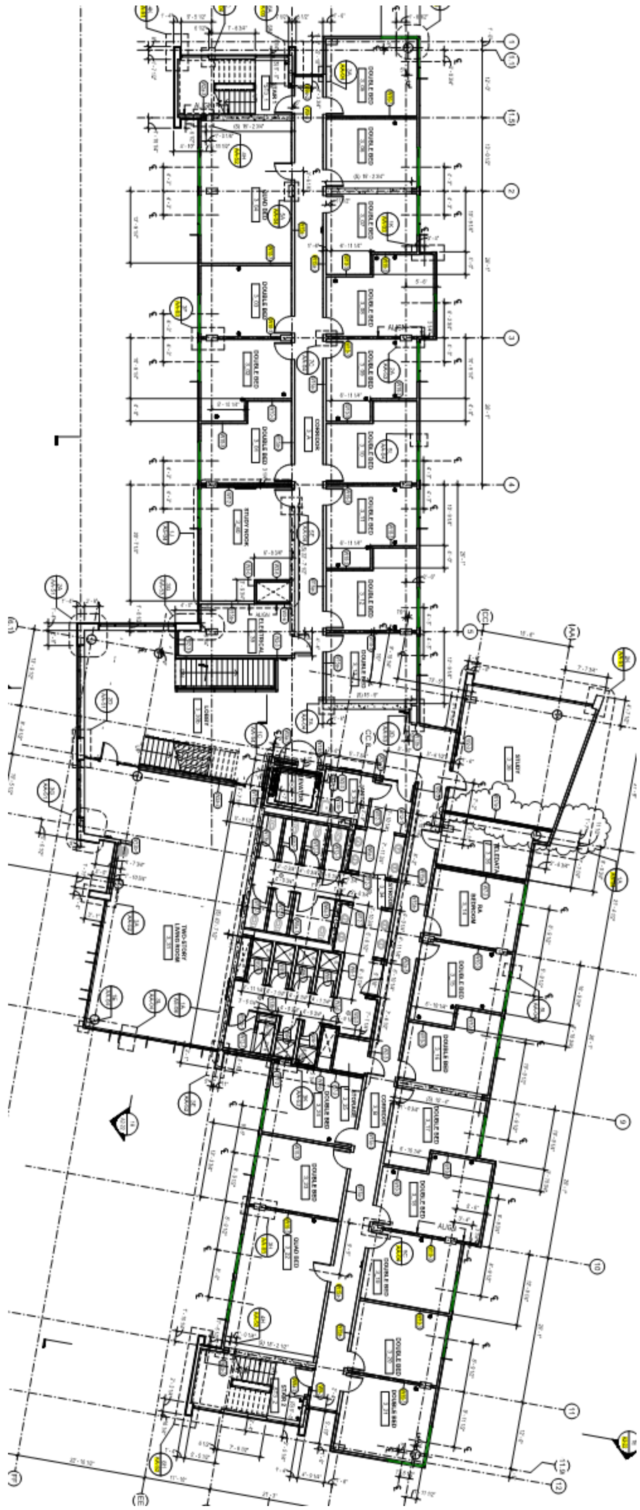


Figure 4 - Third Floor Building Layout

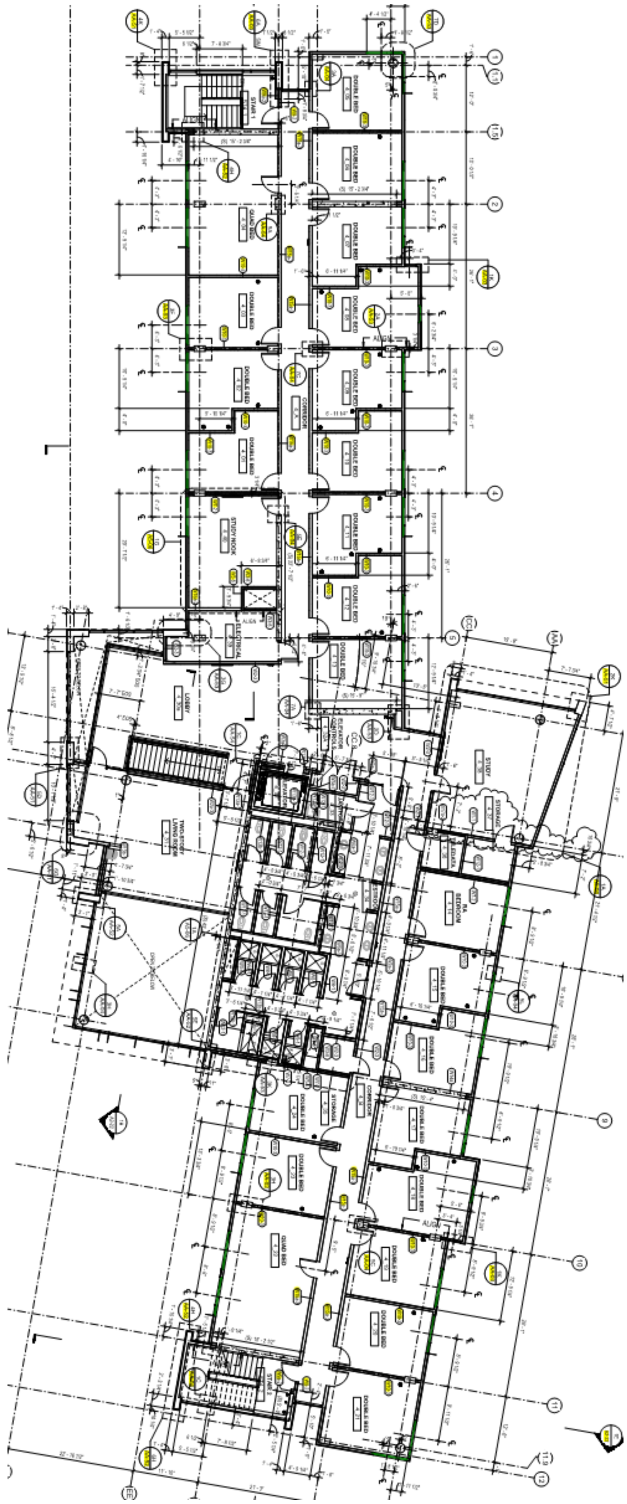


Figure 5 - Fourth Floor Building Layout

Building 172B is a four story building, laid out having a common core with hallways that extend on both sides that lead to the dwelling units. In the common core are the restroom and common room areas. The layout of the building is shown above in Figures 2 through 5. Full size drawings are also available in Appendix A. The layout is mostly replicated throughout the building with only small differences in some areas. The common room areas have two story atriums connecting the first and second common rooms and the third and fourth common room areas, which can be seen in Figures 6 and 7. The first floor common area is equipped with a community kitchen available for resident use. There is a main stairwell in the core that is un-enclosed, therefore not used for egress purposes, and two enclosed stairwells on either end of the building. There are more smaller study areas located throughout the building.

Figure 6 - Second Floor Common Area

Figure 7 - First Floor Common Area

OCCUPANCY CLASSIFICATIONS

Building 172B is classified as R-2 occupancy classification. According to section 310.4 of the IBC, the R-2 occupancy encompasses one or more sleeping units whose occupants are primarily permanent in nature. While most of the building contains sleeping units, there are also rooms for students to use as study rooms or communal areas including a small communal kitchen on the first floor. For the purposes of egress, these rooms have been designated an A-3 occupancy classification in accordance with the definition in section 303.4 of the IBC. The large communal restroom, located in the center of each floor, and the mechanical and electrical rooms have different the occupant load factors, but are not classified as having a differing occupancy classification from R-2. Each space has been colored according to their occupant loading factor that is discussed later in the report. In Figures 8 through 11 shows the occupancy breakdown for the building. These sheets are also located in Appendix B.

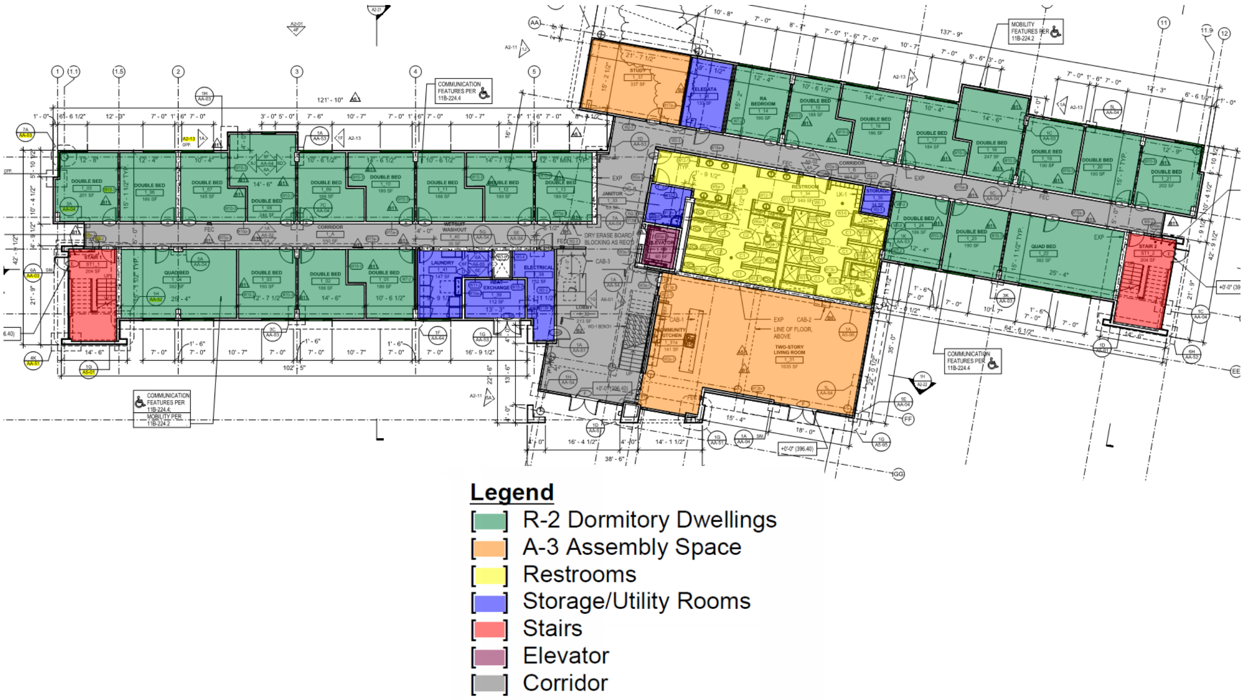


Figure 8 – Occupant Classification Breakdown for First Floor

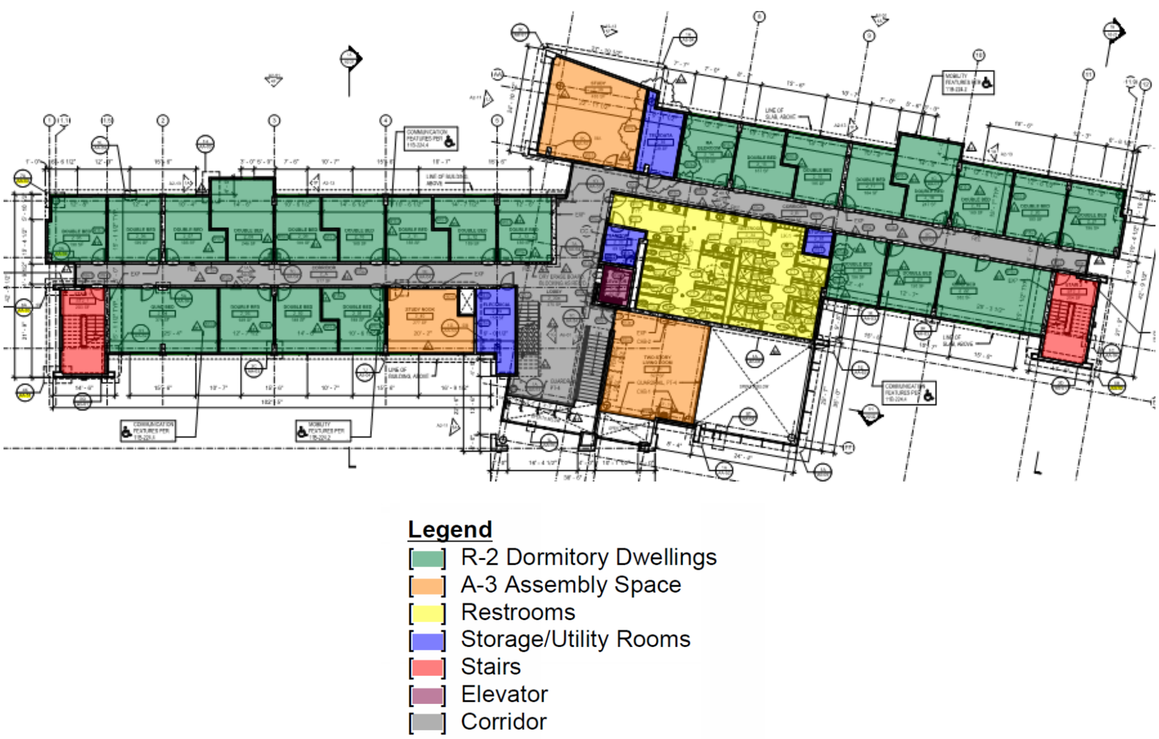


Figure 9 - Occupant Classification Breakdown for Second Floor

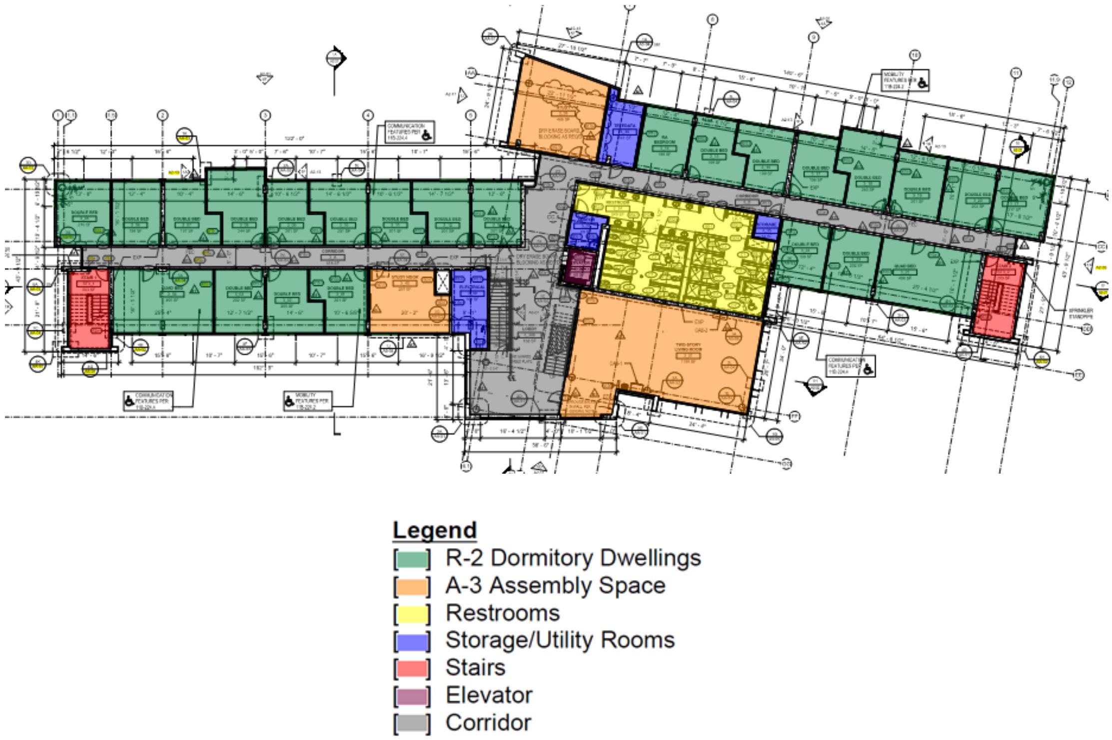


Figure 10 - Occupant Classification Breakdown for Third Floor

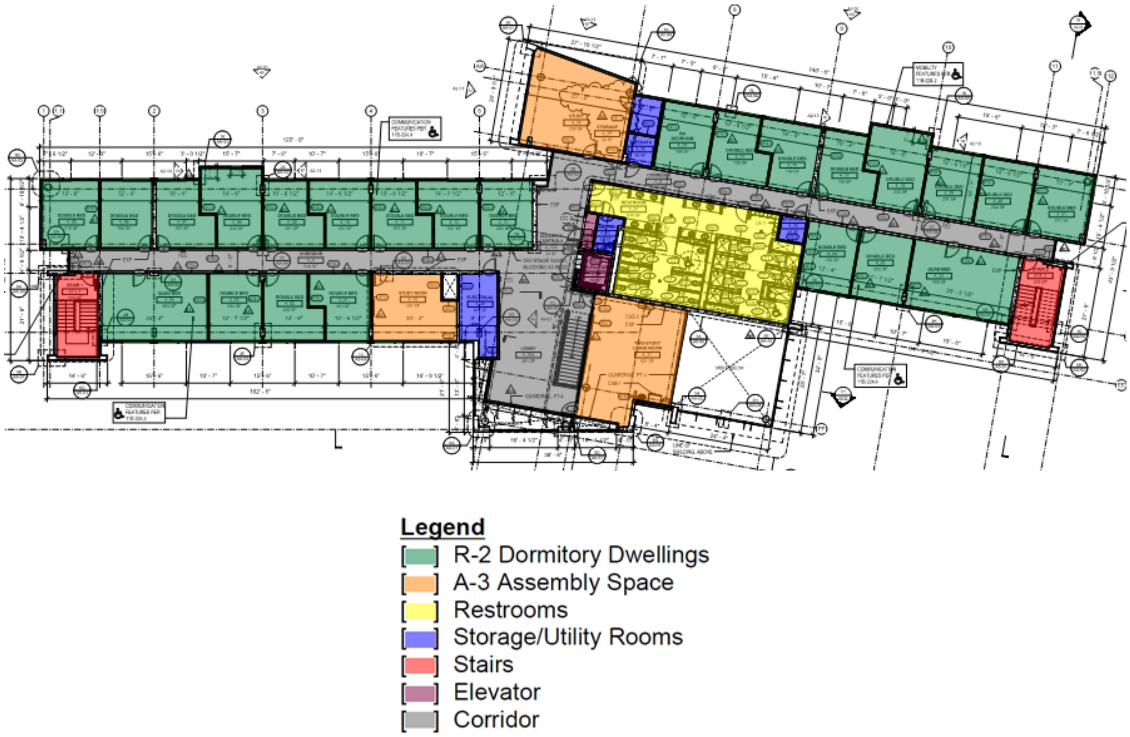


Figure 11 - Occupant Classification Breakdown for Fourth Floor

CONSTRUCTION TYPE

Building 172B is a Type II-B building. It is built from reinforced concrete, and has that concrete exposed as an architectural feature, as seen in Figure 12 below. The allowable height for the building is 60 ft., according to Table 504.3 in the 2018 IBC, since the building is equipped with automatic sprinklers built to NFPA 13R. The actual height of the building is 45 ft., in compliance with code requirements. The maximum number of floors for the building is 4, according to Table 504.4 in the 2018 IBC, which is the number of floors 172B has. The allowable area for Building 172B is 72,000 ft^2. The actual area for the facility is 41,146 ft^2 meeting code requirements.

INTERIOR FINISH REQUIREMENTS

The interior finish requirements for 172B according to table 803.13 in the IBC is class C for the interior exit stairways, exit passageways, corridors, enclosures for exit access, rooms and enclosed spaces. Class C interior finish means that is will have a flame spread index of 76-200 and a smoke-developed index of 4-450 tested in accordance with ASTM E48 or UL 723. Interior finishes must comply with the acceptance criteria defined by NFPA 286 which contains the following: while being exposed to a 40 kW flame, it will not spread to the ceiling, flashover will not occur, peak HHR throughout test will not exceed 800 kW and the total smoke will not exceed 1,000 m^2. The building has exposed concrete walls and some drywall that satisfy this criterion.

The interior floor finish requirements for 172B must be not less than a Class II requirement according to section 804.4.2 of the IBC. Class II floors are determined by ASTM E648 as having 0.22 watts/cm^2 or greater. In order to be used in the R-2 occupancy for stairways, ramps, exit passageways, and corridors it must withstand a minimum critical heat flux as determined by ASTM D2895. The building is provided with industrial carpeting that passes ASTM E648.

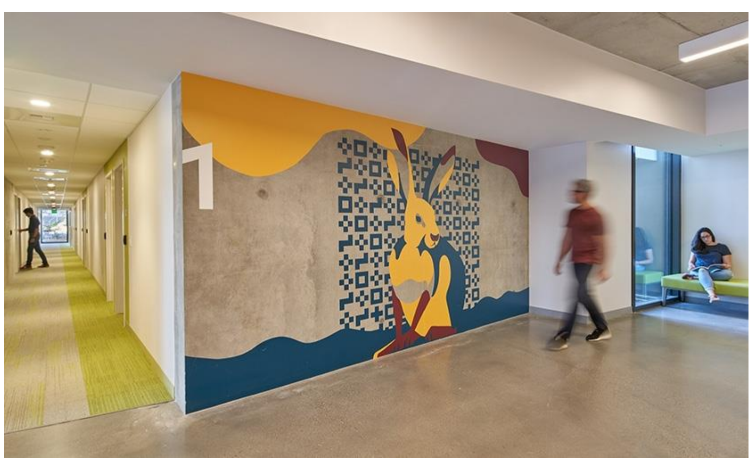


Figure 12 - Example of Interior of Building

FIRE RESISTANCE REQUIREMENTS

The fire resistance rating requirements for this building require fire rated elements on the corridors, dwelling unit separation, shaft enclosures, boiler room and laundry room. It does not require and fire resistance rating on the exterior walls because there is more than a 30-foot separation between buildings in the complex, which is what the code requires in the IBC (Table 602).

For the residential sleeping unit walls and floors, under section 420.8 in the IBC, dwelling units can be separated by fire partitions as specified in section 708. In section 708.3 it states that fire partitions shall not have a fire resistance rating less than one hour, except if, the building is of IIB, IIIB and VB construction and has automatic sprinklers. Even though, 172B meets the exceptions to be allowed only a ½ hour resistance rating, it is still constructed with a 1-hour separation. Corridors require a ½ hour separation, according to Table 1020.2 in the IBC, and 1-hour separation was provided for that requirement as-well.

The stairwell and elevator shafts are protected with a 2-hour resistance fire rating according to section 713.4 that states that shaft enclosures shall have a rating of no less than 2 hours where connecting four stories. For the laundry room and the in-house furnace room on the first floor, they each require a 1-hour resistance fire wall rating according to table 509 – incidental uses.

There is no fire resistance rating requirement for the structural frame, exterior and interior bearing walls; however, 4 hours is provided. The roof and floor resistance requirements also have no fire resistance requirements. The floors will be rated for a 1 hour fire resistance rating since it will be a concrete slab. The roof is also composed of concrete and exceeds the fire resistance rating requirements.

Since building 172B is part of a residential community, it is important to make sure that the building separation requirements are met. However, all buildings are located more than 10 feet away from each other, therefore the requirement fire-resistance rating for exterior walls is 0.

Table 1 - Fire Resistance Rating Requirements from 2018 IBC

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H[e]	OCCUPANCY GROUP F-1, M, S-1[f]	OCCUPANCY GROUP A, B, E, F-2, I, R[i], S-2, U[h]
X < 5[b]	All	3	2	1
5 ≤ X < 10	IA Others	3 2	2 1	1 1
10 ≤ X < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1[c] 0 1[c]
X ≥ 30	All	0	0	0

SUMMARY

Building 172B meets or exceeds all of the building prescriptive requirements laid out in the 2018 IBC. Being constructed as an R-2, type IIB, fully-sprinklered building, there were some allowances in terms of fire partitions that the contractors could have used a lower fire rated walls between dwellings, however they used a stronger 1-hour rated wall, most likely due to other requirement in other parts of the building (laundry room/furnace) therefore having an ease of constructability. The fire resistance ratings between compartments is allowed to be 30 mins, but that requirement is also exceeded with 1 hour separation provided. All of the other resistance requirements are met with what is required. The next section provides an analysis of the egress for the facility.

Egress Analysis

EXITS

Each floor has two stairwell exits located on the North-West and South-East side of the building. There are stairs that are part of the core of the building. Since they are not protected and serve all four floors, the stairs cannot be used in terms of calculating egress. There are an additional two exits on the first floor. One to the main lobby area on the west side of the building and one going in to the first-floor common room/communal kitchen area, also facing west. The arrangement of exits is appropriate; the stairwell doors are more than 1/2 than the building diagonal, which follows Section 7.5.1.3.2 of NFPA 101 and seen in Figure 14. The maximum travel distance in the building is 179 ft. also seen in Figure 14, which is under the maximum 200 ft. stated in NFPA 101. There are no dead end corridors or paths of egress within the facility.

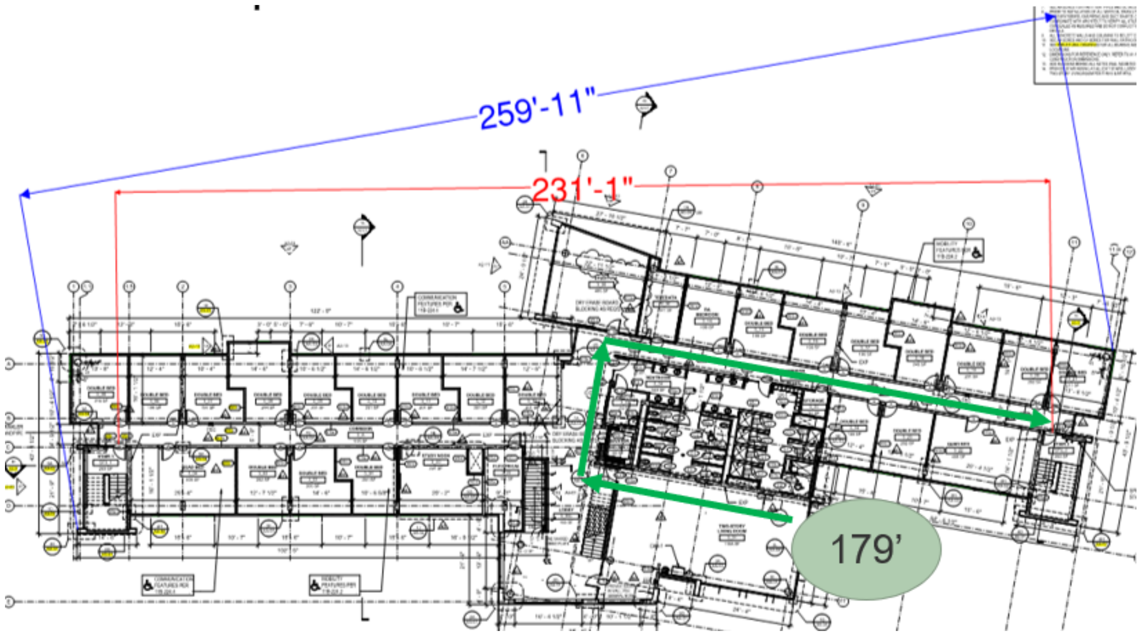


Figure 14 – Exit Separation Dimensions and Travel Distance

According to the 2018 IBC, in Table 1006.3.2, the number of exits per story in the building is based on the occupant load for the floor. Since all floors have an occupant load less than 500, the minimum number of exits per story is 2, which is provided by the stairwells on the west and east sides of the building. Both stairs are 48-inch stairs, with a 7-11 tread, served by 36in clear-width doors on inlet and discharge. The additional two exits on the west side of the building are 6-foot double doors. All doors open in the direction of egress and have appropriate panic hardware. There are no horizontal exits in the building. See Figure 15 below or Appendix A of attached drawing set for dimensions on plan.

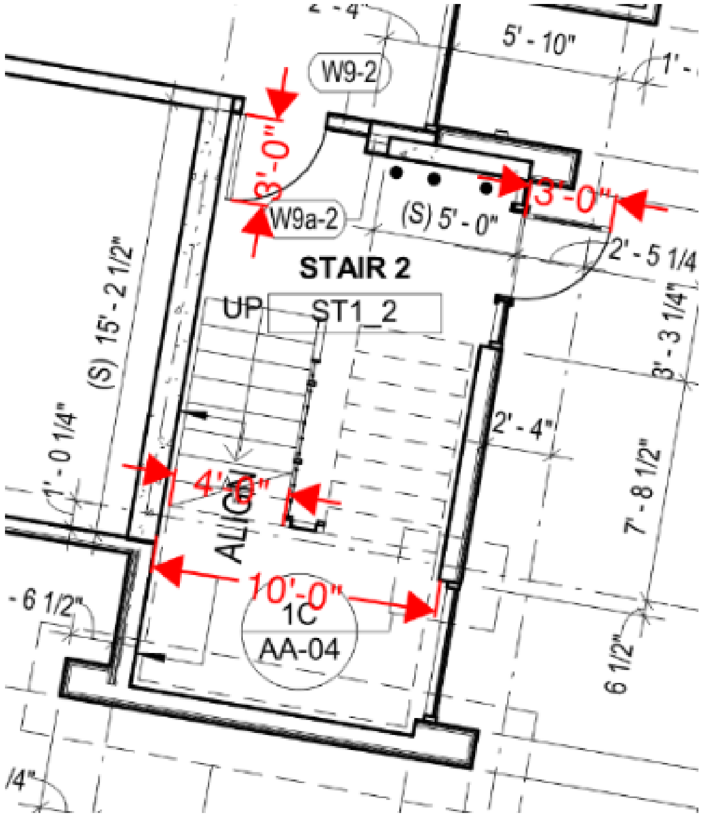


Figure 15 – Dimensions of Stairs (TYP.)

OCCUPANT LOAD

The occupant load was calculated using load factors found in IBC table 1004.5 - Maximum Floor Area Allowances Per Occupant. For the residential sleeping areas, the code allows 50 ft^2/person in dormitories, therefore each room's square footage was divided by the load factor to determine the maximum number of occupants could be in the space at any time. The same process was repeated for the entire building. The communal restrooms were classified as locker rooms due to their large size and had a load factor of 50 ft^2/person. The assembly areas due to the unconcentrated nature of the usage space had a load factor of 15 ft^2/person. The utility rooms and storage spaces were combined in their own classification and have a load factor of 300 ft^2/person. The elevator and corridors were not counted as part of the load. They were only counted as circulation space in this report. Below in Table 2 is a summary table of the occupant load calculations.

Table 2 – Occupant Load Summary Table

Occupant Load Calculation				
Floor	Classification	Sq Footage (ft^2)	Load Factor (ft^2/occ.)	Occupant Load
1	R-2	189	50	108
	A-3	1372	15	92
	Storage/Utility	544	300	14
Total				214
2	R-2	5023	50	106
	A-3	277	15	92
	Storage/Utility	397	300	4
Total				202
3	R-2	5338	50	120
	A-3	1970	15	133
	Storage/Utility	405	300	4
Total				257
4	R-2	5334	50	120
	A-3	1448	15	98
	Storage/Utility	161	300	4
Total				222
Building Total				895

EXIT CAPACITY

Once the occupant load for each floor was calculated, the exits were then analyzed to be sure that they could appropriately handle the amount of people per floor. Taking the maximum number of occupants on a floor, the third floor, as the baseline comparison, the limiting factor between the door and the stairs needed to be found. The 2018 IBC Section 1005.3.1 of the 2018 IBC specifies the occupant load factor for stairs as 0.3 in/occupant and in section 1005.3.2, it specifies 0.2 in/occupant load factor for other egress components. The equation that is listed in NFPA for a staircase that is more than 44 inches was also taken into consideration. In this case the IBC value was more conservative, and it is the one that was used in this analysis. The exit capacity provided for the building is more than enough for the occupant load calculated, Tables 3 and 4 below summarizes the calculations performed.

Table 3 – Exit Capacity Calculation Summary

Exit Capacity Calculation			
Exit Component	Width (in.)	Load Factor (in/occ.)	Exit Capacity (Width/LF)
Stair	48	0.3	160
Door	36	0.2	180

Table 4 – Exit Sufficient for Occupant Load

Highest Floor Occ. Load	257
Exit Capacity:	160
Number of Exit per Floor	2
Total Exit Capacity:	320
No. Occ < Capacity?	Yes

EXIT SIGNAGE

Exit signage for 172B is marked according to provisions set in section 1013 of the IBC. The paths of egress travel and the direction of egress travel is directly marked to be immediately visible for occupants. They are within 100ft of viewing distance and are provided with the adequate lighting and power necessary to run appropriately. There are exceptions that state that they are not necessary in rooms that only require one exit or exit access nor in individual dwelling units for R-2 residencies. There is a clipping of the fourth floor in Figure 15, however the drawings provide better visibility of where the signage is located throughout the building.

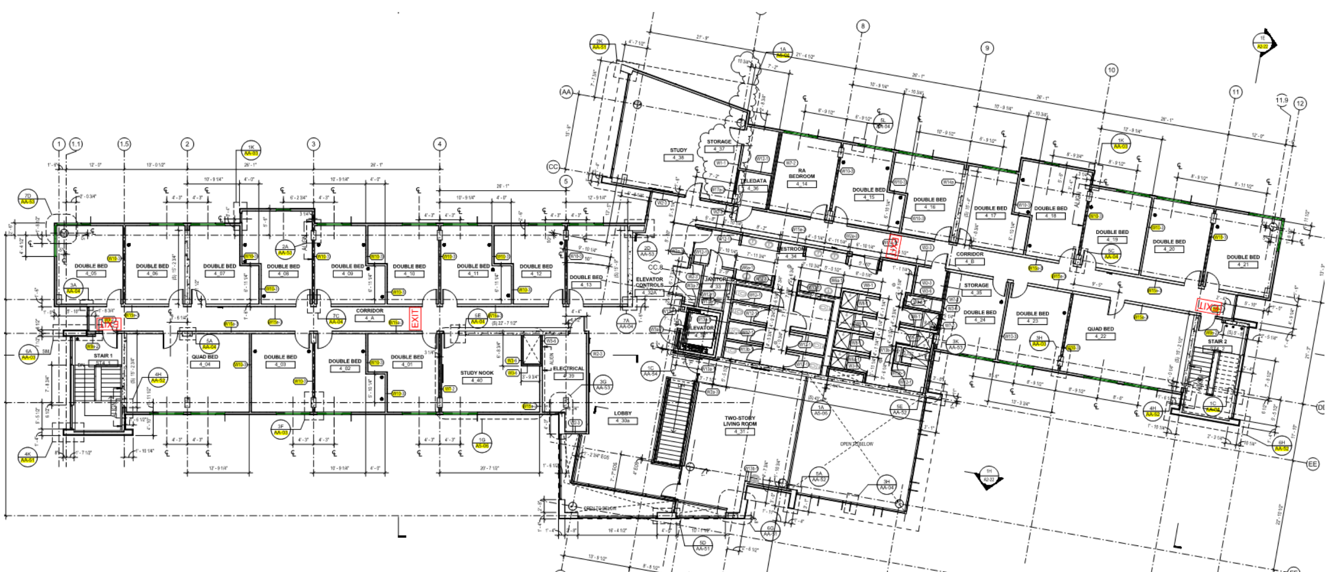


Figure 15 – Map of 4th Floor Showing Exit Signs

Evacuation Routes

The exit routes for the building are through the hallways towards the egress stairwells on the exterior of the building, as seen in Figure 16 below.

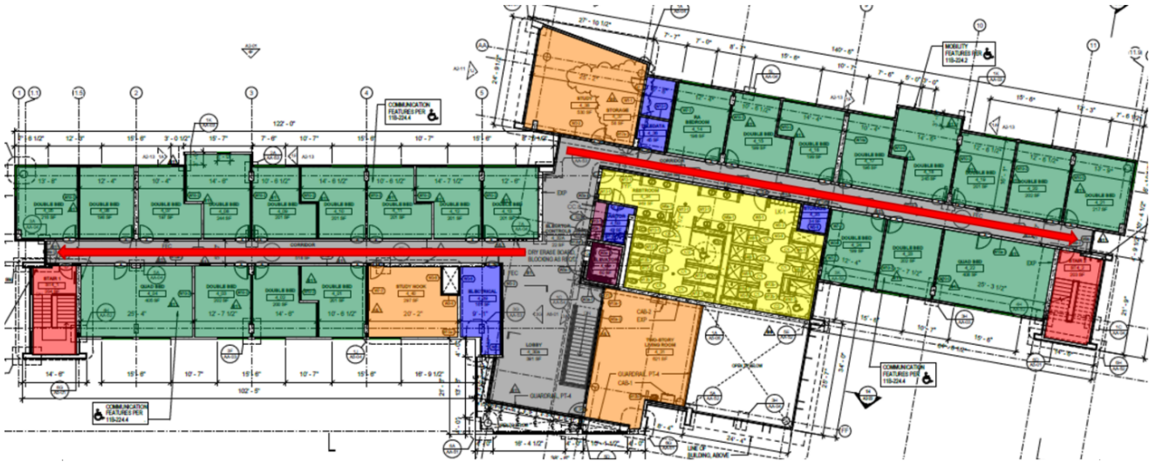


Figure 16 - Egress Routes in Building 172 B

One thing to note is that when fire drills were conducted in this building, it was very common for students to use the central unenclosed stairwell. This stairwell is the main route for students to traverse the building, therefore the one they are most familiar. In an event of an emergency, it is likely that they would use that path before looking for an alternative route of egress.

OCCUPANT CHARACTERISTICS THAT INFLUENCE EGRESS

The population who will be occupying building 172B is first year college students, typically aged 18-20 years old with some residential advisors living with them within the age range of 19-22. Seeing as how the typical college freshman is a recent high school graduate, it is safe to assume that for most of the occupants, this will be their first residence on their own, away from their parents. Given that there is a group of new students going through this experience together, they are more likely to form community ties than in a normal apartment-like complex, so that in the case of an emergency, occupants may look for friends/loved ones, delaying evacuation times.

Another characteristic that this group of occupants is prone to that can affect egress times is that they are prone to setting off smoke detectors with false alarms such as burnt popcorn. The University Police Department must respond to fire alarms going off 3 times a day all over campus that turn out to be false alarms. With the frequency of false alarms, students will be less willing to believe an alarm in a real emergency – they will need more information. Which means that in the event of a fire, their pre-movement time will be delayed due to students questioning if it is a real alarm or not and not wanting to have to leave what they are doing to evacuate the building. This also ties into the social factor that influences human behavior in fire, because if the students see other students who do not want to leave, then they will be less inclined to act. In this situation it will be very important for the RA's to be leaders and be floor wardens and get their residents to evacuate.

Another influence is that depending on when during the week an alarm goes off, reaction times could be delayed due to alcohol. Even though the legal drinking age is 21, it would be naïve to not consider that this dorm building is on a college campus and alcohol consumption does occur, primarily on Friday and Saturday evenings. Cal Poly has a strict no alcohol policy within the dorms themselves, but that does not stop students from going elsewhere then returning to their dorms later in the evening intoxicated. Numerous studies have shown that someone who is intoxicated has a delayed response time, and worst case scenario if they are deeply intoxicated may not wake up in the case of an emergency.

Looking at the data in Table 4.2.1 for Delay Times Derived from Actual Fires and Evacuation Exercises in the Fire Protection Handbooks, for mid-rise apartment buildings the mead delay time could me anywhere from 2.5 to 9.7 minutes, showing that getting the necessary information to shorten pre-movement time is critical were an emergency to occur in 172B.

TOTAL EVACUATION TIME

For the total evacuation time of 172B, a first-order analysis was done, and the time was calculated to be just over 9 minutes, or 600 seconds. The assumptions made in order to calculate the total evacuation for building 172B are as follows:

- Queuing will occur, determining the egress times for floors 2-4.
- First floor evacuation time will be determined using 4 exits available on ground floor.
- F_s=F_{sm} - D=0.175 people/ft^2 according to Figure 4.2.7 in Chapter 2, Section 4 of the NFPA Fire Protection Handbook.
- All occupants start egress at the same time.
- The population will use each exit available to them on their respective floor in optimum balance.

The occupant load calculated above was used in counting how many people would use each exit. The overall equation used to find the total time to evacuate the building ($t(Exit\ Building)$) is:

$$t(Exit\ Building) = \frac{\#\ occup.using\ Exit}{Flow\ Rate\ of\ Exit} + t(Traverse) + t(Evac.1st\ Floor)$$

The equation used to find the time to evacuate the first floor ($t(Evacuate\ 1st\ Floor)$) is:

$$t(Evacuate\ 1st\ Floor) = \frac{\left(No.People\ on\ First\ Floor/_{No.Exits\ Available}\right)}{Flow\ Rate\ of\ Most\ Restrictive\ Exit}$$

The equation to find the time to traverse a vertical floor ($t(Traverse\ a\ Floor)$):

$$t(Traverse\ Floor) = \frac{Floor\ Height + (Landing\ Length * No\ of\ Landings)}{k - akD}$$

Where k = 212 from Table 4.2.5, a = 2.86 when calculating feet per min, and D=0.175 as established in the assumptions. The calculated evacuation times can be seen in the Tables 5 and 6 listed below.

Table 5 – Time to Evacuate First Floor

Time to Evacuate First Floor		
No. Occupants per Floor	214	people
No. of Exits Available	4	exits
No. Occup. using each Exit	54	people
Flow of Door out to Exterior	44	people/min
	1.22	min

Table 6 – Time to Evacuate Building

Time to Evacuate Entire Building		
Floor Occupants	896	people
First Floor	214	
Second Floor	202	
Third Floor	257	
Fourth Floor	223	
No. Floors Evacuating	3	floors
Building Occupants Evacuating	682	people
No. of Exits per Upper Floor	2	exits
N. Occup. Using Each Exit	341	people
Flow of Limiting Egress Factor	44	people/min
Time to Travel One Vertical Floor	0.363571	min/floor
Time to Exit Building	9.33	min

TENABILITY PERFORMANCE CRITERIA

If a tenability analysis were to be performed on 172B the tenability limits would be set as follows:

Table 7 – Tenability Criteria

Tenability Limits		
Compartment Temperature	65 ˚C	Chapter 63, pg 2382 of the 2016 SFPE Handbook
CO Concentration	1100 ppm	Table 63.28 in the 2016 SFPE Handbook
Visibility (familiar)	4 m	Table 61.3 from 2016 SFPE Handbook

These tenability limits are set in Chapter 63 of the SFPE Handbook and are set so that if they occur there is still a chance for occupants to survive. The methodology used for 172B if a tenability analysis were to be performed would be finding the fraction of the incapacitating dose as the conditions change with time. There would need to be a way to account for using the proper respiratory ventilation factor, and at the point the F_{IN} reaches past the tenability limit that is the time it takes to incapacitation. Given that the students who will be living here are young-adults will probably not have extenuating health problems to be concerned about, this analysis is appropriate for the space.

SUMMARY

Overall building 172B meets all criteria to be a safe building in terms of life safety. One area that may be an issue for this building is evacuation times. As mentioned in the report there tends to be a lot of false alarms, especially in campus housing. This leads to a problem once a real emergency happens if occupants disregard alarms thinking it is another false alarm and do not move to evacuate immediately. In this case, it would be recommended that the Resident Advisors be properly trained on evacuation procedures and know to get the students out every time to ensure that no one is ever injured due to identifying an emergency as a false alarm.

As for the egress time calculation itself, once students do begin to move, the time of 10 minutes seems reasonable. There is an additional staircase in the core of the building that is not protected, therefore cannot be used for egress calculation purposes; however, in the event of an emergency, if it were safe to use those stairs, occupants would most likely do so, seeing as it is the main entrance to the building. The allowances for features in the building is due to having an automatic sprinkler system, which is analyzed in the next section.

Water Based Suppression Systems

The sprinkler system designed and installed in the building is a quick-response wet system. Section 8.1 of NFPA 13 outlines the design requirements of a wet pipe system. The first requirement is a pressure gauge installed in each riser, above and below

each alarm check valve or system riser check. Pressure gauges allow for the system to be monitored with ease and ensure that the appropriate amount of water is running through the system. The second requirement is relief valves. A listed relief valve no less than ½ in. in size, set to operate at 175 psi, or 10 psi over the maximum pressure of the system, whichever is greater. If there are auxiliary air reservoirs installed to absorb pressure increases, relief valves are not required. Auxiliary systems are permitted where the water supply is adequate, and heat tracing cannot be used in lieu of heated valve enclosures to protect the valve and water supply system from freezing. However due to the mellow climate of the San Luis Obispo region, frozen sprinkler pipes are not something that is a concern. The final requirement listed in section 8.1 is air venting. A single air vent in compliance with the requirements listed in 16.7 shall be provided on each wet pipe system when using metallic pipe.

The sprinkler system provided in the building meets all these requirements. Pressure gauges are indicated on the attached drawing set, as well as pointed out in a photograph of a typical floor riser below. This system has a ½ in. relief valve, set to operate at 185 psi, and because it has the relief valve, there is no auxiliary system in place.

WATER SUPPLY

The sprinkler system for 172B is connected from the city water supply that runs through campus on Grand Avenue. According to a flow test that had been done on hydrants called out on in Appendix C. The static pressure is listed at 114 psi, residual pressure listed at 75 psi with 2924 gpm. This curve is demonstrated as the red line on the attached flow test summary in Appendix C.

OCCUPANCY REQUIREMENTS

Due to the residential classification of the building, the design and installation requirements must follow that listed in Chapter 12 of NFPA 13R, 2019. Some of the criteria includes properly installing sprinklers based on roof pitches (172B has a flat ceiling so irrelevant in this case), spacing requirements, placement requirements, how to place in regard to obstructions, and sidewall sprinkler placing requirements. Additional requirements are listed in NFPA 13R – for low rise residential occupancies, Chapter 7. This includes the design density listed to be a minimum of 0.05 gpm/sq. ft, 0.1 gpm/sq. ft was used in the project, 16’ x 16’ max area coverage, which is not exceeded in the building, and the hose stream demand is 100 gpm.

Building 172B has 1 sprinkler per dormitory compartment, which provides adequate coverage for the space. In spaces large enough to require more than one sprinkler, the spacing is at the required 8ft and placed around obstructions as per

instructed per code. The typical spacing on branch lines where the compartment requires more than one sprinkler is 8 to 10 feet. As previously mentioned, there are no pitched or sloped roofs or ceilings in this building so that was not a concern in this application.

EQUIPMENT USED IN SPRINKLER SUPPRESSION SYSTEM

The standpipe, cross main and branch lines are marked and called out on the attached drawing set in Appendix C. There are three standpipes in the building, one in the west stair and the other two in the east stair. One of the risers in the east stair is to supply the sprinkler system, and the other risers supply the fire department connection (FDC). The riser that supplies the sprinkler system has tamper switches and waterflow alarms at every floor. The risers that supply the FDC's are equipped with tamper switches. All valves are locked in the open position to prevent tampering as well. The cross-main located in south-east side of the building, closer to the riser, is sized at 2.5" and reduces to 2" as it extends across the building. Since most of the branch lines have a small number of sprinklers on them, they are mostly 1", except for the branch line that protects the bathrooms. Since more sprinklers are located on that branch line, it starts out at a larger size then reduces. Notable sizes are highlighted on the attached drawing set. Each residential dorm room is protected by a concealed side-wall sprinkler head, and the common areas are protected by concealed overhead sprinklers. The k-factor of the sprinklers used in the building is 5.8. Some of the common areas have upright heads protecting the openings that are not concealed because they are out of reach and unable to be tampered with. The sprinkler head details of the heads that used throughout building 172B can be found on sheet FP-0.2 in Appendix C outlined in a green box. The heads installed are Viking VK462 concealed sprinkler heads. Throughout the common areas of the building, and stairwells, pendant sprinklers are used. The temperature at which the cap for the concealed sprinkler cap pops off is 165˚F and the sprinkler activates at 175˚F. The pendant sprinkler activation temperature is also 175˚F. All sprinklers in the building have an RTI value of 50, classifying them as quick response.

Because this building is also located in California, seismic bracing is also required. Details for the bracing used in the design of this system is located throughout the drawing package as well. Victaulic fittings and Viking sprinkler heads were the manufacturers used.

HYDRAULIC CALCULATIONS

For the hydraulic calculations, one analysis was done by calculating a head by head analysis of four of the most remote sprinkler heads, located on the fourth floor on the north-west side of the building. These sprinkler heads are designated in pink in Figure 17.

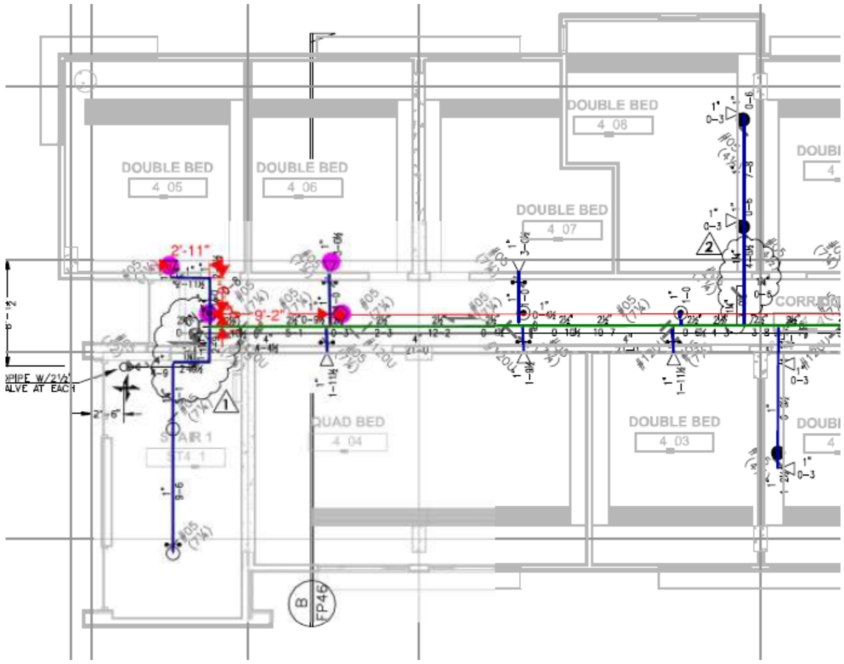


Figure 17 - Four Most Remote Sprinkler Heads Used for Head by Head Analysis

The system is a schedule 40, new steel pipe system, therefore a C factor of 140. Dimensions of pipe lengths are marked in the drawings in red. Table 8 below was used to determine the equivalent lengths for elbows, tees, and valves within the system. Using the requirements above and head by head calculations in the attached spreadsheet in Appendix C, it was calculated that the system demands a flow and pressure of 138.8 gpm and 101.4 psi. Equations used in head by head analysis spreadsheet are provided below:

$$Q = \text{Design Density} \times \text{Sq. Ft Sprinkler Coverage}$$

$$P = \left(\frac{Q}{K}\right)^2$$

$$K_{BL} = \frac{Q}{\sqrt{P}}$$

Table 8 – Equivalent Lengths Table 27.2.3.1.1 from NFPA 13 2019

Table 27.2.3.1.1 Equivalent Schedule 40 Steel Pipe Length Chart

	Fittings and Valves Expressed in Equivalent Feet (Meters) of Pipe														
	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.	3½ in.	4 in.	5 in.	6 in.	8 in.	10 in.	12 in.
Fittings and Valves	(15 mm)	(20 mm)	(25 mm)	(32 mm)	(40 mm)	(50 mm)	(65 mm)	(80 mm)	(90 mm)	(100 mm)	(125 mm)	(150 mm)	(200 mm)	(250 mm)	(300 mm)
45°elbow	—	1 (0.3)	1 (0.3)	1 (0.3)	2 (0.6)	2 (0.6)	3 (0.9)	3 (0.9)	3 (0.9)	4 (1.2)	5 (1.5)	7 (2.1)	9 (2.7)	11 (3.3)	13 (4)
90°standard elbow	1 (0.3)	2 (0.6)	2 (0.6)	3 (0.9)	4 (1.2)	5 (1.5)	6 (1.8)	7 (2.1)	8 (2.4)	10 (3)	12 (3.7)	14 (4.3)	18 (5.5)	22 (6.7)	27 (8.2)
90°long-turn elbow	0.5 (0.2)	1 (0.3)	2 (0.6)	2 (0.6)	2 (0.6)	3 (0.9)	4 (1.2)	5 (1.5)	5 (1.5)	6 (1.8)	8 (2.4)	9 (2.7)	13 (4)	16 (4.9)	18 (5.5)
Tee or cross (flow turned 90°)	3 (0.9)	4 (1.2)	5 (1.5)	6 (1.8)	8 (2.4)	10 (3)	12 (3.7)	15 (4.6)	17 (5.2)	20 (6.1)	25 (7.6)	30 (9.1)	35 (10.7)	50 (15.2)	60 (18.3)
Butterfly valve	—	—	—	—	—	6 (1.8)	7 (2.1)	10 (3)	—	12 (3.7)	9 (2.7)	10 (3)	12 (3.7)	19 (5.8)	21 (6.4)
Gate valve	—	—	—	—	—	1 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)	2 (0.6)	2 (0.6)	3 (0.9)	4 (1.2)	5 (1.5)	6 (1.8)
Vane type flow switch			6 (1.8)	9 (2.7)	10 (3)	14 (4.3)	17 (5.2)	22 (6.7)	—	30 (9.1)	—	16 (4.9)	22 (6.7)	29 (8.8)	36 (11)
Swing check*	—	—	5 (1.5)	7 (2.1)	9 (2.7)	11 (3.3)	14 (4.3)	16 (4.9)	19 (5.8)	22 (6.7)	27 (8.2)	32 (10)	45 (14)	55 (17)	65 (20)

Note: Information on ½ in. pipe is included in this table only because it is allowed under Sections 29.4 and 29.5.
*Due to the variation in design of swing check valves, the pipe equivalents indicated in this table are considered average.

2019 Edition

A SprinkCalc analysis was done on the group of sprinklers in the fourth floor living room area, as seen highlighted in yellow in Figure 18. This analysis was done to determine which area had higher demand, the living room or the four remote sprinklers as calculated above. The model of the SprinkCalc can be seen in Figure 19. Schedule 40 pipe was used, with K5.6 sprinkler heads and 6 inch drops. Equivalent pipe lengths from Table 8 above were used to calculate the total pipe length to the riser on the east side of the building.

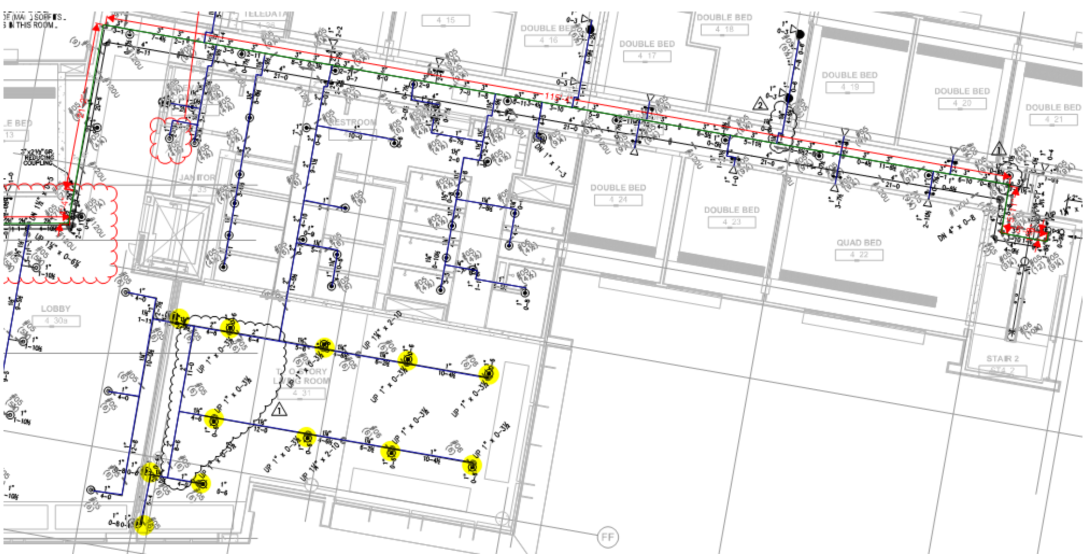


Figure 18 - Sprinklers Used in SprinkCalc Analysis

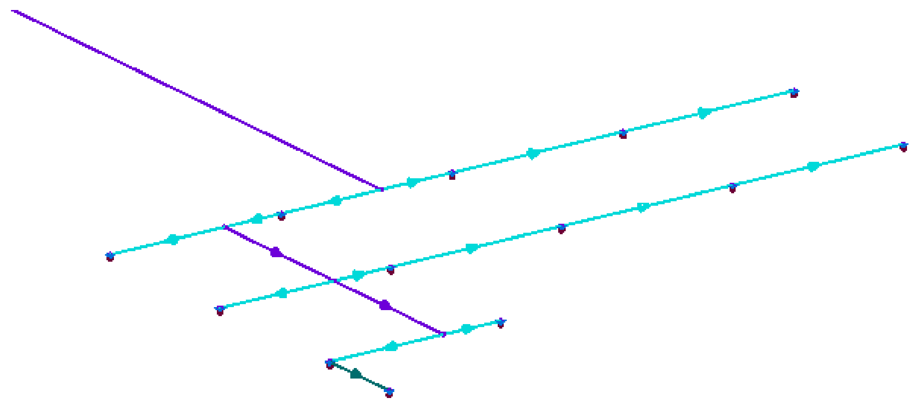


Figure 19 - Screenshot of SprinkCalc Model, also displays direction of where water travels in the system

The SprinkCalc model calculated that the sprinklers located in the living room area on the fourth floor created a demand of 323.5 gpm at 93.5 psi. Graphing this result, the water supply is strong enough to handle this demand without the need of a fire pump, as seen in Figure 20. The demand line is in green, the supply line in blue, and a hose stream allowance of 100 gpm, for a light hazard occupancy, is denoted in red.

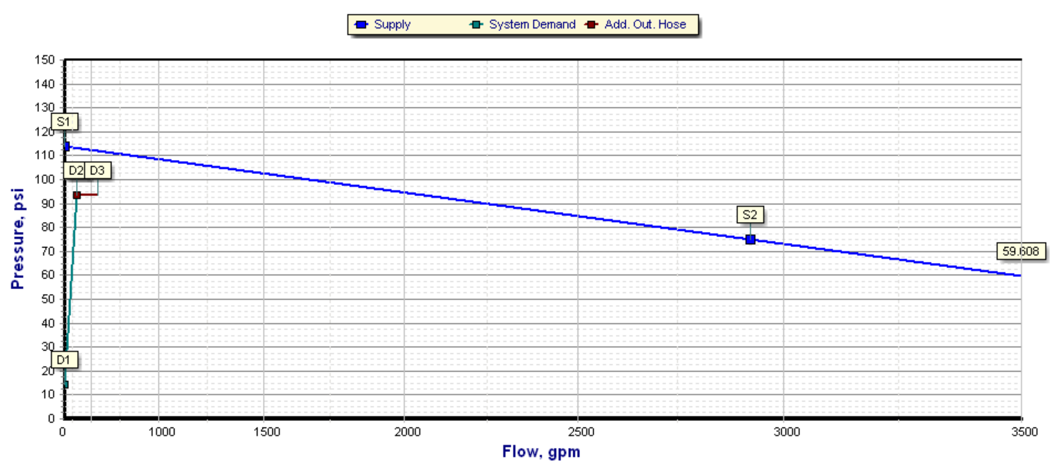


Figure 20 - Fire Sprinkler Demand Curve

Table 9 - Point Values for Sprinkler Demand Curve

Point on Graph	Value
D1	14.2 psi @ 0 gpm
D2	93.5 psi @ 323.5 gpm
D3	93.5 psi @ 423.5 gpm
S1	114 psi @ 0 gpm
S2	75 psi @ 2924 gpm

INSPECTION TESTING AND MAINTENACE REQUIREMENTS

In order for the system to be approved for usage, it must go through a series of tests outlined in Chapter 28 in NFPA 13 (2019). Criteria to pass the tests includes testing the system hydrostatically at 200 psi. The system needs to maintain that pressure without loss for two hours in order to pass. In order to see if there is a loss in pressure, gauges are monitored as well as visual inspections are conducted in search of leaks. If there is any part of the system that is usually ran at a pressure above 150 psi, that portion of the system is tested 50 psi above working pressure to ensure it also maintains its integrity. When the tests are conducted the authority having jurisdiction and the property owner or their representative need to be notified of the date and time. It is also the responsibility of the contractor to remove all caps and straps prior to placing the sprinkler system in service. It also must pass a flow test to verify that the supply is unobstructed and that the water supply is strong enough to power the system.

Once the system passes inspection and testing as deemed by the AHJ, it is the responsibility of the owner to maintain the integrity of the sprinkler system. These responsibilities are outlined in Chapter 5 of NFPA 25. Some of the responsibilities includes performing inspections of the sprinklers from the floor level annually, testing sample sprinklers in sections where required, and never reinstalling a sprinkler if it has been removed. Since Building 172 was just recently turned over to the university, there are no maintenance records on file to ensure that proper protocol is being enforced in terms of maintain the system. In speaking with a representative from campus's Environmental Health & Safety department, there is currently a contract for all of campus' systems to be tested and inspected on a regular basis by a local contractor.

SUMMARY

Overall, this system is a straightforward wet-pipe system that is for a residential occupancy. Because of the location of the dorms, it is at the beginning of the water supply that feeds the rest of campus, it is enough of a supply without the need of a fire pump for additional support. The engineers used concealed heads when designing this building probably to reduce the likelihood of students messing with the system and accidently setting it off. The next session will contain an analysis of the fire alarm and detection systems that are provided within the building.

Fire Alarm and Detection

Building 172B was constructed with an automatic detection and alarm system with emergency responder radio coverage throughout the entire building. The fire alarm drawings for the building can be found in the Appendix D attached at the end of this

report. Since this building is a subset of a larger housing project, the device symbols are uniform throughout and can be found on the legend on sheet FA0-02

NFPA 101 section 28.3 outlines the protection requirements for new hotels and dormitories, which is the classification of buidling172B. Within that chapter, it is stated that notification is required per section 9.6, a risk analysis for an occupant load greater than 100 is needed per section 9.14, smoke detectors are required per section 9.6 and carbon monoxide detectors are required per section 9.12. From there, NFPA 72 outlines how the system is designed and constructed per various chapters more specifically discussed later on throughout the report.

The building's fire alarm system is controlled by a Notifier fire alarm control panel, Model No. NFW 100X, located in the first floor electrical room. This panel controls all the systems, and because the electrical room also serves as the fire control room, there is a 1 hour rated wall construction in the room.

DETECTION DEVICES

The detection devices that are located throughout the building include: smoke detectors, carbon monoxide detectors, heat detectors and concealed sprinkler heads. All of the detection devices, excluding the sprinklers, are supplied by Notifier to compose a cohesive system. Details of the level of detection to send an alarm signal will be discussed later in the report. Since the main purpose for sprinklers is for fire control, not as dual purpose for detection, this section will include some detail about the sprinkler heads that are being used in the building, however moving forward, detection analysis will mainly focus on smoke, heat and carbon monoxide detectors. If a fire is detected, the campus police and local fire department are notified. Campus police are first dispatched to the area where the detector tripped to identify the problem and can cancel the fire department if it is a false alarm. The waterflow and tamper devices also notify campus police and the fire department. The building is also equipped with pull stations throughout the building to activate the system manually. This process fulfills code requirements for notification.

Device Spacing, Location and Placement

The spacing for each device is dictated by NFPA 72. Each device is placed no more than $0.7S$, where S is the listed coverage per section 17.6.3.1.1. The most common device throughout the building is the smoke detectors which are listed to have 30 foot spacing. Since the average square footage of the dorm rooms is 187 square feet, with the longest edge being 14 feet, one detector per room is sufficient coverage. In the hallways and common areas, the square footage is increased, and in two locations the ceiling height increases from 10 feet to 19.5 feet. The smoke detectors still meet code

requirements by being placed every 21 feet down the corridors, and no large common area exceed the square footage requirements.

FIRE DETECTION RESPONSE

The smoke detectors that are installed throughout the building are addressable photoelectric smoke detectors (Part No. FSP-851). These smoke detectors are plugged in to the system and can be set to a specific sensitivity established from the panel. The range of sensitivity that these detectors can be set at is from 0.5% per foot obscuration to 2.35 per foot obscuration and the operating temperature rage is from 32˚ to 120˚ Fahrenheit. All detectors are paired with a base (Part No. B210LP) whose specification sheet can be found in the Appendix D. Since combination fire/carbon monoxide/heat detectors are the primary detection device installed throughout the building, the smoke detectors are installed in areas of low occupancy such as the storage closets, electrical rooms, and data rooms.

The building has some carbon monoxide detectors (Part No. FCO-851) that are combination fire, heat and carbon monoxide detectors that have both normal and low frequency settings. The low-frequency setting is paired with low-frequency sounder bases which meet the NFPA 72 standard for sleeping area requirements. These devices are addressable and programmable for different environments, which are specified in the specification sheet located in Appendix D. For the dorm room environment, Notifier recommends programming the devices to a level 3, which alarms when smoke is at a 3% per foot of smoke obscuration. The heat detector portion of the detector is set to alarm at 135˚ Fahrenheit. The carbon monoxide concentration levels that activate the device are listed in Table 10 below as well as the maximum time allotted per UL Standard 2034:

Table 10 – Concentration of CO and Maximum Alarm Times

Concentration of CO	Maximum Alarm Time Response
70 (+/- 5) PPM	240 min (not less than 60 min)
150 (+/- 5) PPM	50 min (not less than 10 min)
400 (+/- 10) PPM	15 min (not less than 4 min)

The heat detectors (Part No. FST-851) provided in the building are less frequent than the smoke detectors, only appearing in the janitor closet adjacent to the bathroom. These heat detectors are addressable, fixed-temperature setpoint 135°F (57°C), rate-of-

rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C). The base plates used with these devices are the same ones used with the smoke detectors.

SEQUENCE OF OPERATIONS

Figure 21 below is the sequence of operations for Building 172B.

	ACTIVATE ALARM AT FACP	ACTIVATE ALARM AT REMOTE ANNUNCIATOR	ACTIVATE TROUBLE SIGNAL AT FACP	ACTIVATE TROUBLE SIGNAL AT REMOTE ANNUNCIATOR	ACTIVATE SUPERVISORY SIGNAL AT FACP	ACTIVATE SUPERVISORY SIGNAL AT REMOTE ANNUNCIATOR	SEND ALARM OFF-SITE VIA COMMUNICATOR	SEND TROUBLE SIGNAL OFF-SITE VIA COMMUNICATOR	SEND SUPERVISORY SIGNAL OFF-SITE VIA COMMUNICATOR	ACTIVATE AUDIBLE/VISIBLE SIGNALS	ACTIVATE SOUNDER BASE IN ROOM OF ALARM ONLY TEMPORAL 3	ACTIVATE SOUNDER BASE IN ROOM OF ALARM ONLY TEMPORAL 4	ACTIVATE HEARING IMPAIRED ROOM AUDIBLE/VISUAL ONLY IN ROOM CONTAINING ALARM	ACTIVATE WATERFLOW BELL	PRIMARY FLOOR RECALL*	SECONDARY FLOOR RECALL*	ELEVATOR SHUNT TRIP DISABLE	ACTIVATE FIRE FIGHTERS HAT LAMP	GLOBAL SHUTDOWN HVAC UNITS EXCEEDING 2000 CFM	HVLS FANS	SHUT FIRE/SMOKE DAMPERS	CLOSE FIRE DOORS	UNLOCK SECURITY DOORS	ELEV. SHUNT TRIP AFTER CAB REACHES PRIMARY FLR.**	ACTIVATE BATTERY BACK-UP	RESET 24V 4-WIRE DEVICES	SYSTEM NORMAL
MANUAL PULL STATION	X	X					X			X									X		X	X	X				
SMOKE DETECTORS:																											
ALL (EXCEPT LISTED BELOW)	X	X					X			X									X		X	X	X				
SLEEPING UNITS					X	X					X																
ADA/HEARING IMPAIRED ROOMS					X	X					X		X														
PRIMARY FLOOR ELEVATOR LOBBY	X	X					X			X						X			X		X	X	X				
ALL OTHER ELEVATOR LOBBIES	X	X					X			X					X				X		X	X	X				
ELEVATOR MACHINE ROOM/SHAFT	X	X					X			X					X				X		X	X	X				
HEAT DETECTORS:																											
ALL (EXCEPT LISTED BELOW)	X	X					X			X									X		X	X	X				
ELEVATOR MACHINE ROOM/SHAFT	X	X					X			X					X			X	X		X	X	X	X			
CARBON MONOXIDE DETECTOR					X	X			X			X															
FIRE SPRINKLER WATERFLOW SWITCH	X	X					X			X				X					X	X	X	X	X				
FIRE SPRINKLER TAMPER SWITCH					X	X			X																		
DOUBLE DETECTOR CHECK VALVE					X	X			X																		
GENERATOR RUN					X	X			X																		
GENERATOR TROUBLE			X	X				X																			
GENERATOR FAIL					X	X			X																		
WIRING CONDITIONS:																											
SIGNALING LINE CIRCUIT (SLC) -																											
WIRE-TO-WIRE SHORT			X	X				X																			
SINGLE OPEN			X	X				X																			
SINGLE GROUND			X	X				X																			
NOTIFICATION APPLIANCE CIRCUIT (NAC) -																											
WIRE-TO-WIRE SHORT			X	X				X																			
SINGLE OPEN			X	X				X																			
SINGLE GROUND			X	X				X																			
LOSS OF 120VAC POWER			X	X				X											X		X	X	X		X		
ELEVATOR PH. 2 SHUNT DISABLE SIGNAL					X	X											X	X									
RESET FACP																										X	X

Figure 21 – Sequence of Operations Matrix

Smoke Control System

Since Building 172B is not a high-rise building, there is no requirement to have a pressurized smoke control system for the building. The building does have some features to help with smoke travel throughout the facility. When the fire alarm is sent into trouble, the dorm room doors are set to automatically close, preserving the separation for the dorms, and the path of egress from a potential fire in a dorm room. There are also automatic doors that cover the elevators, protecting smoke from travelling through the elevator shaft, as seen in Figure 22 below.

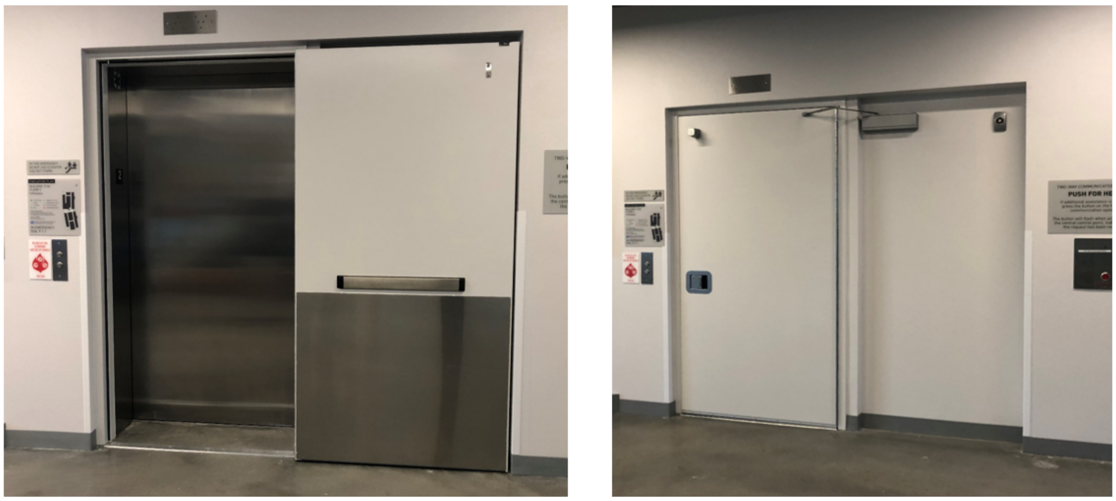


Figure 22 - Automatic Door Protecting Elevator Opening

FIRE ALARM SYSTEM REQUIREMENTS

The requirements for the fire alarm systems for Building 172B is dictated by NFPA 17, Chapter 18. Even though the specific chapter for dormitories is outlined in Chapter 29, the applicable requirements refer back to Chapter 18 for Sleeping Area Requirements. Starting with 18.4.6.1, the requirement for the noise level of the alarm devices is the greater of 15 dB above ambient, 5 dB above the maximum noise level, or 75 dBA measured at the pillow area. The alarm is also required to be a low frequency alarm signal to awake persons sleeping in the room. In order to meet this requirement devices must both be within 10% of 520 Hz and be a listed device to produce a low frequency.

For the visual requirements, they are outlined in section 5 of Chapter 18. The frequency of the strobe flashes must not be no more than 2 per second and no less than 1 per second. The maximum pulse time is 20 milliseconds. The light color of the strobe must be clear or nominal white, and not exceed 1000 cd. For spacing requirements and specific minimum lighting and device amount requirements, that is dependent on the size

of the room, refer to Tables 11 (a) and 11 (b) From section 18.5.5.5.1 in NFPA 72. Table (a) is for wall mounted devices and Table (b) is for ceiling mounted, both of which are present within 172B.

Table 11 (a) – Room Spacing for Wall-Mounted Visual Notification Appliances

Maximum Room Size		Minimum Required Light Output [Effective Intensity (cd)]	
ft	m	One Visual Notification Appliance per Room	Four Visual Notification Appliances per Room (One 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

NA: Not allowable.

Table 11 (b) – Room Spacing for Ceiling-Mounted Visual Notification Appliances

Maximum Room Size		Maximum Lens Height*		Minimum Required Light Output (Effective Intensity); One Visual Notification Appliance
ft	m	ft	m	(cd)
20 × 20	6.1 × 6.1	10	3.0	15
30 × 30	9.1 × 9.1	10	3.0	30
40 × 40	12.2 × 12.2	10	3.0	60
44 × 44	13.4 × 13.4	10	3.0	75
20 × 20	6.1 × 6.1	20	6.1	30
30 × 30	9.1 × 9.1	20	6.1	45
44 × 44	13.4 × 13.4	20	6.1	75
46 × 46	14.0 × 14.0	20	6.1	80
20 × 20	6.1 × 6.1	30	9.1	55
30 × 30	9.1 × 9.1	30	9.1	75
50 × 50	15.2 × 15.2	30	9.1	95
53 × 53	16.2 × 16.2	30	9.1	110
55 × 55	16.8 × 16.8	30	9.1	115
59 × 59	18.0 × 18.0	30	9.1	135
63 × 63	19.2 × 19.2	30	9.1	150
68 × 68	20.7 × 20.7	30	9.1	177
70 × 70	21.3 × 21.3	30	9.1	185

*This does not preclude mounting lens at lower heights.

ALARM NOTIFICATION APPLIANCES

This building is equipped with combination speaker/strobe devices throughout the devices to alert the residents of an emergency. These devices are made by System Sensor, and it is their L-series of devices. These speaker/strobe combination devices are programable to the main system and interconnected so that if one device in the system detects a problem, all devices in the system alert the building to the issue. They have an automatic selection to 12 or 24 volts based on the candela output, which ranges from 15 to 177. The speakers are set to output 520 Hz square wave tones or a clear voice output.

One of these devices is placed in every dorm room, as the size of the dorm room meets the coverage area capable of the devices, which also complies with NFPA 101, Chapter 28. For the larger common areas, they can still be covered with one device, the settings are changed to have a higher candela and louder horn. For the corridor's, devices are placed along the hallway as to not interfere with one another and to provide a continuous alarm. Please reference Appendix D for the data sheets of the devices and the locations throughout the building.

MASS NOTIFICATION SYSTEMS

According to NFPA 101, Chapter 28, section 3.4.4.1, this building is required to have a mass notification system, because it is a dormitory for a university that has an occupant load greater than 100. Therefore, this building is equipped with an EVACS systems. Once there is a fire detected in the system an alarm is sounded, the horns will chime first, then a voice message reads "There has been a fire alarm reported in the building, please proceed to the stairways and exit the building, do not use the elevators." There are two annunciator stations for the station that overrides the programmed alarm system to be able to communicate with the egressing population. If either of these are used by the appropriate personnel, the sounding evacuation is overridden for the annunciator message. This allows potential specific directions from the fire department. One of the annunciators is located by the fire panel for easy fire department access, and the other is located by the front desk for use by the building Resident Advisor if they are trained on the system.

SYSTEM POWER REQUIREMENTS

In order for the system to be commissioned, there needs to be a backup power battery for the system to still operate in the event of a fire when there is a loss of power, such as after an earthquake. In order to know how much power is needed, calculations are performed to adequately size batteries to run the system for at least fifteen minutes to evacuate occupants out of the building.

For Building 172B batteries have been appropriately calculated to satisfy code requirements to support the system in the event of loss of main power. The required

alarm capacity for the building, is 1.615 amp-hours, calculated by multiplying 0.25 by the total system alarm current, 6.46 amps. The required standby power for the system for 24 hours is 68.9 amp-hours, calculated by multiplying 24 by the total standby current for the system, 2.87 amps. The total capacity for the system is calculated by adding those two values, which is 70.5 amp-hours. Adding a safety factor of 20%, the total amp-hours required for the system is 84.6. The building is supplied with two 12V 100 amp-hour batteries, having a spare amp-hour capacity of 15.38 amp-hours. These calculations are summarized below in Table 12.

Table 12 – Battery Calculations for Building 172B

EQUIPEMENT	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
NFS2-3030D: Fire Alarm Control Unit	0.3400	X	1	=	0.3400	0.3400	X	1	=	0.3400
UDACT-2: Alarm Communicator Transmitter	0.0400	X	1	=	0.0400	0.0400	X	1	=	0.0400
B465: Universal Dual Path Communicator	0.1500	X	1	=	0.1500	0.2300	X	1	=	0.2300
LCM-320: Loop Control Module	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
LEM-320: Loop Expander Module	0.1000	X	1	=	0.1000	0.1000	X	1	=	0.1000
HS-NCM-MF: Network Communitor Module	0.4000	X	2	=	0.8000	0.4000	X	2	=	0.8000
DVC-EM: DVC Audio Processor	0.3000	X	1	=	0.3000	0.3000	X	1	=	0.3000
DVC-KD: DVC Keypad	0.0600	X	1	=	0.0600	0.0600	X	1	=	0.0600
AMPS-24: Power Supply & Charger	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
ACPS-610: NAC Power Supply & Charger	0.1300	X	1	=	0.1300	0.1300	X	1	=	0.1300
DS-AMP: Digital Series Amplifier	0.1250	X	1	=	0.1250	0.1250	X	1	=	0.1250
DS-DB: Digital Series Distribution Board	0.3550	X	1	=	0.3550	0.3550	X	1	=	0.3550
DS-XFM70V: Transformer	0.0600	X	1	=	0.0600	0.0600	X	1	=	0.0600
LCD-160: LCD Annunciator	0.0750	X	1	=	0.0750	0.0750	X	1	=	0.0750
NBG-12LX: Manual Pull Station	0.0004	X	1	=	0.0004	0.0004	X	1	=	0.0004
FSP-851: Photo Smoke Detector	0.0003	X	16	=	0.0048	0.0003	X	16	=	0.0048
FSP-951: Photo Smoke Detector	0.0002	X	160	=	0.0320	0.0002	X	160	=	0.0320
FST-851: Heat Detector	0.0003	X	4	=	0.0012	0.0003	X	4	=	0.0012
CO1224T: CO Detector	0.0200	X	1	=	0.0200	0.0400	X	1	=	0.0400
FDM-1: Dual Monitor Module	0.0008	X	6	=	0.0048	0.0008	X	6	=	0.0048
FMM-1: Monitor Module	0.0004	X	6	=	0.0024	0.0004	X	6	=	0.0024
FRM-1: Relay Module	0.0003	X	19	=	0.0057	0.0003	X	19	=	0.0057
XP6-C: Control Module	0.0023	X	2	=	0.0046	0.0023	X	2	=	0.0046
Pam-1: Multi-Voltage Relay	0.0000	X	8	=	0.0000	0.0150	X	8	=	0.1200
Strobes on XP-6C	0.0000	X	12	=	0.0000	0.2810	X	12	=	3.3720
	0.0000	X	0	=	0.0000	0.0000	X	0	=	0.0000
				TOTAL SYSTEM STANDBY CURRENT (AMPS)	2.8709				TOTAL SYSTEM ALARM CURRENT (AMPS)	6.4629

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	2.8709	=	68.9016	0.250	X	6.4629	=	1.6157

REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR (%)		TOTAL AMP-HOURS REQUIRED
68.90	+	1.6157	=	70.5173	70.5173	+	20%	=	84.62079
TOTAL AMP-HOURS PROVIDED: (2) 12V 100AH BATTERIES									
AVAILABLE SPARE AMP-HOUR CAPACITY: 15.38AH									

INSPECTION, TESTING AND MAINTENANCE REQUIREMENTS

In order for the system to be approved for usage, it must go through a series of tests outlined in Chapter 14 of NFPA 72. First the building must pass an acceptance testing done with the AHJ of the area. After the initial acceptance testing, the interval of testing is determined by the system and Table 14.3.1 in NFPA 72, or by local codes and

the AHJ. Frequency varies from weekly to annually depending on the system. It is stated specifically in the code however, that the sensitivity of the system must be checked 1 year after installation.

Once the system passes inspection and testing as deemed by the AHJ, it is the responsibility of the owner to maintain the integrity of the fire alarm system. Currently for Building 172B, it has not been officially turned over to the university, therefore there are no official maintenance records to ensure that proper protocol is being enforced in terms of maintenance of the system. How the building is currently occupied with a temporary occupancy certificate issued from the California State Fire Marshall's office, which allowed Cal Poly to house students in the building complex this year while construction was finishing up before the system was completely commissioned. In order to receive this certificate, some preliminary inspections were conducted to ensure that the systems were functional. Once construction is fully completed for the entire housing complex a full commissioning of the system will be completed. In speaking with a representative from campus's Environmental Health & Safety department, the university currently holds a contract for all campus systems to be tested and inspected on a regular basis by a local contractor.

SUMMARY

The systems designed for building 172B meets the code requirements for NFPA 72. This building is equipped with an EVACS system that serves as a mass notification system since it services a university dormitory with an occupant load of over 100. There are smoke detectors located in every dwelling, as well as combination speaker/strobe devices to alert residents when there is an issue. If there is a fire in the space, it is shown in the analysis that early detection and fast suppression when working together can contain the fire to allow for successful egress.

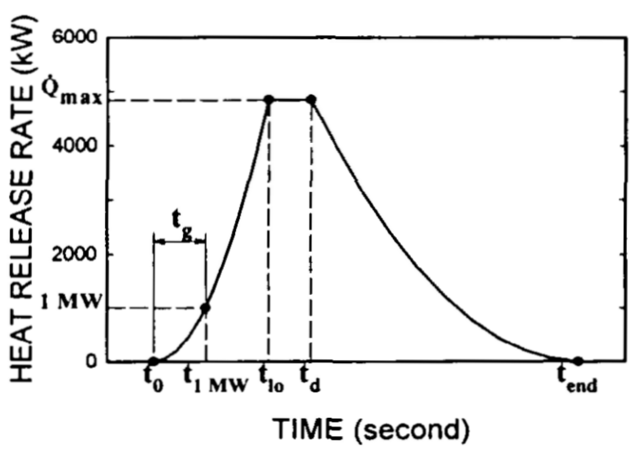
Performance Based Analysis

This portion of the report outlines a performance based analysis conducted on Building 172B. In order to conduct this analysis, three possible design fires were put together, and one was modeled and analyzed for the purpose of this report. The objective for this performance based analysis is to analyze the life safety of Building 172B. The three design fires are located in a dorm room, in the first floor communal area, and on the second floor core stair. The dorm room was selected to show how ventilation affects a fire, the first floor atrium was chosen due to the high ceilings, and the second floor of the core stair was chosen to see how smoke travelled through the building with the interconnected stair.

ANALYSIS METHODS

Heat Release Rate Curves

In order to analyze the HRR cures for the design fires within the compartments, there were two methods used. The first was to estimate a fuel load based on the compartment size and SFPE Handbook values for the amount of energy released per area, from there, select an appropriate alpha value, to the create an overall alpha-t-squared fire curve for the compartment. The second method was to analyze data found for individual fuel packages and extract an alpha value. This methodology is outlined in detail in a paper written by Hyeong-Jin Kim and David G. Lilley in their paper *Heat Release Rates of Burning Items in Fires*. Extracting alpha values is done by plotting the data found in the growth phase and fitting a second order polynomial trend line to the data. By then extracting the equation of the trendline, the coefficient of the squared term is the alpha value. From there, the same can be done for the decay phase of the fire, where plotting the data once the fire begins to decay will give an alpha decay value. The time between alpha growth and alpha decay is where the fuel burning is estimated to be burning at a steady rate at its maximum HRR. With the alpha values and the time steps for growth, steady state, and decay, a plot can be made of an alpha-t-squared fire of the burning fuel package to then be on a uniform time step. Figure ### below is a representation of the different phases during a fire as described above.



$$\dot{Q} = 0 \qquad 0 \le t \le t_o$$

$$\dot{Q} = \alpha_g (t - t_o)^2 \qquad t_o \le t \le t_{\ell o}$$

$$\dot{Q} = \alpha_g (t_{\ell o} - t_o)^2 \qquad t_{\ell o} \le t \le t_d$$

$$\dot{Q} = \alpha_d (t_{end} - t)^2 \qquad t_d \le t \le t_{end}$$

$$\dot{Q} = 0 \qquad t_{end} \le t \le \text{Infinity}$$

Figure 23 – Phases of fire and corresponding alpha equations.

This methodology is important because it allows for easy comparisons between fuel packages to be made, even if the measurements of the HRR curves were originally done on different time steps. With the comparisons, an analysis based on the critical heat flux for ignition and the orientation of the fuel packages is completed to calculate if and when a second item would ignite. This is done by using Equations (1) and (2) below. Equation 1 is the radiative portion of the HRR that is released from a fire. For the analysis in this design fire the radiative fraction chosen was a value of 0.3.

$$\dot{Q}_R = \chi_R \dot{Q}_T \tag{1}$$

From there Equation (2) was re-arranged to Equation (3) to be able to solve for the amount of radiative heat flux the second item receives.

$$\dot{Q}_R = 4\pi R^2 \dot{q}''_{ex} \tag{2}$$

$$\dot{q}''_{ex} = \frac{\dot{Q}_R}{4\pi R^2} \tag{3}$$

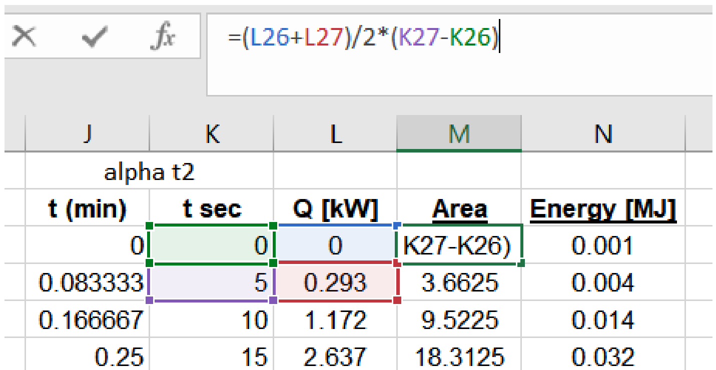
Once the external heat flux on the second item is known, it is compared to the critical heat flux for ignition for the item and at the point where $\dot{q}''_{ex} > \dot{q}''_{ig,cr}$ then ignition of the second item occurs. Once that happens (if it happens) at the time it took to ignite is added as a delay from the preceding ignition time, and the curve is then added to the overall HRR curve for the design fire. The process is repeated for the second burning item to see if it will ignite the third item. The ensuing item ignition is based on only the item HRR that came before it, not the compiled overall HRR for ease of calculation purposes. Once the individual fuel package curves are compiled based on the ignition times, it creates the overall heat release rate curve for the design fire. This overall HRR is used in other analyses such as sprinkler activations.

Burnout Time

The burnout time for the design fire dictates how long each design fire occurred because it was calculated based on the amount of energy released from the fuel. For the first method, the total amount of energy released from the compartment based on the area was known due to the fuel load density, therefore the HRR curve ran until the total area under the curve was equal to that value. The same concept applies to the second methodology, however in order to find the total energy released in the design fire the area under the overall HRR was calculated, the time for how long to run the alpha-t-squared fires is not a concern since we have the burning time data from the experiment. Knowing the total energy released however helps knowing how long to extend the sprinkler curve once sprinkler activation occurs, as seen later in this paper.

The method used to calculate the area is the trapezoidal sum approximation method. The formula typed into excel, as seen in the figure below, portions the area under the curve

into trapezoids based on the time step, then another column adds them consecutively as the fire progresses. Even though this is an approximate method for summing the area under the curve, for this purpose, it is accurate enough to get a good estimate for the time that the compartment will burn out. This can be seen in Figure 25 which demonstrates the trapezoidal method pictorially.



=(L26+L27)/2*(K27-K26)

J	K	L	M	N
alpha t2				
t (min)	t sec	Q [kW]	Area	Energy [MJ]
0	0	0	K27-K26)	0.001
0.083333	5	0.293	3.6625	0.004
0.166667	10	1.172	9.5225	0.014
0.25	15	2.637	18.3125	0.032

Figure 24 – Screenshot of excel sheet to demonstrate trapezoidal method for finding the area under the curve.

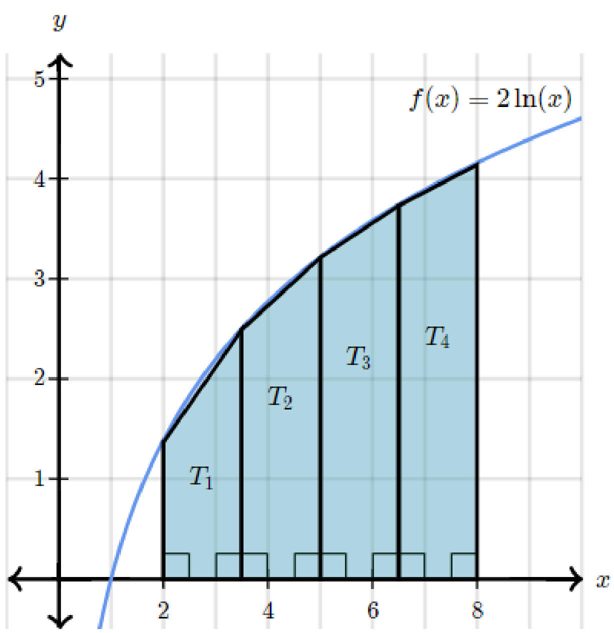


Figure 25 – Trapezoidal method used to approximate area under the curve.

Sprinkler Activation

Sprinkler activation was determined by using the combined overall HRR and Alpert's ceiling jet correlation to calculate the bulb temperature to see when it would activate. By calculating sprinkler activation, the analysis changes based on the time of activation,

because it is assumed that once the sprinkler activated the fire is controlled at that state, therefore ignition of subsequent items stops. The temperature of the bulb is dictated by the ceiling jet temperature which can be found using Alpert's correlation, Equations (4) and (5) and Figure 26 below.

$$T_j - T_\infty = \frac{5.38}{H}\left(\frac{\dot{Q}}{r}\right)^{\frac{2}{3}}, \; {}^{r}/_{H} > 0.18 \tag{4}$$

$$u_j = 0.195\left(\frac{\dot{Q}^{1/3}H^{1/3}}{r^{5/6}}\right)^{\frac{2}{3}}, \; {}^{r}/_{H} > 0.15 \tag{5}$$

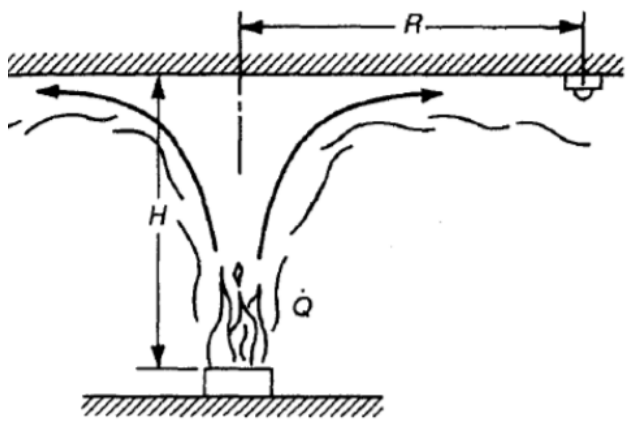


Figure 26 – Pictorial representation of Alpert's correlation.

Once the temperature of the ceiling jet is known, the temperature of the bulb is found by using Equation (6). The system activates once the temperature of the bulb is heated past the activation temperature. These equations can be plugged into Excel then plotted to find the time.

$$\frac{dT_d}{dt} = \frac{\sqrt{u_j}}{RTI}(T_j - T_d) \tag{6}$$

The sprinklers used in the building are Viking VK 462 sprinkler heads. They have a cap activation temperature of 165˚F and a bulb activation temperature of 175˚F. There was no data on the actual RTI value of the sprinkler, however they are listed as quick response, therefore an RTI value of 50 $ms^{1/2}$ was assumed and used in the analysis. These sprinkler properties are constant throughout all three design fires.

Soot Yields

The soot yields for the design fires can be found by using Equation (7).

$$\dot{m}_s = y_s \frac{\dot{Q}}{\Delta H_c} \tag{7}$$

DESIGN FIRE SCENARIOS

Design Fire – Dorm Room

For the first design fire, the location chosen was a dorm room because it is a good representation of the most common occupancy of the space. This fire is also one of the common demonstrations throughout the industry, especially to demonstrate the importance of sprinklers. The location of the dorm room selected was on the second floor near one of the enclosed stairwells on the end of the building. Figure 27 below shows the compartment used in the analysis. The compartment dimensions are also shown in the figure. The ceiling height is 9'3", the compartment openings consist of a 5'x7' window and a 3'x8' door that is connected to the alarm and detection system to automatically close when the system is tripped. For this design fire, two scenarios were analyzed, one where the system works properly and the door closes, and another where something prevents the door from closing, therefore it is modeled as open.

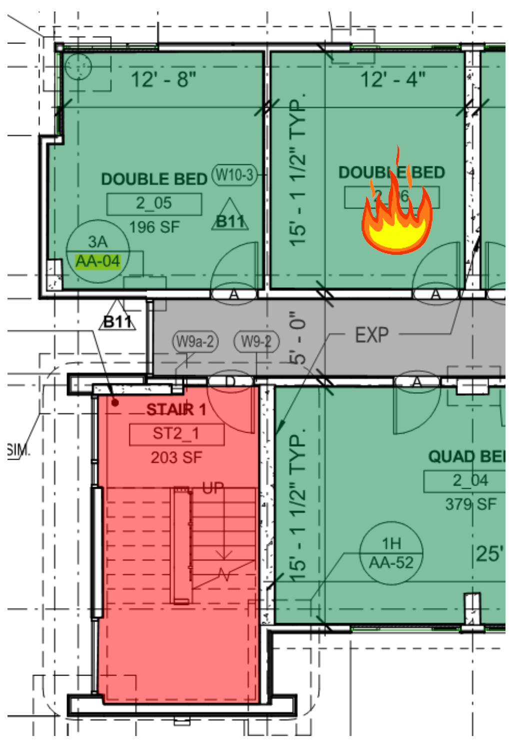


Figure 27 – Plan view of dorm room compartment.

The ventilation factors are important to consider in this analysis because it is the openings of the compartment that determine the flashover temperature of the compartment. Table 13 below shows the two scenarios and two correlations, Thomas, Equation (7) and Babrauskas, Equation (8), for the flashover scenarios.

Table 13 – Flashover values for the different compartment scenarios.

	Thomas Correlation	**Babrauskas Correlation**
Door Closed	1817 kW	3010 kW
Door Open	3013 kW	5382 kW

$$\frac{\dot{Q}_{fo}}{A_o\sqrt{H}} = 378 + 7.8\frac{A_t}{A_o\sqrt{H}} \tag{8}$$

$$\frac{\dot{Q}_{fo}}{A_o\sqrt{H}} = 750 \tag{9}$$

For this design fire the first method described in the previous section was used. The fuel load estimated for this compartment as taken from the SFPE Handbook for dwellings is 780 MJ/m^2. Multiplying this by the area of the compartment gives us a total energy release of 13,406 MJ for the compartment. It was assumed a medium alpha value of 0.01172 kW/s^2 based on Figure 28 below. Given that the fuel in the space will be composed of cotton/polyester innerspring mattresses from the bed and the possible ignition source for this design fire would be a student left an unattended candle on their nightstand that caught their bedding on fire, it is a reasonable assumption.

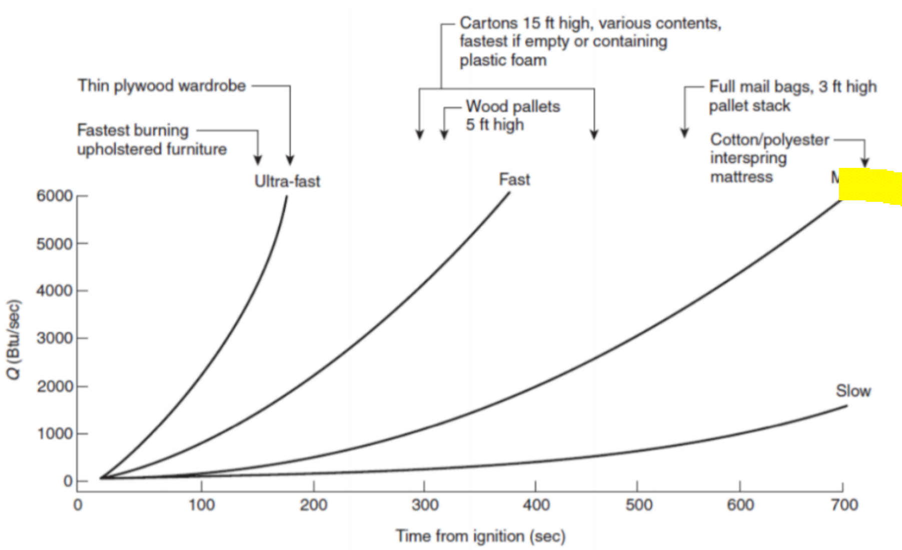


Figure 28 – Alpha curves from NFPA 72

Using Babrauskas's calculated value for the compartment flashover, being that it is the higher value, therefore more taxing on the system, an alpha-t-squared fire was generated for both spaces as seen in Figures 29 and 30 below.

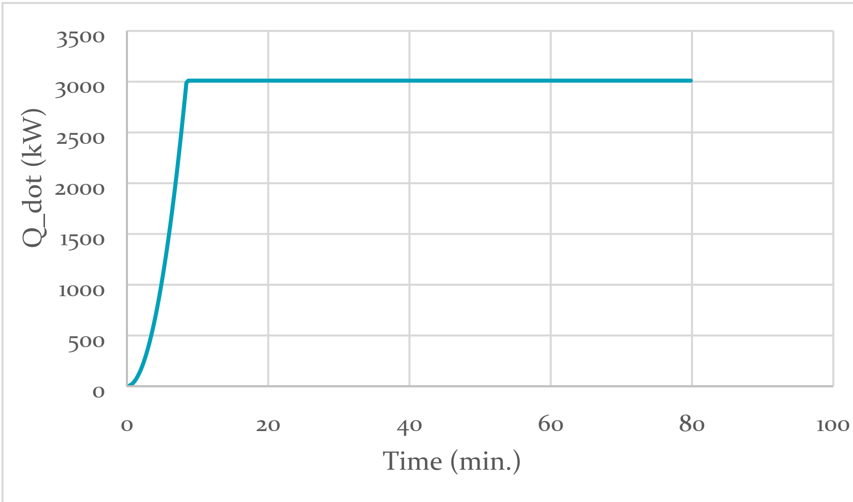


Figure 29 – HRR curve for the door closed scenario.

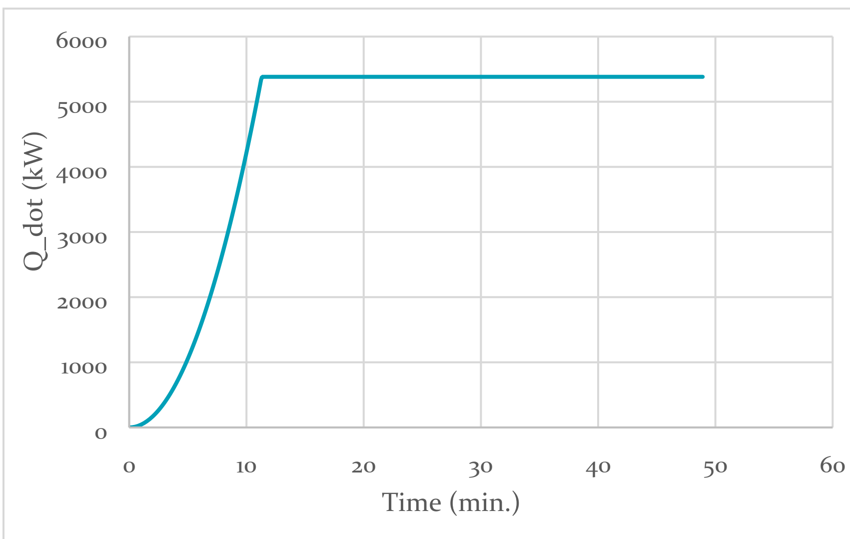


Figure 30 – HRR curve for the door open scenario.

Since the flashover HRR values for the door open scenario is higher than the door closed scenario, the fuel is consumed faster, and the limit if 13,406 MJ being released from the fire, is achieved quicker, leading to a faster burnout time of 49 min compared to 80 min with the door closed.

Since both curves use the same alpha value, only one sprinkler analysis needed to be made. Figure 31 shows the sprinkler layout for the compartment. Because the room is

protected by a singular wall sprinkler, the spacing used in the analysis is a worst case scenario of the fire originating in the opposite corner, giving us an r value of 15'. Figure 32 shows the graph of the gas temperature and the bulb temperature over time. The dashed line represents the activation temperature, 175 F or 353 K, therefore at the intersection point is the time of activation, which is at 3.5 min, using Alpert's correlation.

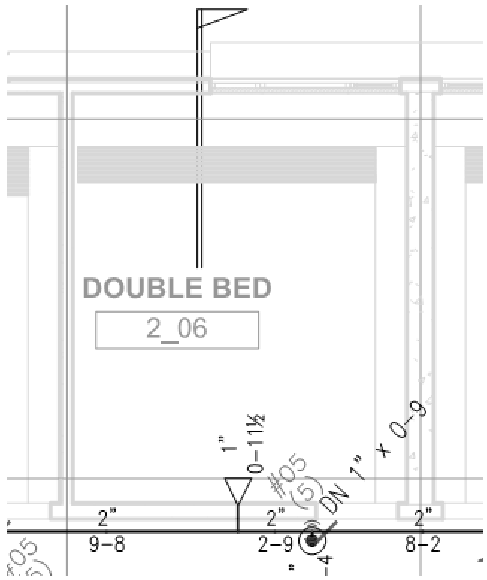


Figure 31 - Plan view of the sprinkler plan for the compartment.

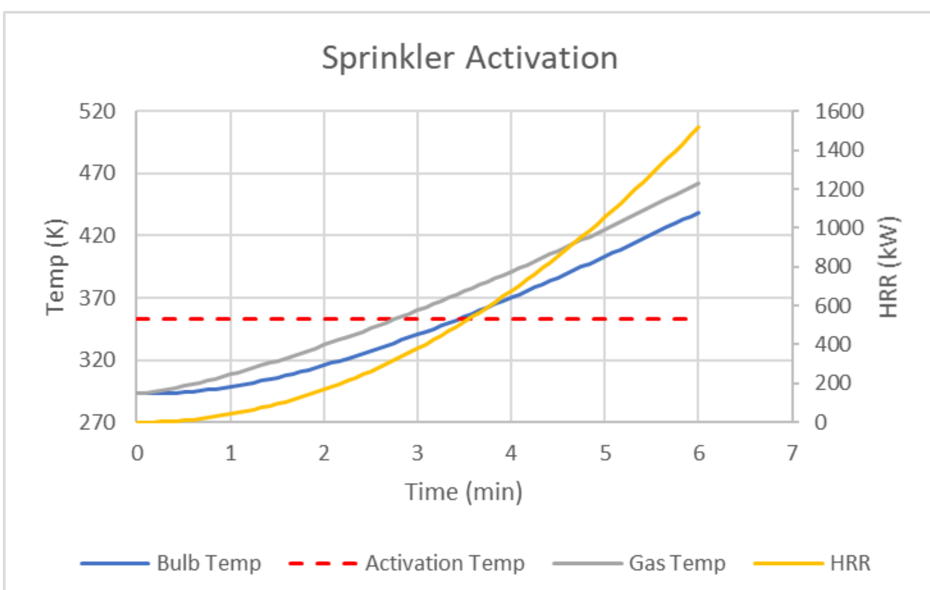


Figure 32 – Plot of bulb and gas temperature versus time.

Since activation occurs at 3.5 min, the HRR is capped at 1162 kW, which means the time it takes for the compartment to burnout the fuel lasts longer until 195 mins. It is

unrealistic to expect that the sprinkler system will run for the entire 195 mins, since that is an equivalent to approximately 3.5 hours, and it is anticipated that there will be fire department intervention before then, since sprinkler systems are not designed to run that long. Below in Figure 33 is the plot of the HRR curve with sprinkler activation.

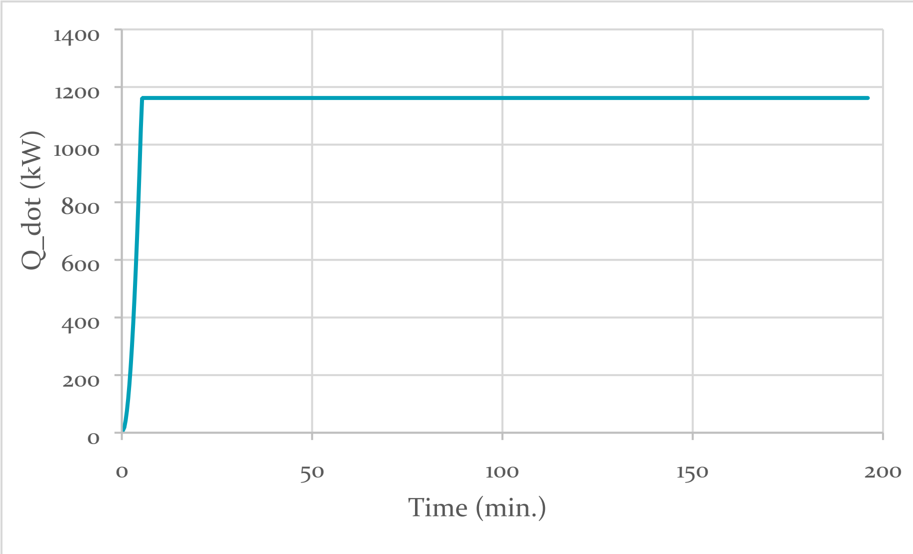


Figure 33 – Plot of HRR curve with sprinkler activation within compartment.

The soot yields for this design fire were composed of a composite of the different fuels found in the space. Based on observation, it was concluded that the prominent fuels within the compartment consist of polyurethane foam found in the mattresses and chairs, polyester that is used for the bedding, and wood that is the main material for the furniture within the space.

Figure 34 – Example of the interior of a double occupancy dorm room in 172B.

Based on the usage of the space, the following percentages were assumed, and a composition was composed to analyze the soot yields. Below in Table 14 is the individual yields and their respective percentages. Using the percentages, the composite soot yield rate curve was generated, using the door closed HRR, as seen in Figure 35.

Table 14 – Soot Yield Percentages for Dorm Fire

*Values from SFPE Handbook	y_s	ΔH_c	Percentages
Polyurethane Foam	0.227	19	15%
Polyester	0.091	20.6	35%
Wood (Red Oak)	0015	12.4	50%

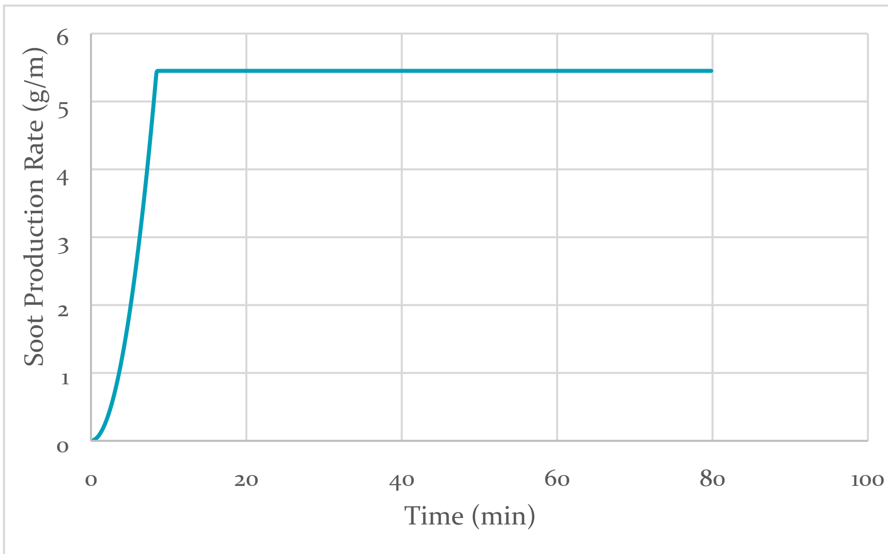


Figure 35 – Plot of soot production rate curve.

Design Fire – Atrium Fire

The second design fire location was chosen to be placed in the atrium common room space on the first floor. The layout consists of a large floorplan open two stories high on the first floor, with a small platform on the second level. Please refer to Figure 36 to see the plan view of this layout. This common room design is repeated on the third and fourth floor of the building. This room was selected because of the unique behavior of atriums, and to make sure that the fire protection systems placed at the top of the highest point in the atrium will activate in a reasonable amount of time given the fuel load in the space. The fuel in the space, as seen in Figure 37 consists of couches and chairs with some other small tables in the surrounding areas. Since the peak HRR for the chairs and couches typically greatly overshadow the peak HRR of furniture such as small coffee tables, only the two chairs and two sofas as seen in the picture were used in the analysis.

Figure 36 – Plan view of the atrium space

Figure 37 – Picture of the fuel located within the atrium space.

Given that this building was built before January 2019, when CA TB 133 was still in effect, it is a safe assumption that the furniture is compliant. However, given that the bulletin has been repealed, the fuel packages chosen for this analysis are not TB 133 compliant. The data used for the chairs comes from Cleary and Ollenheimer's paper *The Influence of Ignition Source on the Flaming Fire Hazard of Upholstered Furniture,* that was found from University of Maryland's Burning Item Database. The data for the sofa also was found from UoM's Burning Item Database and is from Lawson, J. Randall, W. Douglas Walton and William H. Twilley, *Fire Performance of Furnishings as Measured in the NBS Furniture Calorimeter. Part I.* Details of the alpha values extracted from the data for each piece of furniture are listed in Table 15 below. Below that, in Figures 38 and 39 is a comparison of the created alpha-t-squared curves and the actual data.

Table 15 - Values extracted from data for atrium fire

Item	t_0 (s)	t_{l0} (s)	t_d (s)	t_{end} (s)	α_g (kW/s^2)	α_d (kW/s^2)
Sofa	0	254	325	2071	0.049500	0.000600
Chair	0	180	233	1532	0.022000	0.000300

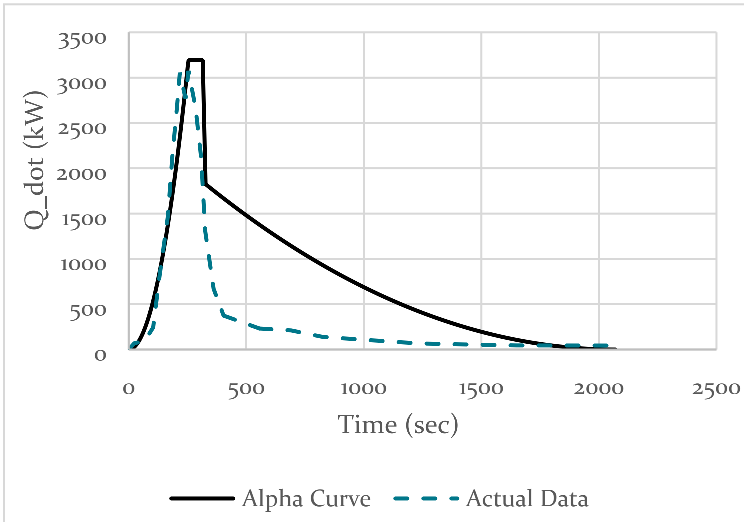


Figure 38 – Sofa data HRR curve compared to actual data.

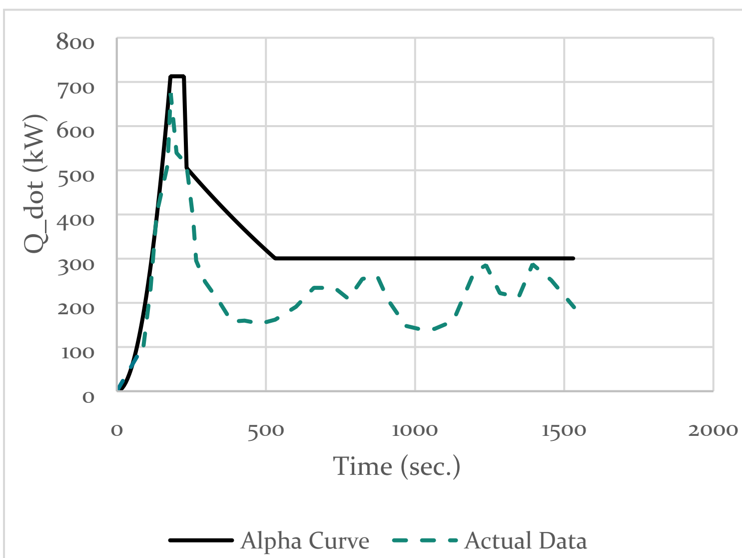


Figure 39 - Chair data HRR curve compared to actual data.

For Figure 38, the decay phase is held steady at 300 kW until burn out as a conservative estimate to not cut out part of the decay data with a curved polynomial trend. The design

fire ignition scenario is a possible cell phone, a Samsung Galaxy Note 7, slipping into the cushions of the chair on the bottom right corner of Figure 39, overheating, and igniting the chair. Assuming that the pieces of furniture are spaced 0.5m apart from each other, the delay of the second piece of furniture igniting is 111s, the third piece ignites at 186s, and the fourth piece ignites at 297s. This delay is based off the sofa having a critical heat flux of 26 kW/m^2 for vinyl and the chair having a critical heat flux of 25 kW/m^2 for polyolefin. The combined HRR curve for the compartment can be seen in Figure 40 below.

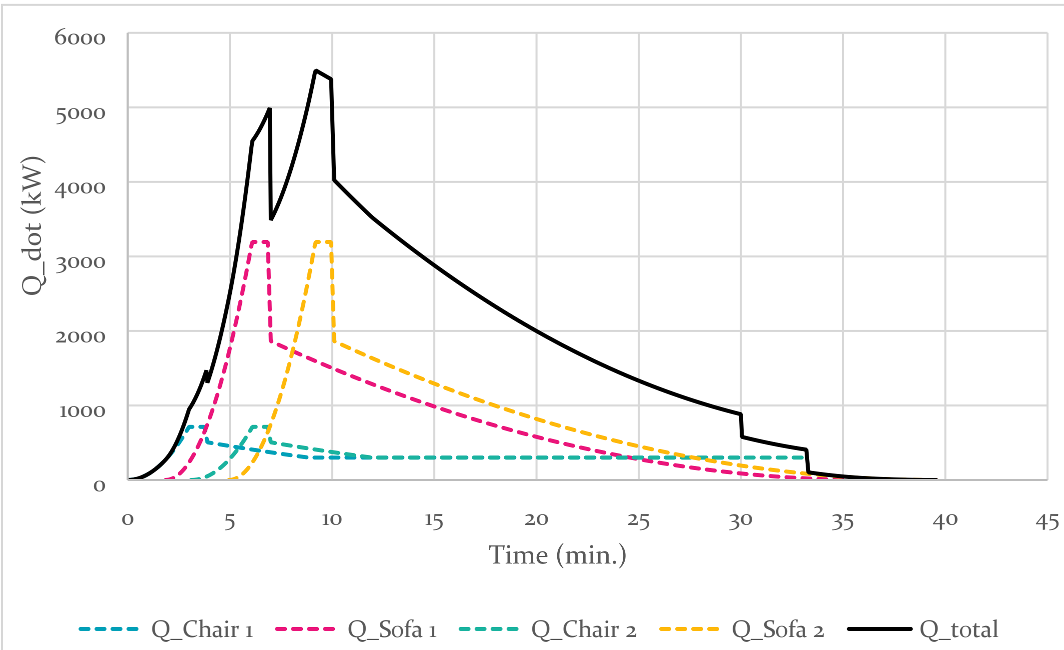


Figure 40 – Combined HRR curve for atrium design fire.

The peak HRR calculated for this design fire is 5454 kW and the fire duration is 40 min. The total energy released was calculated to be 4526 MJ. The ceiling height of the compartment is 19.5' and the sprinkler spacing within the atrium space is 12', however, due to the grid spacing arrangement, the diagonal of 17' was used as the spacing when running calculations. See sprinkler plan below in Figure 41 for reference.

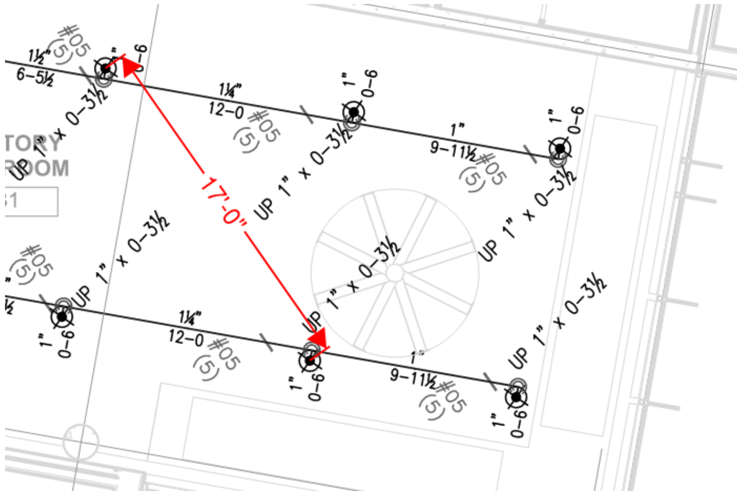


Figure 41 – Sprinkler plan for atrium design fire.

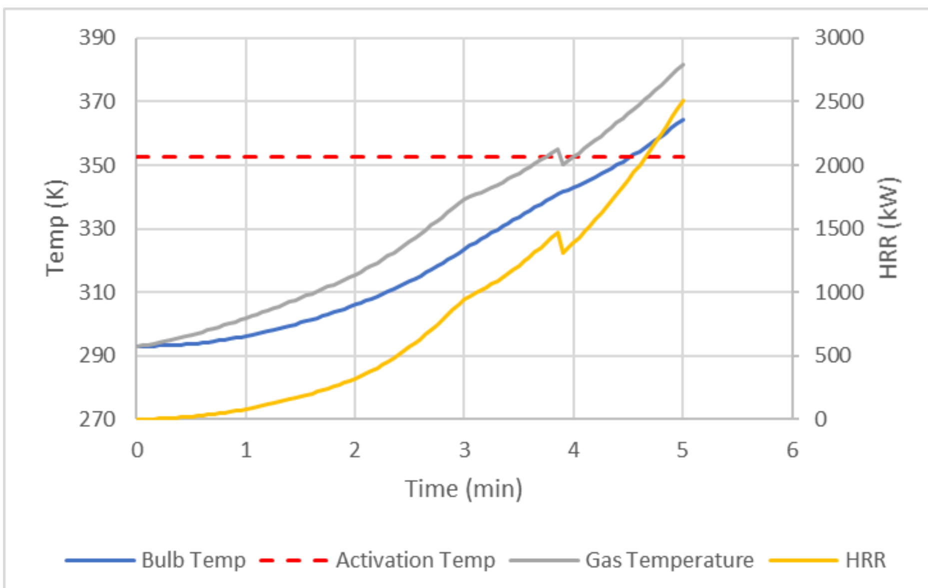


Figure 42 – Sprinkler activation plot for atrium design fire.

Figure 42 above shows that the sprinkler system activates at 4.6 mins, at the temperature of 175 ˚F or 353 K. This caps the combined HRR curve at 2000 kW for 58 min to burn out the compartment energy. The time that the system activates is just after the second chair ignites, preventing ignition of the fourth item. The sprinkler activation HRR curve can be seen in Figure 43 below.

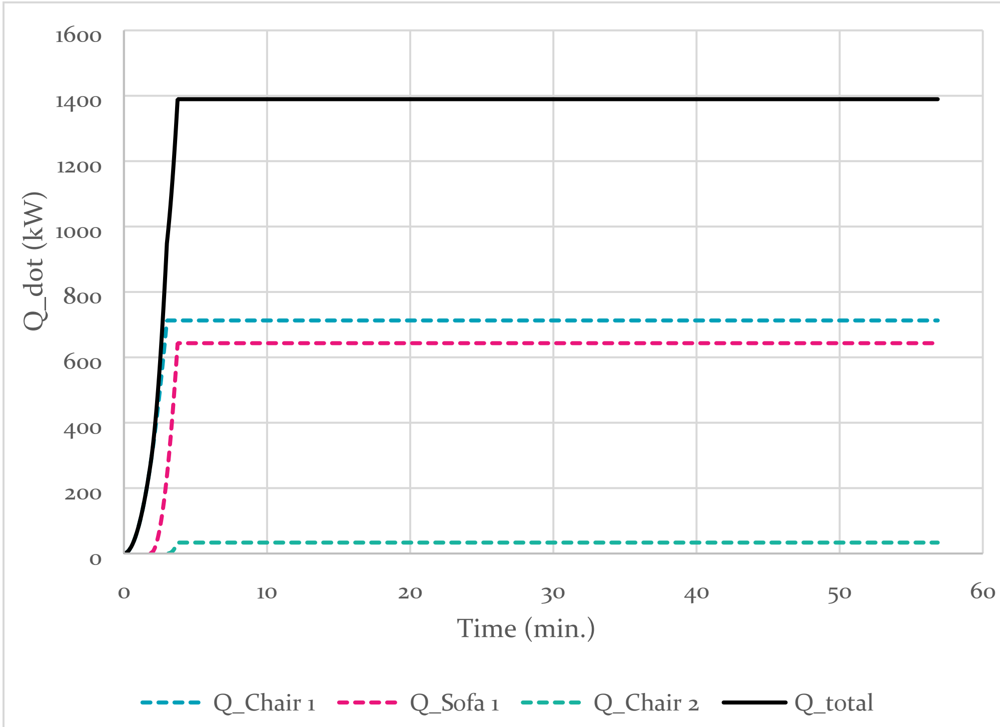


Figure 43 – Sprinkler HRR curve of atrium fire.

Based on the usage of the space, the following percentages were assumed, and a composition was composed to analyze the soot yields. Below in Table 16 is the individual yields and their respective percentages. Using the percentages, the composite soot yield rate curve was generated, as seen in Figure 44.

Table 16 – Soot Yield Percentages for Atrium Fire

*Values from SFPE Handbook	y_s	ΔH_c	Percentages
Polyurethane Foam	0.227	19	60%
Polyolefin	0.119	10.7	15%
Vinyl	0.172	16.4	15%
Wood (Red Oak)	0015	12.4	10%

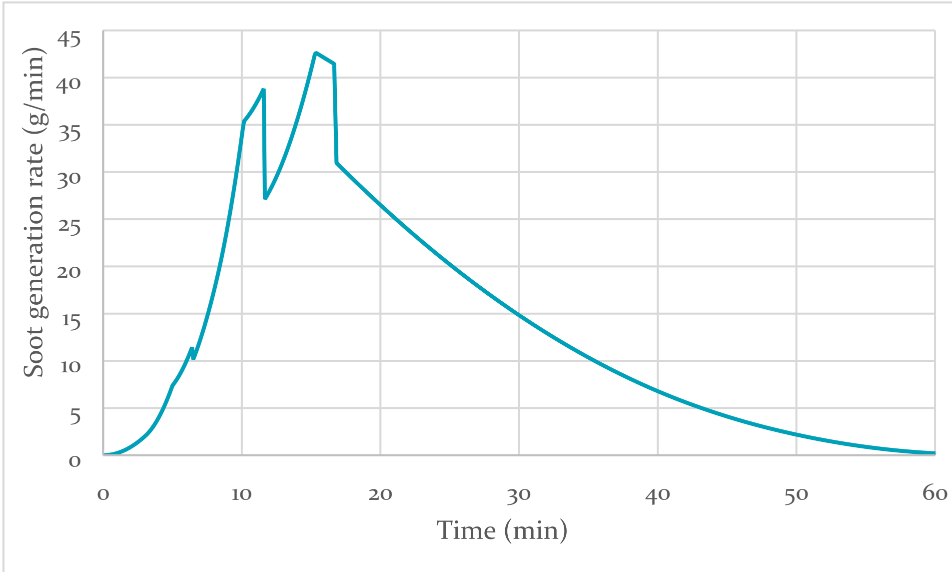


Figure 44 – Soot generation rate plot for atrium fire.

Design Fire – Core Stairwell

The final design fire was placed on the second floor stairwell landing in the middle of the building because of its proximity to the corridors that are the main path of egress for the occupants. The stairwell that is in the center of the building is not protected, and therefore is not counted for egress purposes, however, it does connect all four floors providing a pathway for smoke to potentially spread through the building. For that reason, this design fire was selected. See Figure 45 below to see the plan view location of design fire three. The plan south area of the compartment is open to the first floor below. The area of this compartment is 807 square feet, and due to the large nature of the compartment and the abundance of openings, it was assumed that this compartment will not reach flashover.

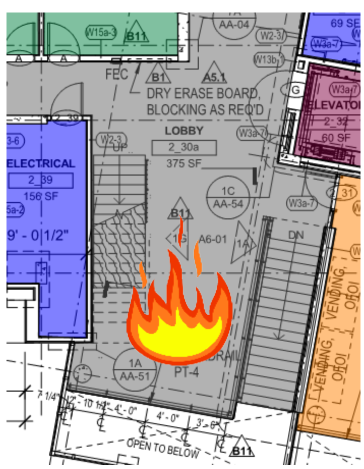


Figure 45 – Plan view of corridor design fire.

The space as designed did not have any furniture planned for this area. However, since this building is located on a college campus and students tend to be ignorant of what is and is not allowed in spaces in regard to furniture, Figure 46a is a photo taken of the actual space to demonstrate what type of fuel can be found in the space today, even though the corridor is supposed to remain free of fuel. The collection of furniture in the corridor is due to a lack of administrative controls. For the purposes of this design fire, a different fuel load was assumed to create a different type of design fire, based on the assumption that college students will place furniture where it does not belong. The fuel load selected for the space is beanbags because the space is fitting for this type of "hang out" furniture. See Figure 46b below.

Figure 46a (Left) - Photo taken of the actual space. Figure 46b (Right) - Assumed fuel load for the space.

The data used for burning bean bags comes from the Kim and Lilley paper referenced in the analysis section. Since the data came from the paper the analysis was based from, the alpha values for growth and decay were given, as well as the time points for the different phases and can be seen in Table 3 below. Also below is the comparison between the alpha-t-squared curve and the actual data in Figure 47.

Table 16 - Values used to create bean bag HRR curve

t_0 (s)	**t_{l0} (s)**	**t_d (s)**	**t_{end} (s)**	**α_g (kW/s^2)**	**α_d (kW/s^2)**
88	545	718	1228	0.002296	0.001843

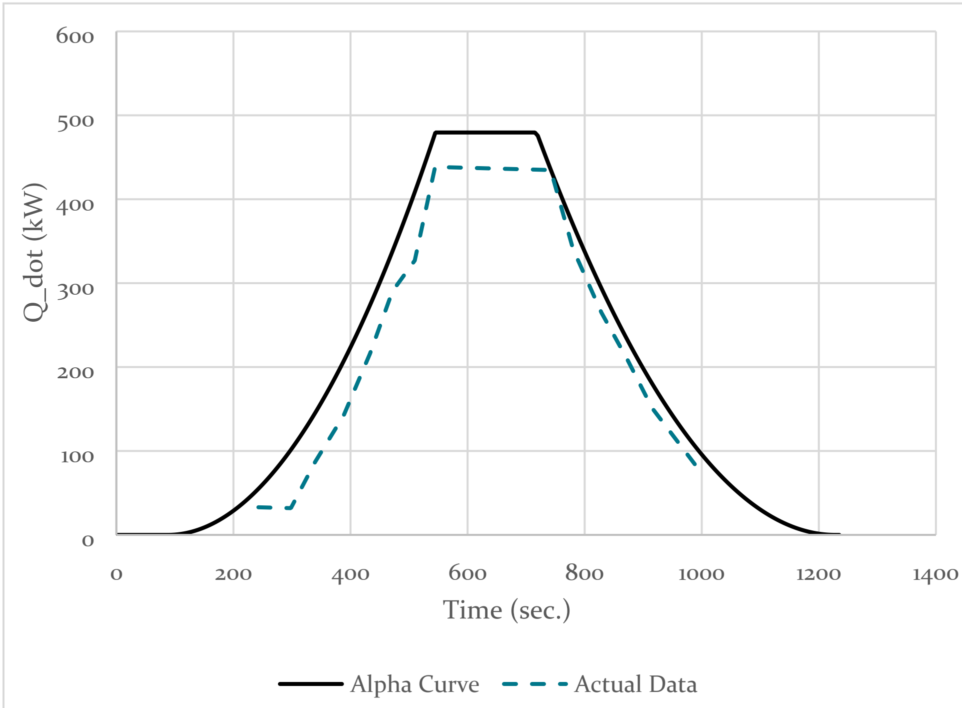


Figure 47 – Comparison of alpha-t-squared fire and actual data.

Looking at the data, the bean bag does not actually ignite until 88 seconds after they start recording time, this is adjusted once the curves are compiled together to see second item ignition times for the overall curve. For the overall curve it was assumed that there were five bean bags of all the same material in the space, placed 0.25m apart from each other. Theoretically, a student could leave a laptop charging on one of these beanbag chairs, then having a malfunction in the electronics caused from the laptop not being able to cool properly could cause an ignition. From there, the critical heat flux of the material of the beanbags, polyurethane, is 13 kW/m^2, so a second item ignition was reached after 125 seconds. Assuming that the beanbags then ignited at a staggered 125 seconds, Figure 48 shows the plotted combined HRR curve.

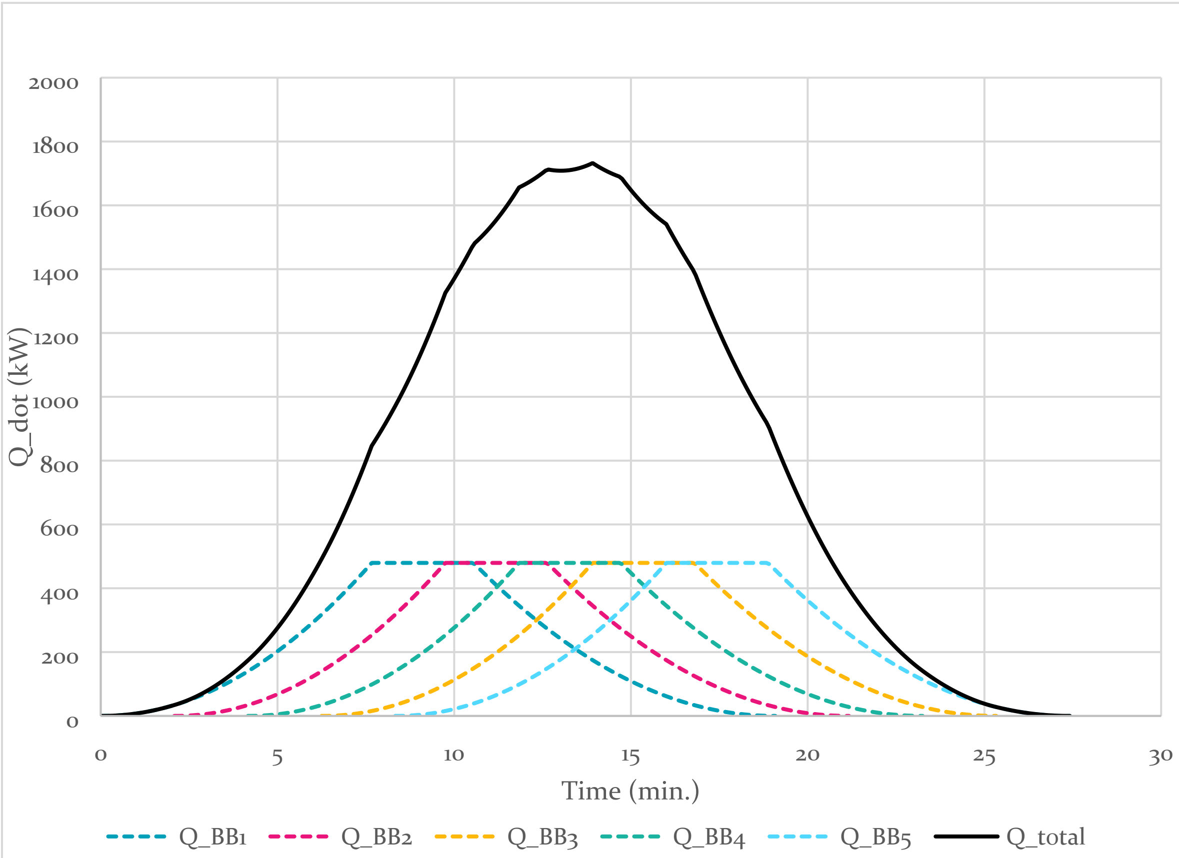


Figure 48 - Plot of combined HRR for corridor fire.

The peak HRR for this design fire was calculated to be 1726 kW and the burning duration for this fire is 27 min. The total energy released is 1187 MJ. When taking this overall HRR and analyzing the sprinkler system, the spacing used for analysis is 12 ft. It is worth to note that after the primary analysis for this report was complete, it was discovered from the California State Fire Marshall that one of the conditions for approval to allow the staircase in the middle of the building is to have 18” draft curtains and reduced sprinkler spacing around the stairwells which can be seen in Figure 49 below.

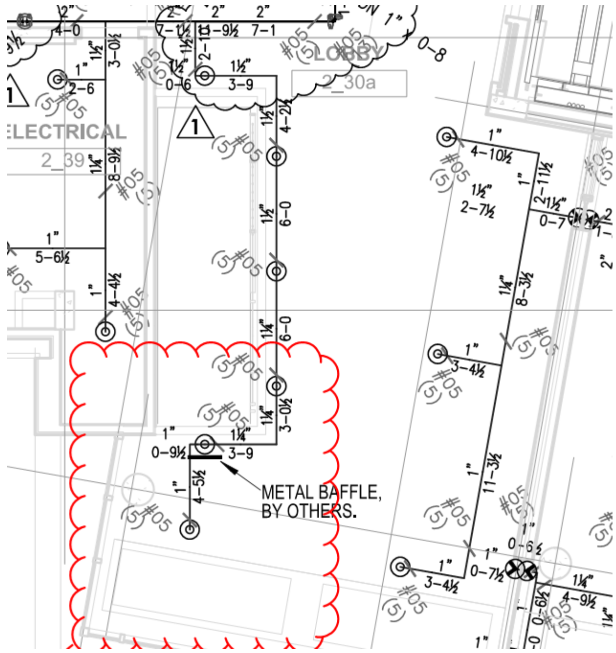


Figure 49 – Sprinkler plan for corridor design fire.

Further analysis is required to see how this design affects smoke movement and behavior in terms of the entire building, however for the sake of this design fire, a spacing of 12 ft. is still used to produce a more conservative analysis. Below in Figure 50 is the sprinkler activation plot.

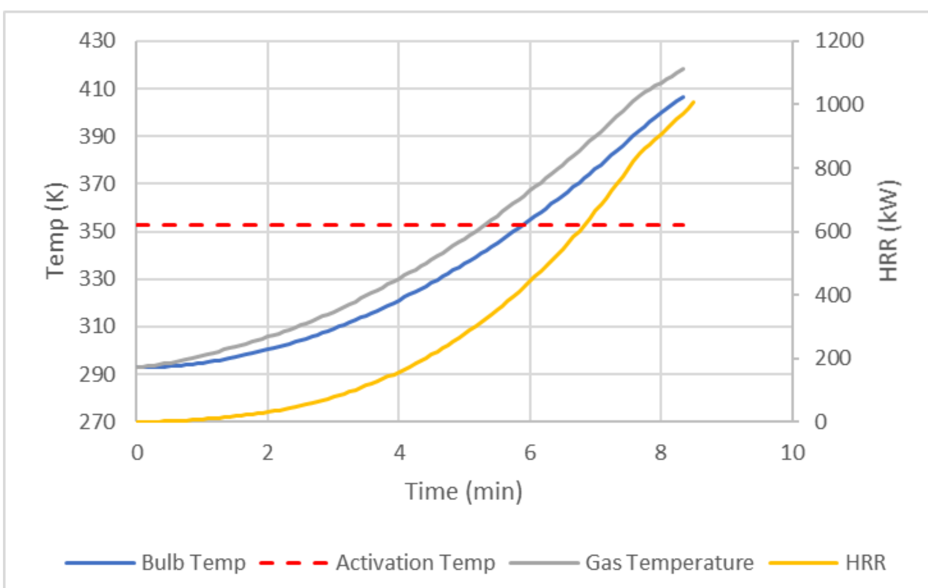


Figure 50 – Plot of gas temperature and bulb temperature to find activation time.

The time the sprinkler system activates, due to the slow growing nature of the beanbags, is at 5.91 min, at the temperature of 175 ˚F or 353 K. This allows for three beanbags to ignite, capping the HRR at 427 kW once the sprinkler activates. Assuming that the same amount of energy is released from the compartment, it would take 51 mins for this fire to burn out with sprinkler control. Figure 51 shows the HRR plot with sprinkler activation.

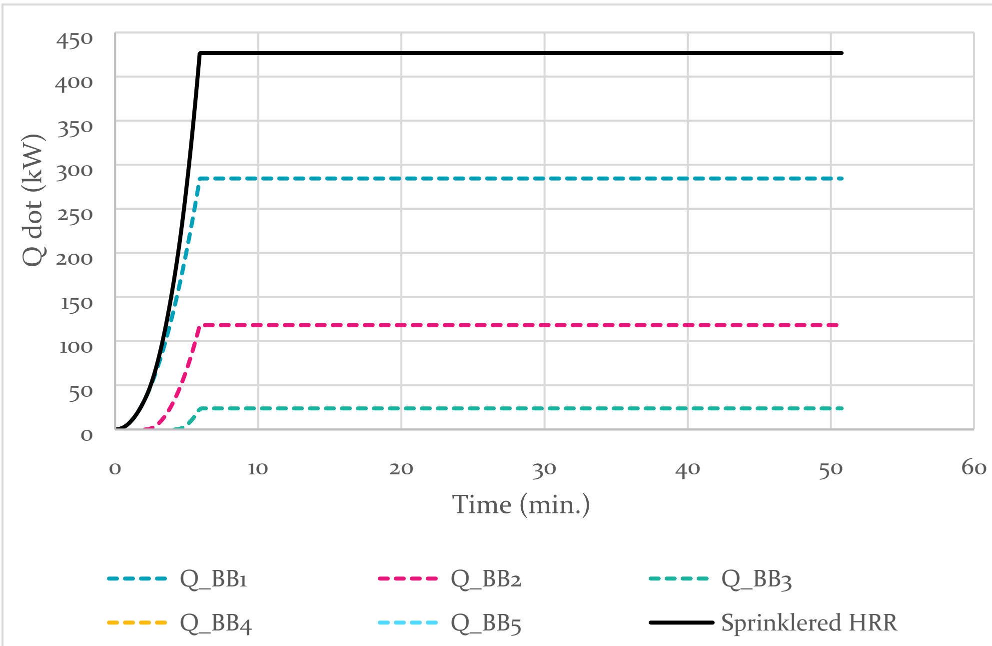


Figure 51 – Plot of HRR curve with sprinkler activation.

Since the only fuel used in the analysis is the bean bags, a breakdown of the composition of the chair was assumed into the beans filling the chair and material containing it. Below in Table 4 is the individual yields and their respective percentages. Using the percentages, the composite soot yield rate curve was generated, as seen in Figure 52.

Table 17 – Soot Yield Percentages for Corridor Fire

Values from SFPE Handbook - Table A.39	y_s	ΔH_c	Percentages
Expanded Polystyrene	0.164	19	100%

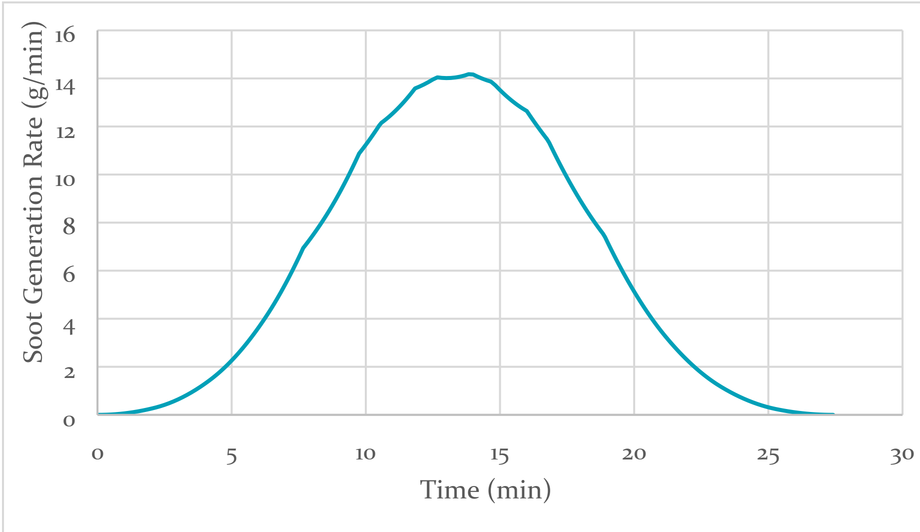


Figure 52 – Soot yield plot for corridor fire.

FIRE MODELING

For the fire modeling analysis, the design fire in the main core was selected to be modeled in PyroSim. In creating this model, assumptions were made that the space has the combustible fuel loading outlined in the design fire scenario and that the sprinkler system is impaired and will not activate. This compartment will allow for the worst case scenario for the analysis. In addition to save in computation power, only the top three floors were modeled in FDS, since the fire is anticipated to start on the second floor due to the high likelihood of the storage of combustibles. The model was ran for approximately 16 mins just after the fire reaches its peak HRR instead of the full 23mins as described above to save computational power.

Unenclosed Stair

The presence of the unenclosed stair connecting all four floors in the core of the building makes this feature a point of interest for a modeling purpose. In the IBC, the exceptions for unenclosed vertical openings apply to single residential units connecting four floors, or sprinklered mercantile occupancies with escalators. However, this building was built using the 2013 version of the CBC. Starting with Section 712.1.12, for Unenclosed Stairs and Ramps, it states that vertical floor openings created by unenclosed stairs or ramps must be in accordance with sections 1009.2 and 1009.3. Section 1009.2 states that the exit stairway must lead directly to the exterior of the building. Section 1009.3 states that the openings between floors shall be enclosed, but has some exceptions listed. The exception that is used for Building 172B is Exception H; which states in other than groups B, I-2, 2-2.1, I-3 and M occupancies, exit access stairways are not required to be enclosed provided the building is provided with an automatic sprinkler system, with closely spaces sprinklers around the opening and a draft curtain in accordance with

NFPA 13. There are also requirements to not exceed more than four stories and that the opening does not exceed twice the horizontal projected area of the exit stairway.

This exception allowing the unenclosed stairwell interconnecting the four floors of the building is permitted due to the building being equipped with a sprinkler system. However, in the event of a fire, this means that the design of the building is relying heavily the automatic suppression portion of the fire safety strategy to protect the occupants and the property. This model is intended to analyze the performance of Building 172B in the event that this key piece of the fire safety strategy fails.

Required Safe Egress Time

The required safe egress time (RSET) for the building is composed of three times, detection time, pre-movement time and evacuation movement time. The evacuation movement time was calculated to be 600 seconds. Detection time is taken to be at 60 seconds, which is an average time for smoke detector activation as well as a smoke detector with an RTI of 5 and an activation temperature of 85 ˚F, which is an increase of 15 degrees within a minute, seen in Figure 53.

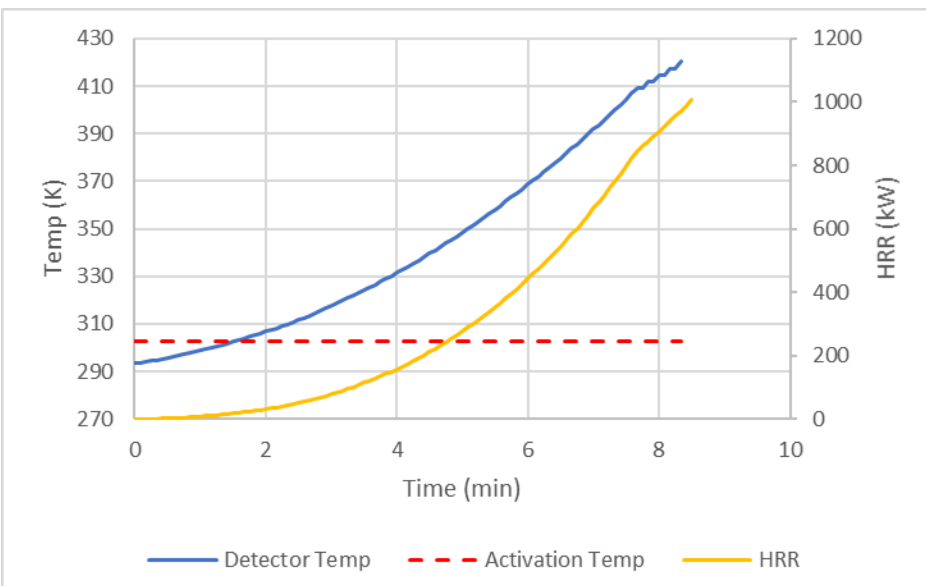


Figure 53 – Smoke detector activation plot

The pre-movement time is determined by using the following equation from the paper by Yan, Han, and Li: *Accurate assessment of RSET for Building Fire Based on Engineering Calculation and Numerical Simulation* [12]:

$$T_{pre} = 120 + A_0^{\frac{1}{2}} + 0.4H$$

Where A_0 is the area of the building, 49,164 ft^2 and H is the height of the building, 45 ft. Pre-movement time is calculated to be 248 seconds. The total RSET is 908 seconds or 15.1 mins.

Modeling Inputs

As stated before, since the design fire is located on the second floor of the building in the core, only floors 2, 3 and 4 are modeled. Five burners to represent the bean bags are located on the second floor. The burners were set to be an alpha t^2 fire, having a max Heat Release Rate Per Area (HRRPUA) of 435 kW/m^2 and a ramp up time of 300 s to match the actual data from Kim and Lilley's burn data for a bean bag char as discussed in the design fire section.

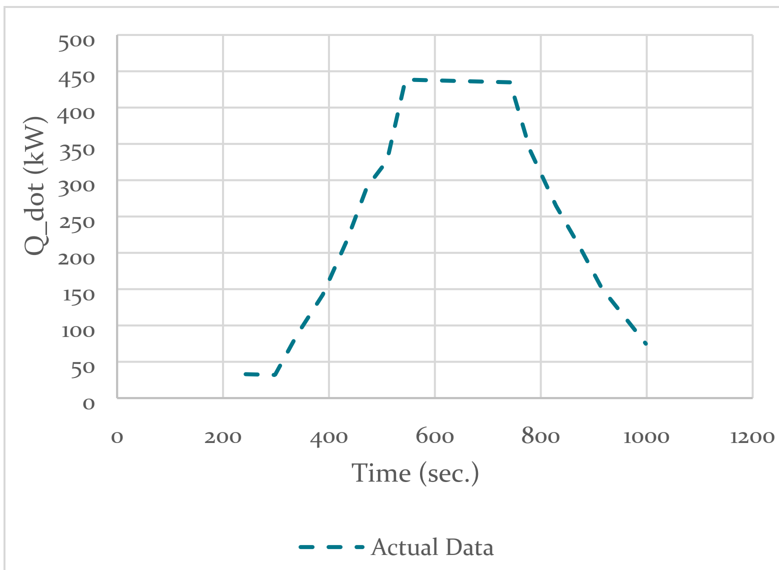


Figure 54 - Chair Data from Kim and Lilley

Beanbags are made from Expanded Polystyrene beads. The reaction for the model was set for a Polystyrene fuel with a simple chemistry composition for C_8H_8. The carbon monoxide yield (Y_{CO}) was set for 0.06, the soot yield (Y_S) was set for 0.164, and the hydrogen fraction set for 0.014. These values came from Table A.39 of the Appendix of the SFPE Handbook for expanded polystyrene.

To replicate the overall HRR calculated for the entire fire, the burner ignition times were staggered to start at the same time steps that were calculated in the design fire scenario. The time steps were calculated based on the ignition temperature and spacing between the bean bag chairs. In the design fire, based on the staggered ignitions and the total burning time for five chairs, the fire was designed to last a total of 1645 seconds or 27.4 min. However, due to limitations in processing power, the model was processed for 1000 seconds or 16.6 min, just after the model reaches peak HRR and before decay

begins. Below, in Figures 55 and 56 are screenshots of the model. Note: some walls are hidden for clarity.

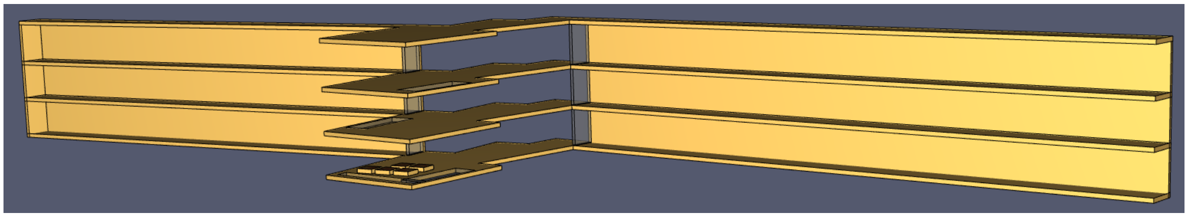


Figure 55 - Screenshot of PyroSim Model

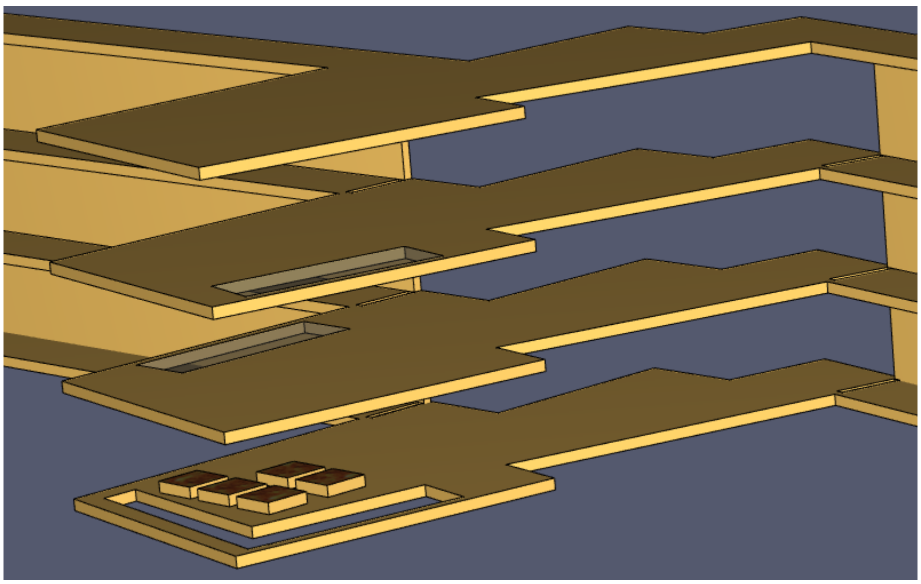


Figure 56 - Close Up of Building Model Core

Slice files measuring temperature were placed at the mid-level and ceiling level throughout the levels of the building, as seen in Figure 57. Slice files measuring visibility are places at eye level throughout the compartment, seen in Figure 58. These slice files are used to measure the tenability criteria such as when visibility drops below 4m, the CO concentration goes above 1100 ppm, and when temperatures rise above 65˚C.

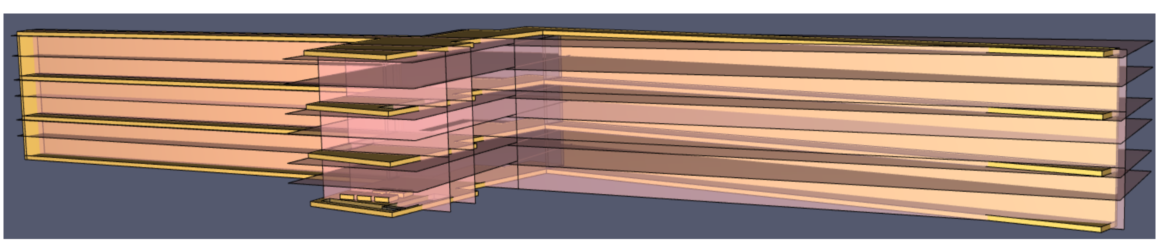


Figure 57 - Temperature Slice Files

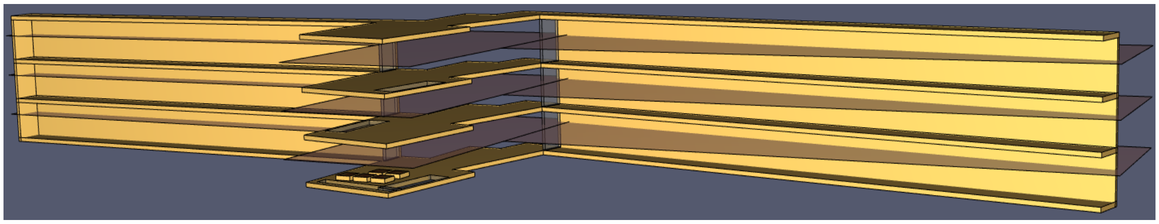


Figure 58 - Visibility and CO Slice Files

Modeling Results

After running the model for 1000 seconds, smoke completely fills the fire compartment. As the fire grew in size, the smoke from the fire first filled the core then extended towards the hallways. First, Figures 59 through 68 will show time step progressions of the smoke travel throughout the building. Then Figures 69 through 72 will show the time step progressions with the compartment temperature slice files, and Figures 73 through 14 are the time steps for the ceiling temperatures. Figures 77 through 79 will show the progression of the CO concentration within the building during the design fire. And finally Figures 80 through 85 will show the time step progressions with the visibility slice files.

Smoke Travel

The following figures show the time steps at minute intervals to show the smoke progression throughout the building until 600 seconds once the entire building is engulfed in smoke. Notable figures are discussed in this paragraph. The first time step is showing the model at 60 seconds after ignition to show the first burner during the growth phase. The second time step is at 120 seconds is once the second burner ignites and a significant smoke layer has built up in the second floor and third floor core area. At this time smoke also begins to travel down the west hallway on the second floor and the east hallway on the third floor. The third time step is at 180 seconds, the third burner not ignited, however the smoke layer on the second and third floors of the building have descended to the floor and smoke is accumulating on the third floor. The next time step at 240 seconds, the third burner has ignited, and the entire core is filled with smoke. The fourth burner ignites at 375 seconds, and the fifth burner ignites at 500 seconds. Figure 64 at 360 seconds is when the west side of the building is filled with smoke.

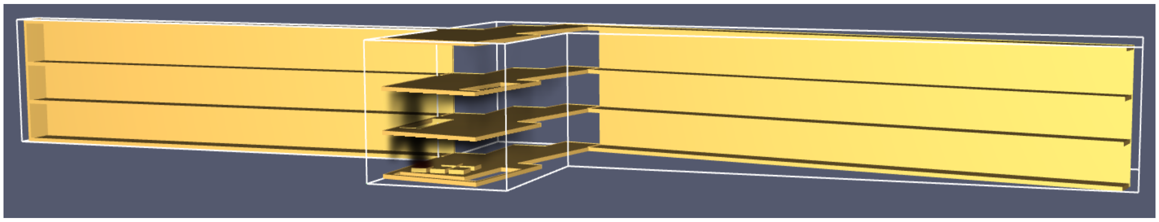


Figure 59 - Smoke Travel at 60 sec.

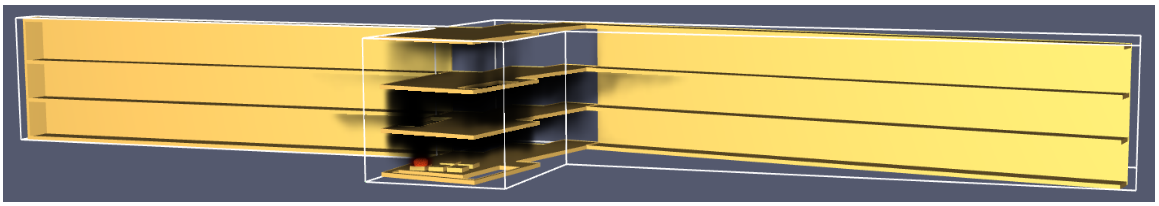


Figure 60 - Smoke Travel at 120 sec.

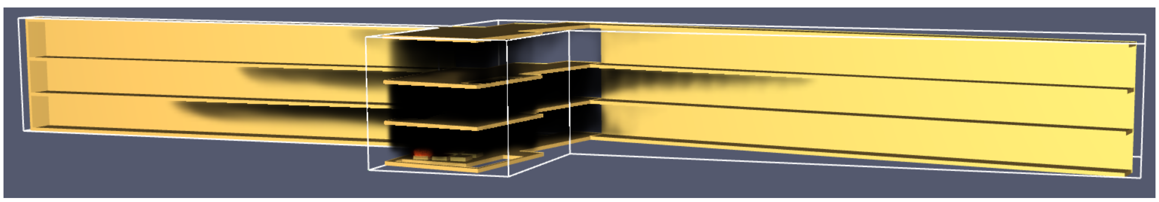


Figure 61 - Smoke Travel at 180 sec.

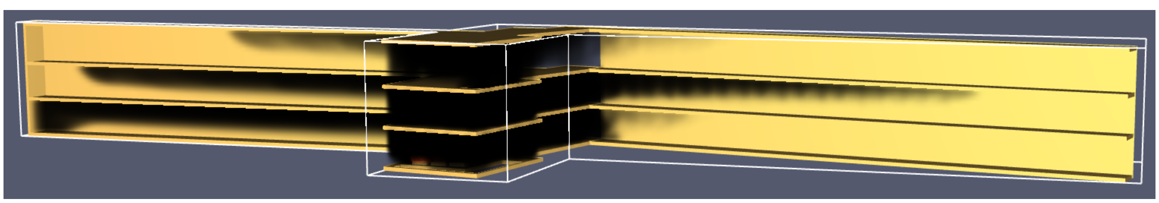


Figure 62 - Smoke Travel at 240 sec.

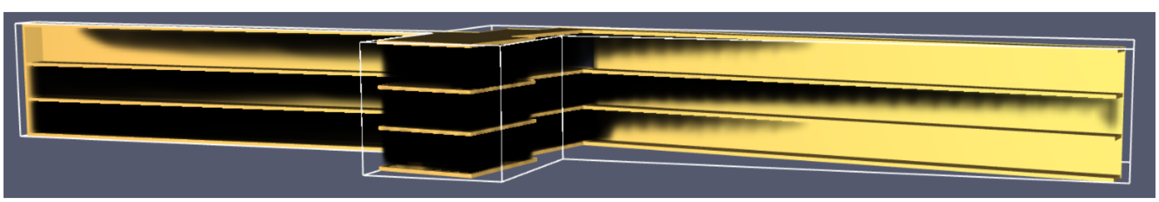


Figure 63 - Smoke Travel at 300 sec.

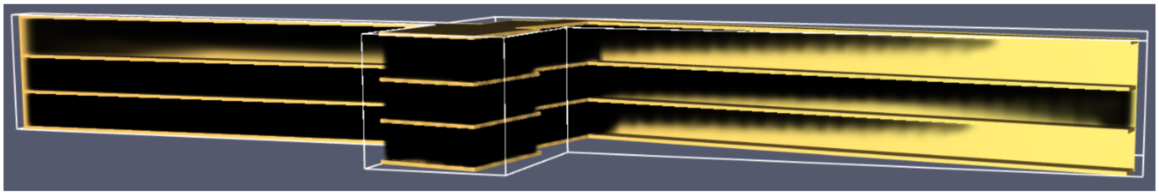


Figure 64 - Smoke Travel at 360 Sec.

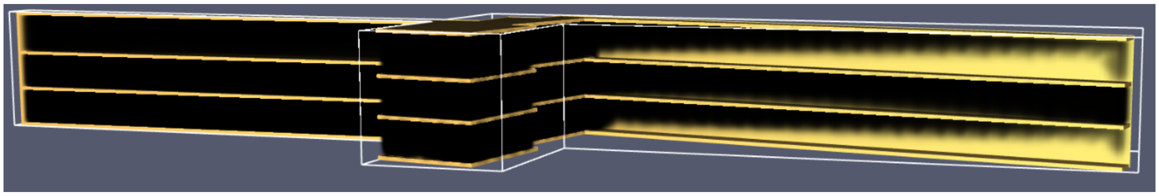


Figure 65 - Smoke Travel at 420 sec.

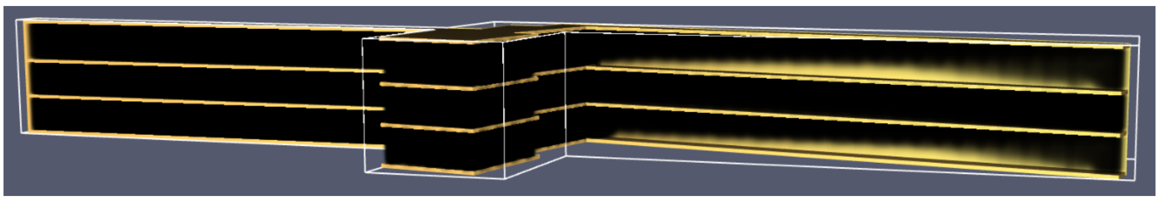


Figure 66 - Smoke Travel at 480 sec.

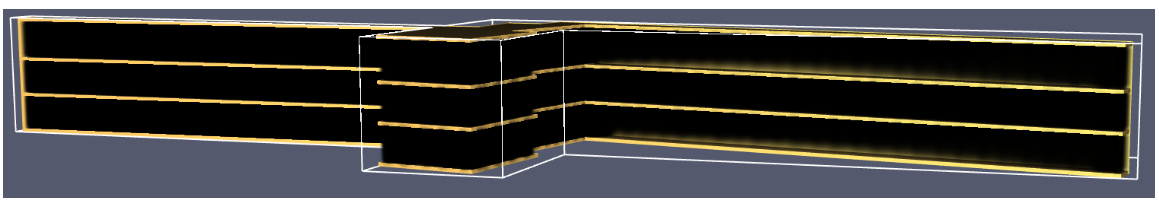


Figure 67 - Smoke Travel at 540 sec.

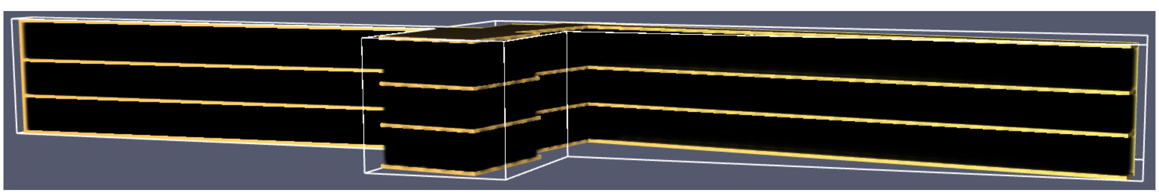


Figure 68 - Smoke Travel at 600 sec.

Compartment Temperatures

For the compartment temperatures, slice files were placed throughout the building at mid compartment level and the ceiling level. The purpose for the mid-level slice files is to measure temperatures for untenable conditions being above 65˚C at the mid-level. The purpose for the ceiling level slice files is to measure temperatures for possible building

damage. Since this building is made of reinforced concrete, it can be subjected to thermal degradation beginning at about 300˚C.

First looking at the mid-level slice files for untenable conditions, the compartment begins to significantly increase in temperature on the fire floor at approximately 250 s, as seen in Figure 69. The core on the fire floor ant the floor above reaches untenable conditions around 360 seconds as seen in Figure 70. At that time, the temperature begins to increase in the west hallway in the fire floor as well. The west hallway on the fire floor reaches untenable temperature conditions at 600 seconds, as seen in Figure 71. This figure also shows that the west hallway on the floor above the fire and the top core floor begin to increase. At 800 seconds, the top floor of the core reaches untenable temperature conditions as well at the west hallway on the floor above the fire floor, seen in Figure 72.

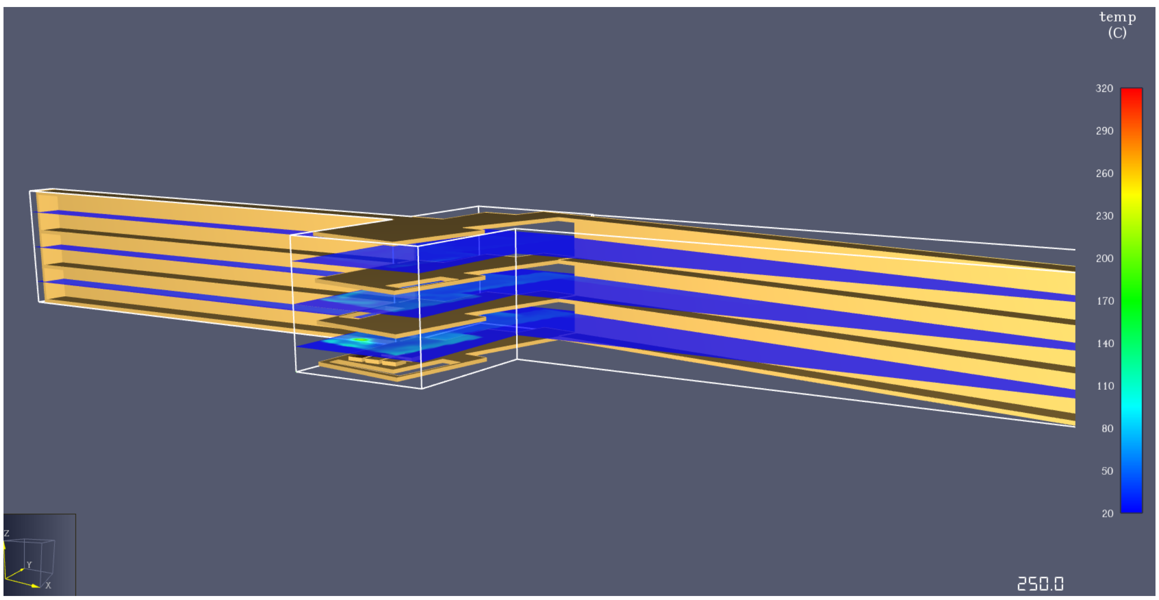


Figure 69 - Compartment Temperature at 250 sec.

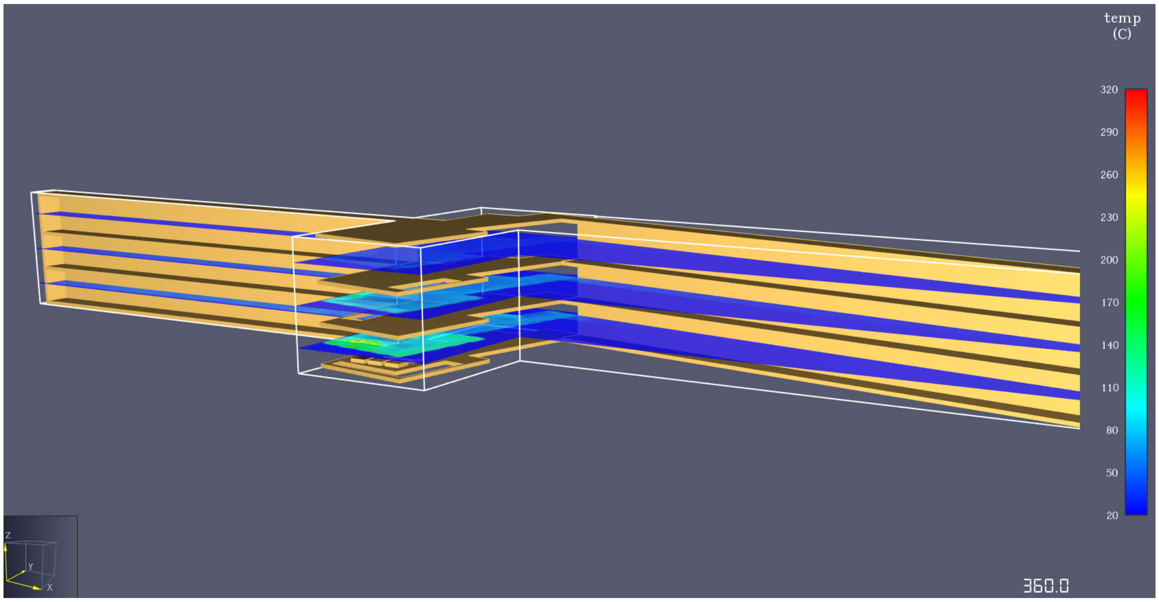


Figure 70 - Compartment Temperature at 360 sec.

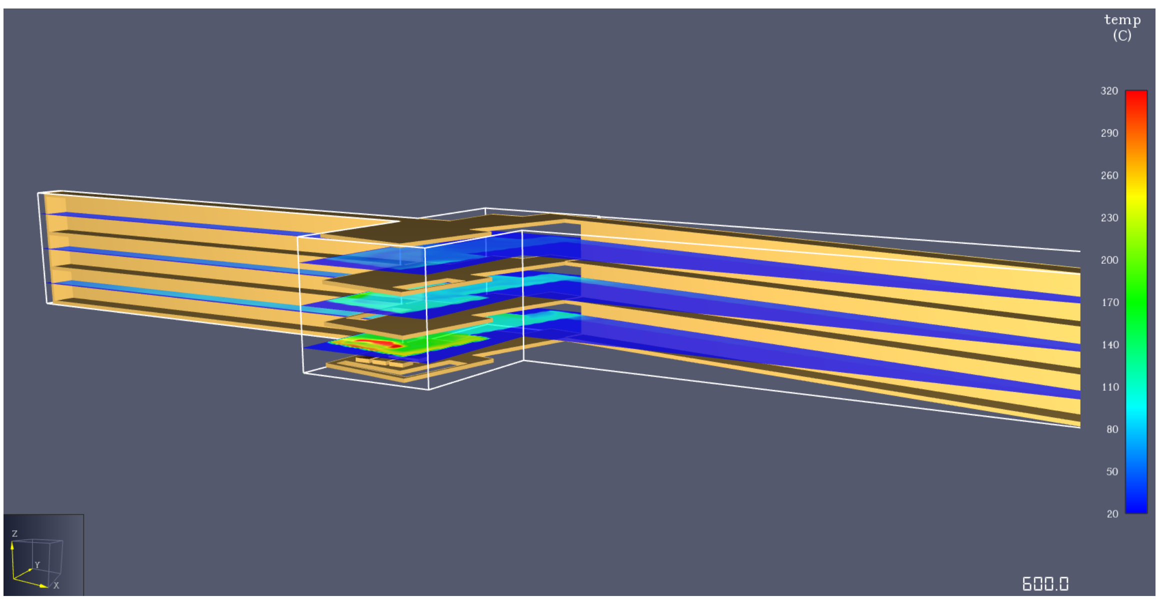


Figure 71 -Compartment Temperature at 600 sec.

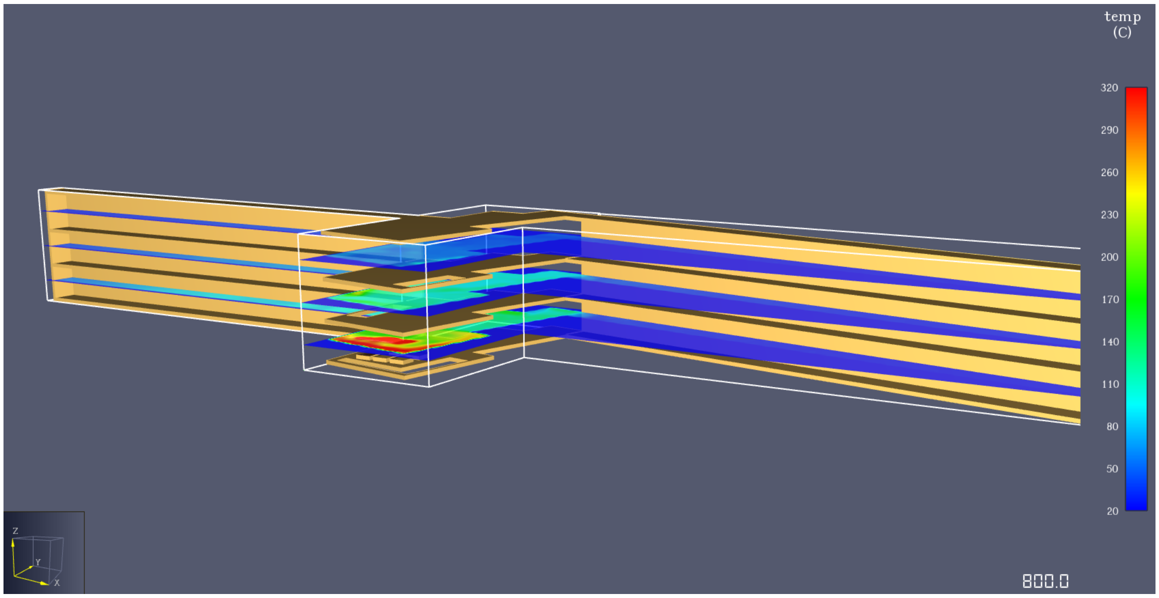


Figure 72 - Compartment Temperature at 800 sec.

For ceiling level temperatures within the model, major temperatures begin to register at 300 seconds on the fire floor directly above the fire, as seen in Figure 73. However, ceiling temperatures do not begin to reach 300˚C until 420 seconds, seen in Figure 74. At 575 seconds, or Figure 75, the ceiling above the fire begins to reach peak temperatures of 420˚C, which expands throughout the compartment till the end at 1000 seconds in Figure 76. Other areas of the model see increases in temperature, but do not reach over 300˚C.

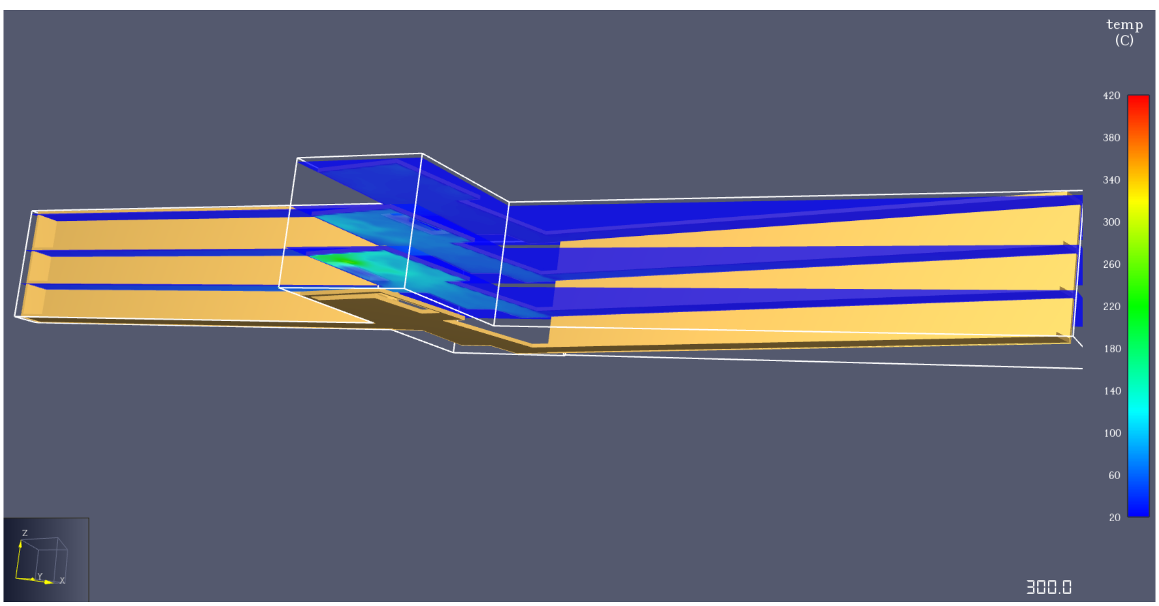


Figure 73 - Ceiling Temperatures at 300 sec.

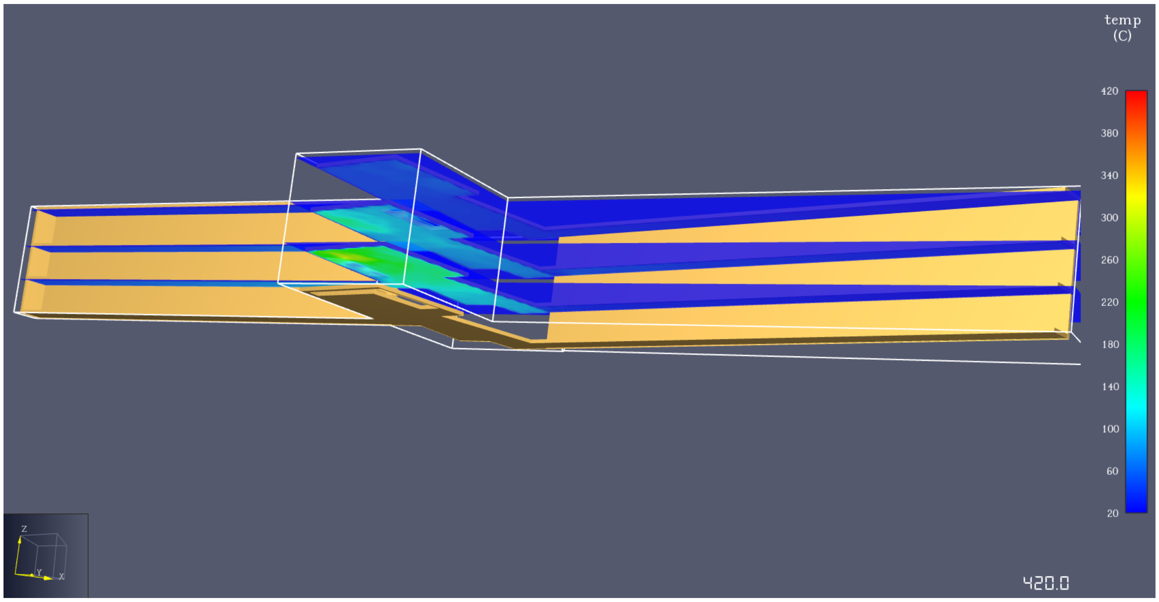


Figure 74 - Ceiling Temperatures at 420 sec.

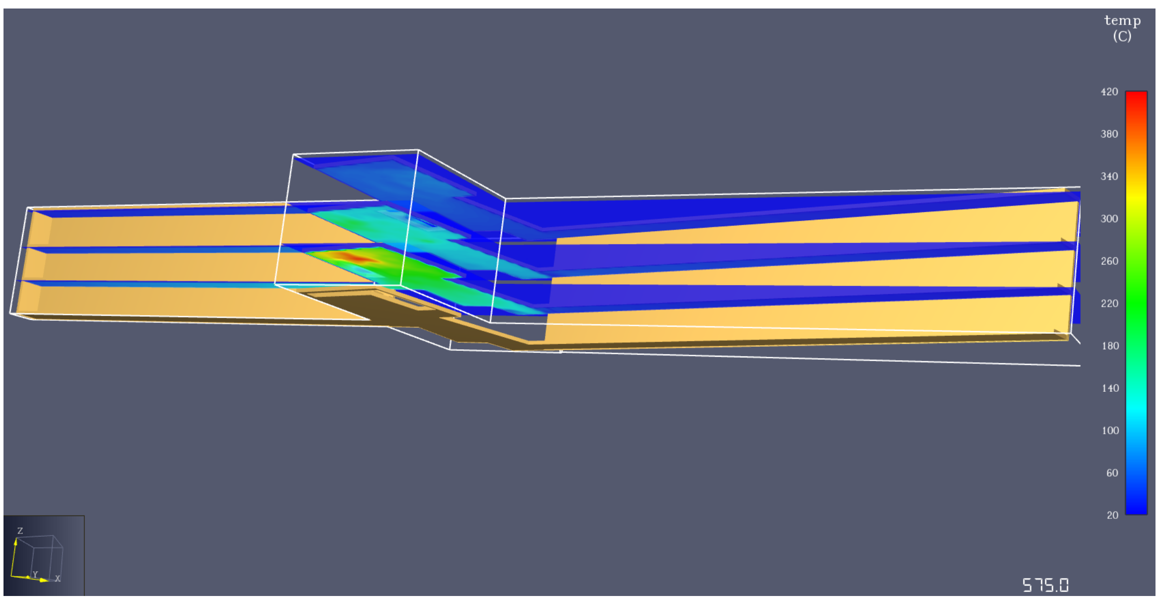


Figure 75 - Ceiling Temperature at 575 sec.

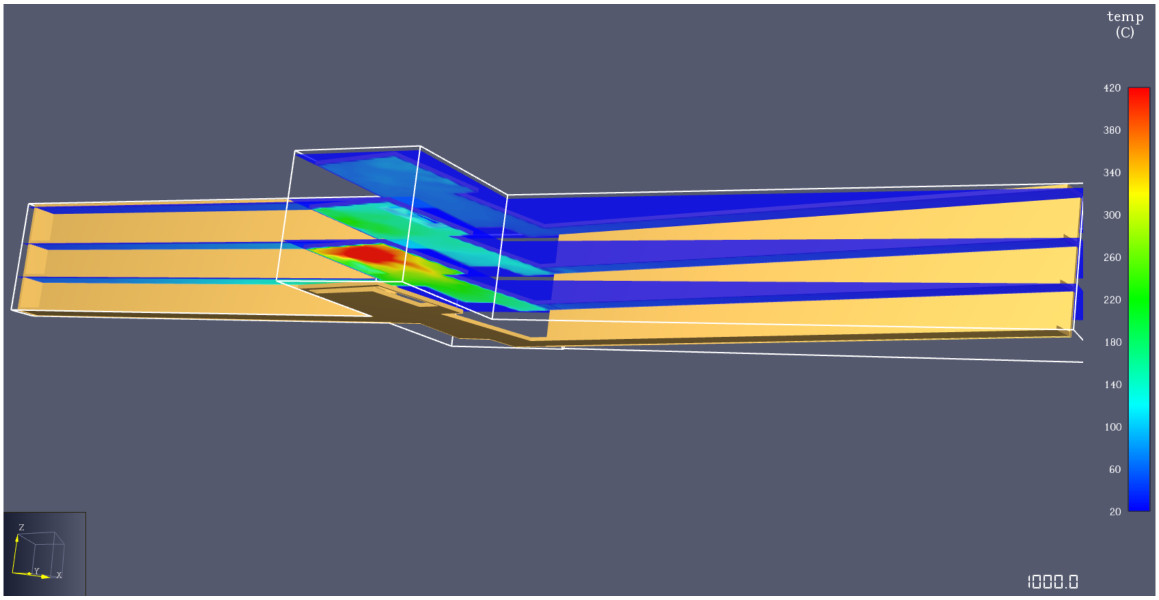


Figure 76 - Ceiling Temperature at 1000 sec.

CO Concentration

For the concentration of carbon dioxide within the compartment, the first compartment to lose tenability is the first floor core at 400 seconds, seen in Figure 77. The next compartment is the second floor core and hallway, which goes above the tenability limit at 500 seconds, Figure 78. The entire building crosses the tenability threshold at 700 seconds, Figure 79.

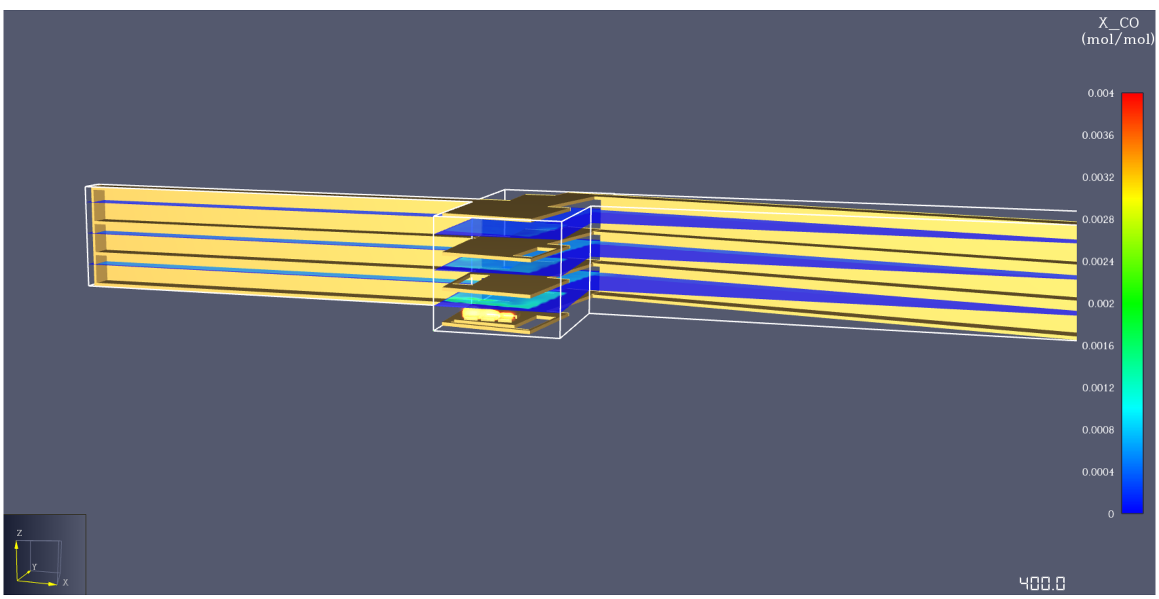


Figure 77 - CO concentration at 400 sec.

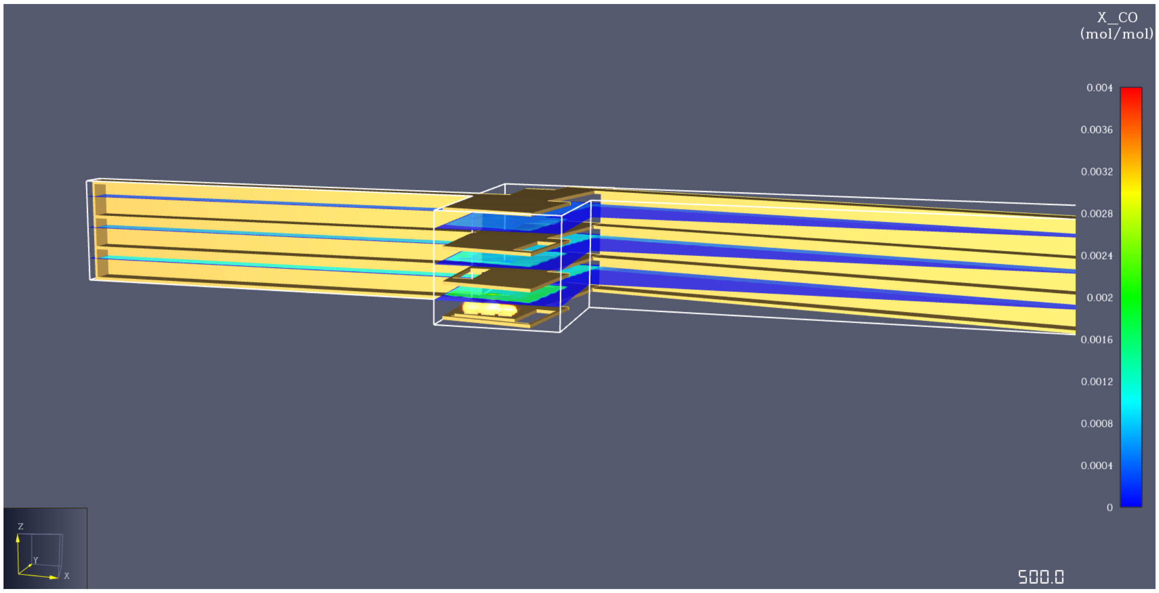


Figure 78 - CO concentration at 500 sec.

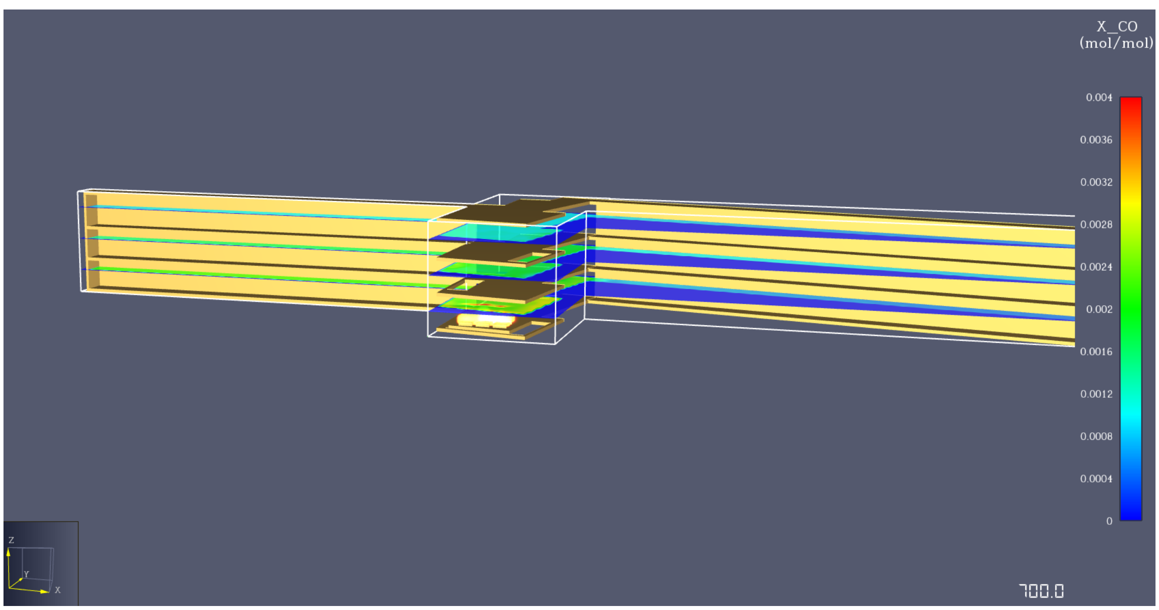


Figure 79 - CO concentration at 700 sec.

Visibility

Looking at the slice files for visibility, starting with 90 seconds, seen in Figure 80, visibility begins to decrease in the core of the fire floor and the floor above, but does not cross that overall threshold of 3 meters for failing tenability criteria. At 120 seconds, we lose visibility in the majority of the core where the unenclosed stairwell is, and visibility begin to decrease at smoke travels down the hallway and to the top floor core. Once 180 seconds is reached in Figure 81, the fire floor and floor above core has completely lost visibility, with visibility on the west hallways and on the top floor core rapidly decreasing. At 240 seconds, the top floor core visibility is lost, as well as the fire floor and floor above west hallways, seen in Figure 83. At 360 seconds (Figure 84) the entire west side of the building has lost visibility, and the building loses all visibility at 450 seconds (Figure 85).

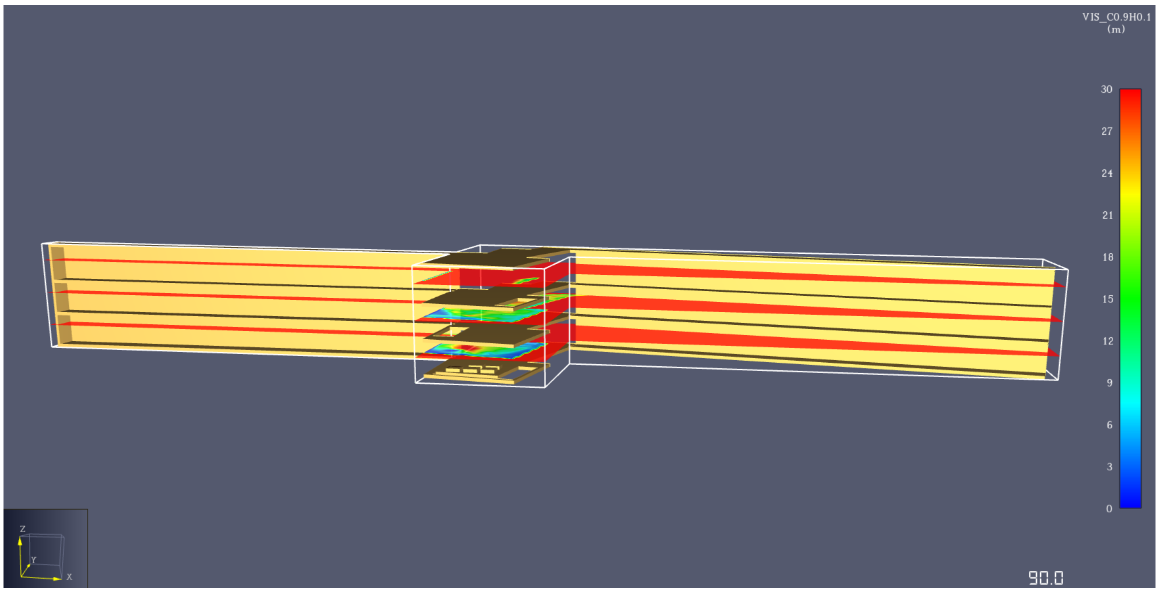


Figure 80 - Visibility at 90 sec.

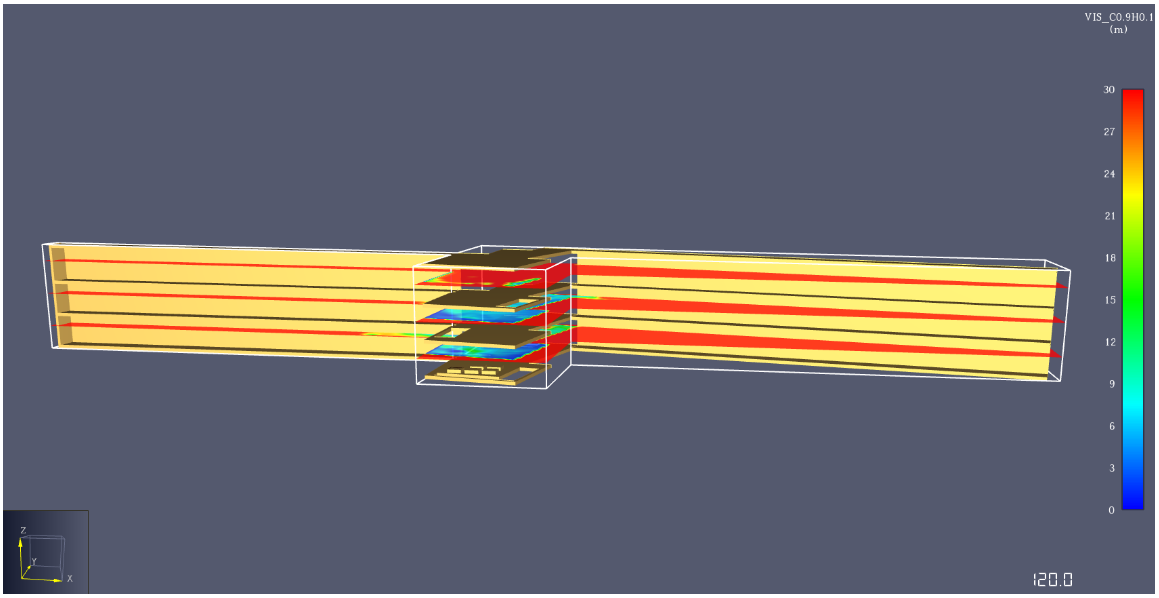


Figure 81 - Visibility at 120 sec.

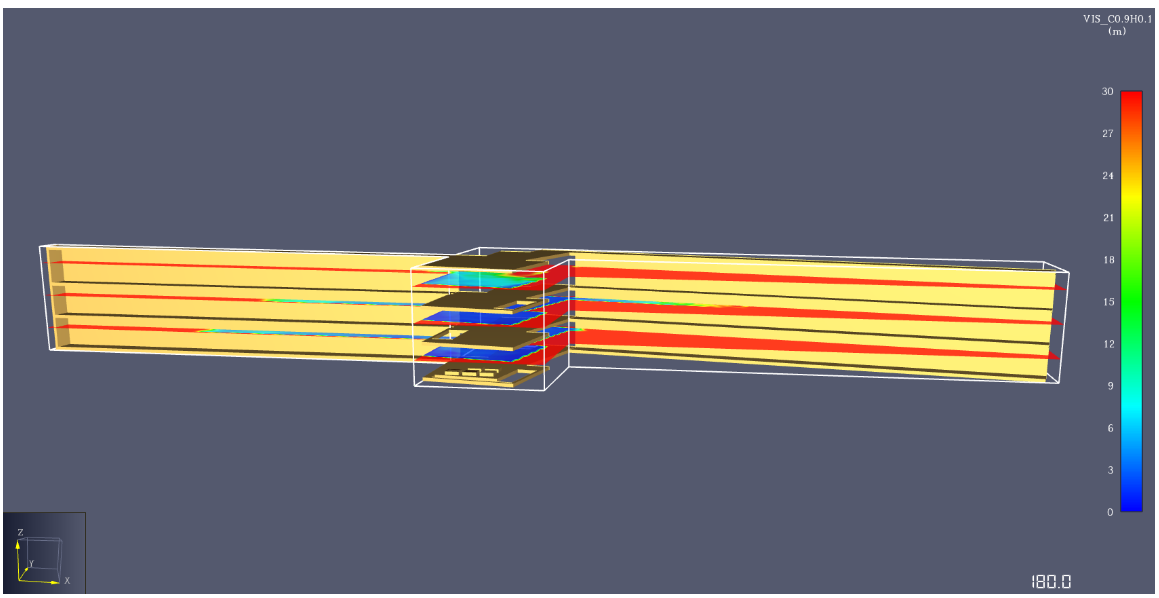


Figure 82 - Visibility at 180 sec.

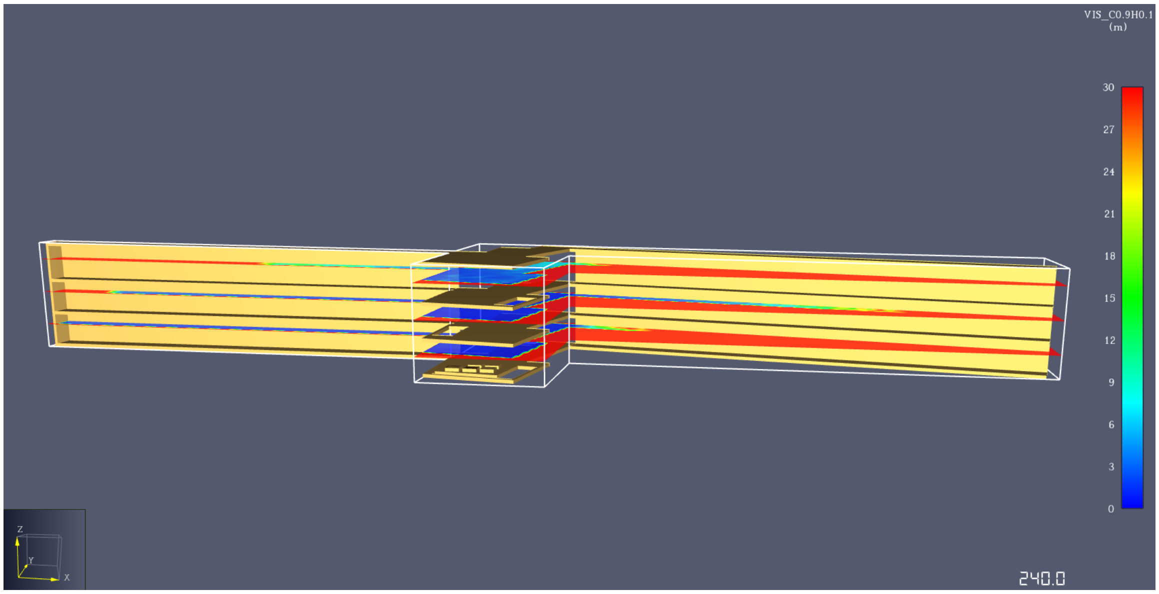


Figure 83 - Visibility at 240 sec.

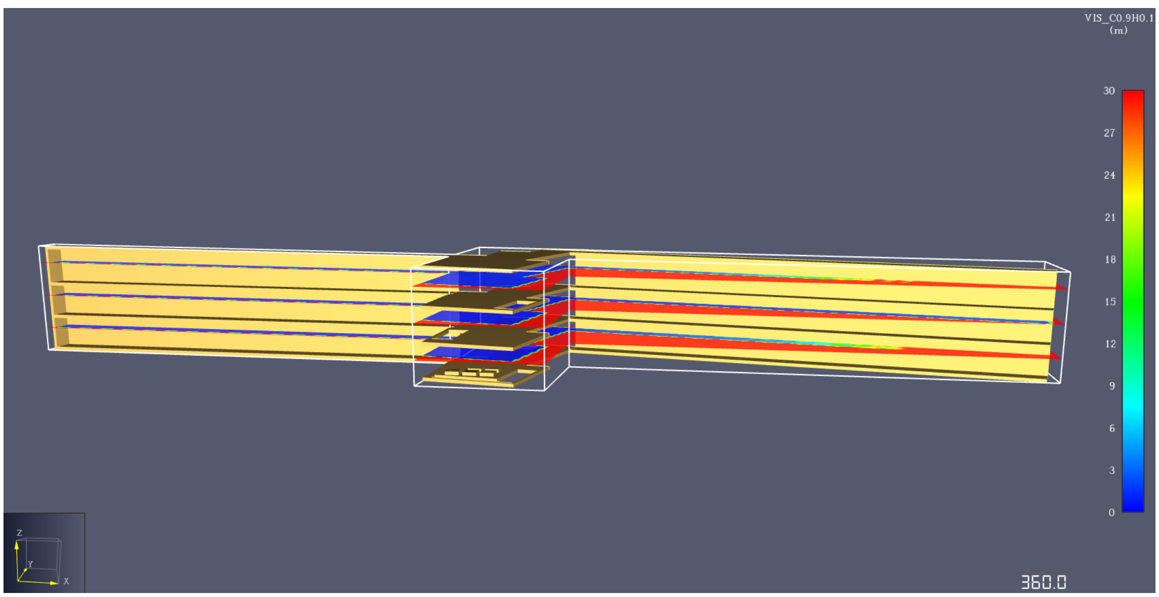


Figure 84 - Visibility at 360 sec.

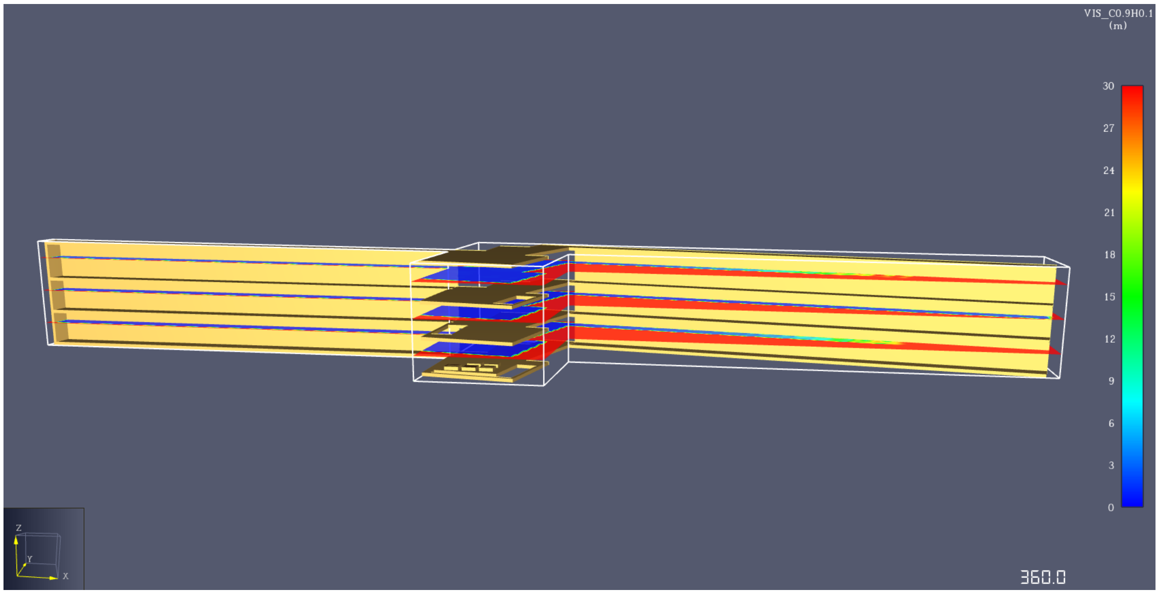


Figure 85 - Visibility at 450 sec.

Design vs Modeling

Comparing the modeling results with the design fire in terms of the HRR outputs we get the results as seen in Figures 86 and 87 below. The design fire calculations predicted a peak combined HRR of 1700 kW, just after 12 mins and held for approximately three mins before decay set in, seen in Figure 86. Looking at the HRR graph produced from the fire model in Figure 87, the combined HRR from all five burners activating reaches a peak HRR of 2100 kW and is held for four mins until the end of the model when decay would have set in.

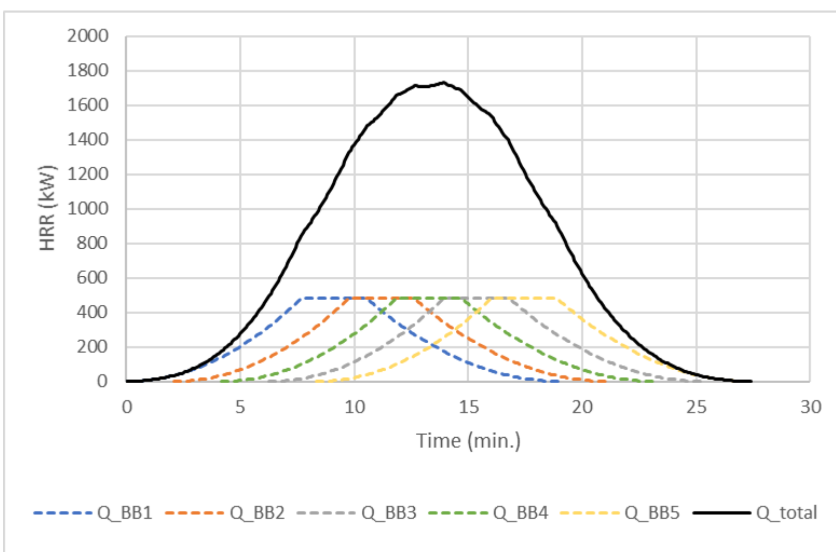


Figure 86 - Combined HRR Curve from Design Fire

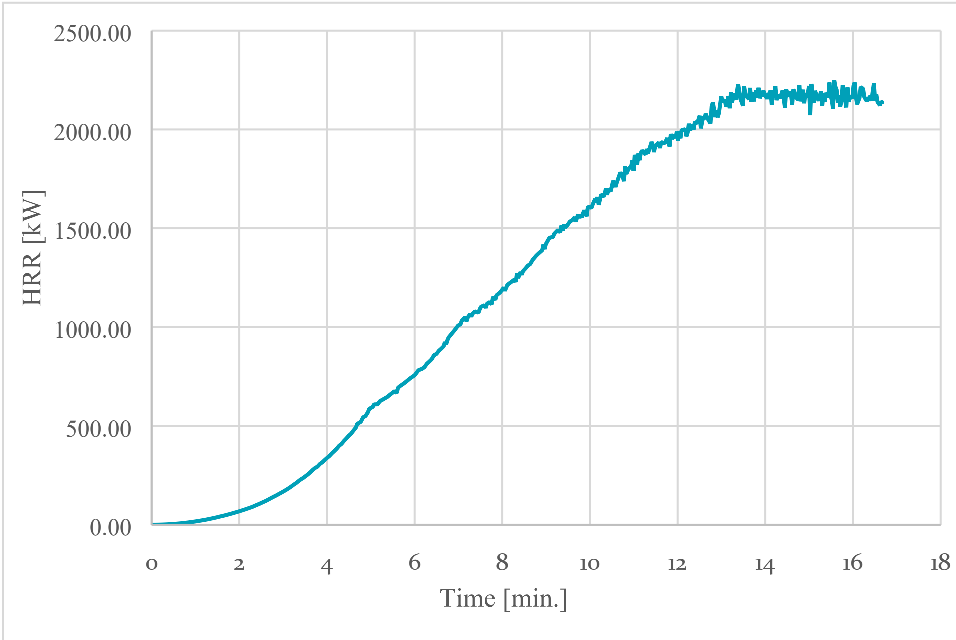


Figure 87 - HRR Curve from Fire Model

Recommendations

There are multiple ways to mitigate hazards in order to prevent the scenario that is modeled in this report. The first would be administrative controls of the building. What this means is that the building was designed to be a sterile place in the corridors and on the stairwell landings. Ideally, there would be no furniture in the area where the fuel load was. However, as proven earlier in the report, fuel can make its way into these areas. Improving upon administrative controls to prevent that, with training for the Resident Advisors and building inspections can help ensure that fuel that is not supposed to be there will not be there. Another mitigation step to take would be to increase testing of the sprinkler system and to implement an impairment management system. The number one reason for sprinkler failures is that something was closed when it should have been open. There are already locks on the valves to help prevent easy tampering with the valves, but an impairment management system would help prevent improperly closed valves after repairs and routine maintenance, ensuring that the sprinkler system works when the building needs it most. The final action that could be taken is to install an automatic enclosure system. What is meant by that is some sort of automatic smoke curtain, or the like, that could encapsulate the core and/or the stairwell. That way in the event of a fire these devices would activate and prevent smoke from travelling throughout the entire building, allowing more time for occupants to egress.

SUMMARY

From the performance based analysis, it can be concluded that even though the building was constructed to code, if there is a breakdown in administrative controls and an issue with the sprinkler system it can compromise the fire safety strategy. The exception that allows for the unenclosed stair, compromises the compartmentation of the building, and relies on the sprinkler system to control a fire. The RSET for the building is 908 seconds or 15.1 mins and the ASET, based on visibility is at maximum 450 seconds. Since the ASET is less than the RSET, for this design scenario, it fails the life safety criteria. With this, even though the building meets code criteria, it fails when it comes to administrative controls and the intent of the code is compromised with a malfunctioning sprinkler system.

CONCLUSIONS

This reports purpose is to perform a prescriptive analysis and performance based analysis of the fire and life safety systems of building 172B on Cal Poly's campus. This section will summarize the findings of each analysis as well as recommendations to mitigate any shortcomings that were found in this academic analysis.

Prescriptive Analysis

The prescriptive position of this analysis for Building 172B was completed using the 2016 version of the IBC and various recent editions of NFPA codes. The building was constructed under the 2013 version of the CBC. Where the IBC called out requirements for the building to meet in terms of construction requirements, space separation, interior finishes, and fire resistive ratings for the R-2 occupancy; Building 172B meets that requirement or provides above and beyond. The building is equipped with an automatic sprinkler system and is built by the requirements listed in NFPA 13R. The alarm and detection features of this building are also built to code requirements listed in NFPA 72, providing an EVACS system to aid in the safe evacuation of the occupants. Egress requirements in terms of space between exits and the amount of exits for occupants is plenty, given that the occupancy for the current state of the building is much lower than it could be. The one point of the building that could be seen not to code, is the unenclosed stair in the core of the building connecting all four floors. When looking in depth, this is an exception for a sprinklered building allowed by the 2013 CBC for up to four floors, which Building 172B qualifies for. In terms of looking at Building 172B through a purely prescriptive based analysis approach, the building meets all code requirements.

Performance Based Analysis

Even though Building 172B meets all prescriptive code requirements, its important to perform a performance based design to ensure that the building still performs to the intent of the code. The performance based analysis focused on the

unenclosed stair since it heavily relies on the use of sprinklers for the fire safety strategy. Since such a heavy emphasis is reliant on the sprinkler system working, this model's purpose is to investigate the scenario if the sprinklers were impaired during a fire. In hand calculations performed in the egress analysis, it was determined that the RSET for Building 172B is 908 seconds or 15.1 mins. The ASET determined by the visibility tenability criteria in the fire model determined that occupants on the fire floor had approximately 180 seconds before losing visibility, with the entire building being obscured at 450 seconds. Concluding that in this scenario, the ASET is less than RSET which points to a flaw in the building design. The intent of the code is to protect those not intimate with the fire, and without separating the main core with an unenclosed stair from the corridors, it compromises a safe egress passageway for those who are not intimate with the fire. Enforcing administrative controls to keep the corridor free from fuel, as well as frequent testing and maintenance of the sprinkler protection system will help prevent the design fire analyzed.

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[5] Kim, Hyeong-Jin and David G. Lilley. "Heat Release Rates of Burning Items in Fires." AIAA 2000-0722. 38th Aerospace Sciences Meeting & Exhibit. Reno, NV. January 2000.

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[7] NFPA 13. (2019). Quincy, Massachusetts: National Fire Protection Association.

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[12] Yan, Z., Han, X., & Li, M. (2016). Accurate Assessment of RSET for Building Fire Based on Engineering Calculation and Numerical SImulation. MATEC Web of Conferences. Retrieved from https://www.matec-conferences.org/articles/matecconf/pdf/2016/24/matecconf_apop2016_04024.pdf

Appendix A

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GENERAL NOTES

1. TOP OF CONCRETE AT SLAB-ON-GRADE VARIES; COORDINATE WITH CIVIL
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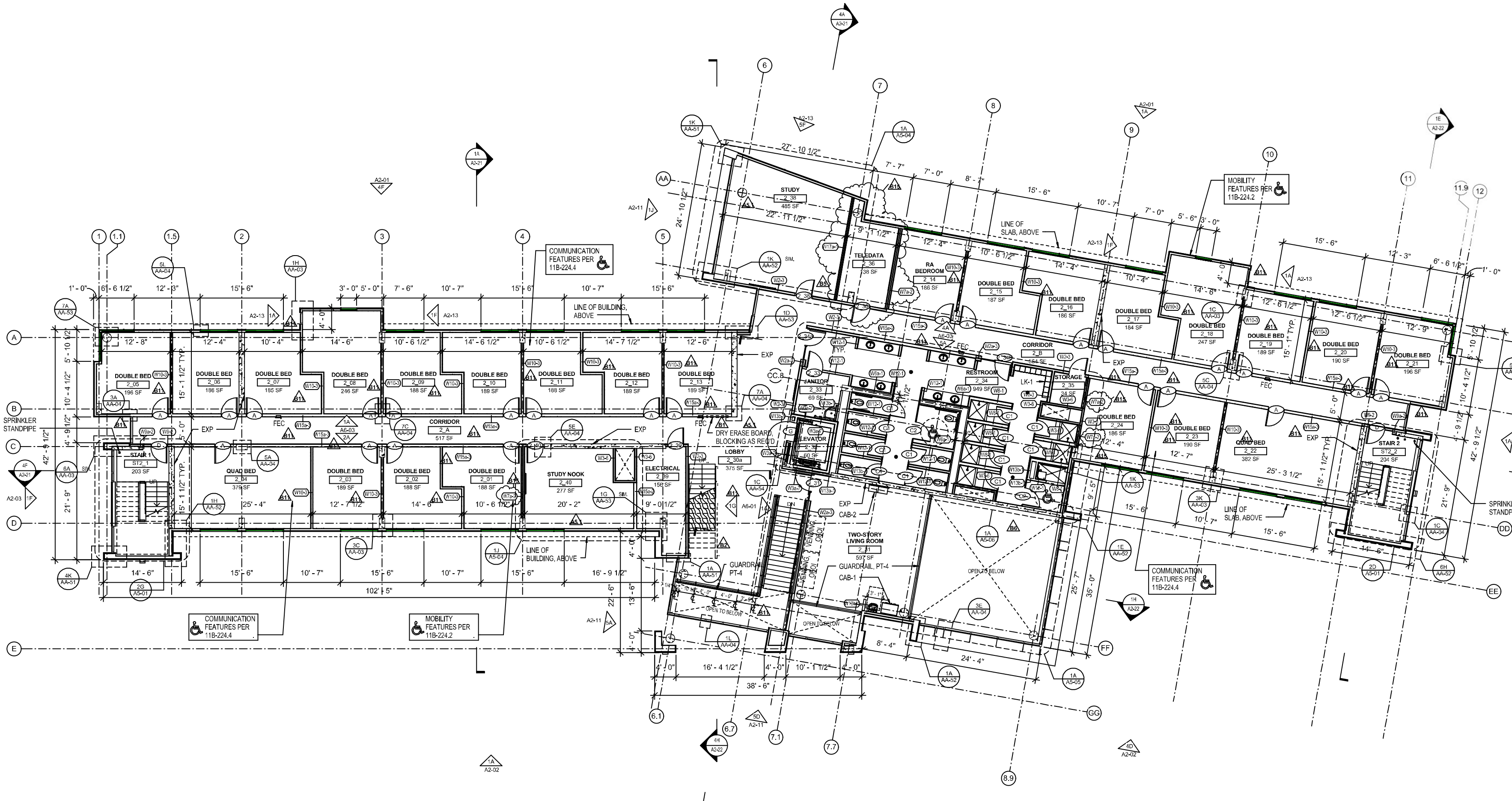

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B15	ADD-009 / 3B RESNET	03.24.2017

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3B

SHEET NUMBER
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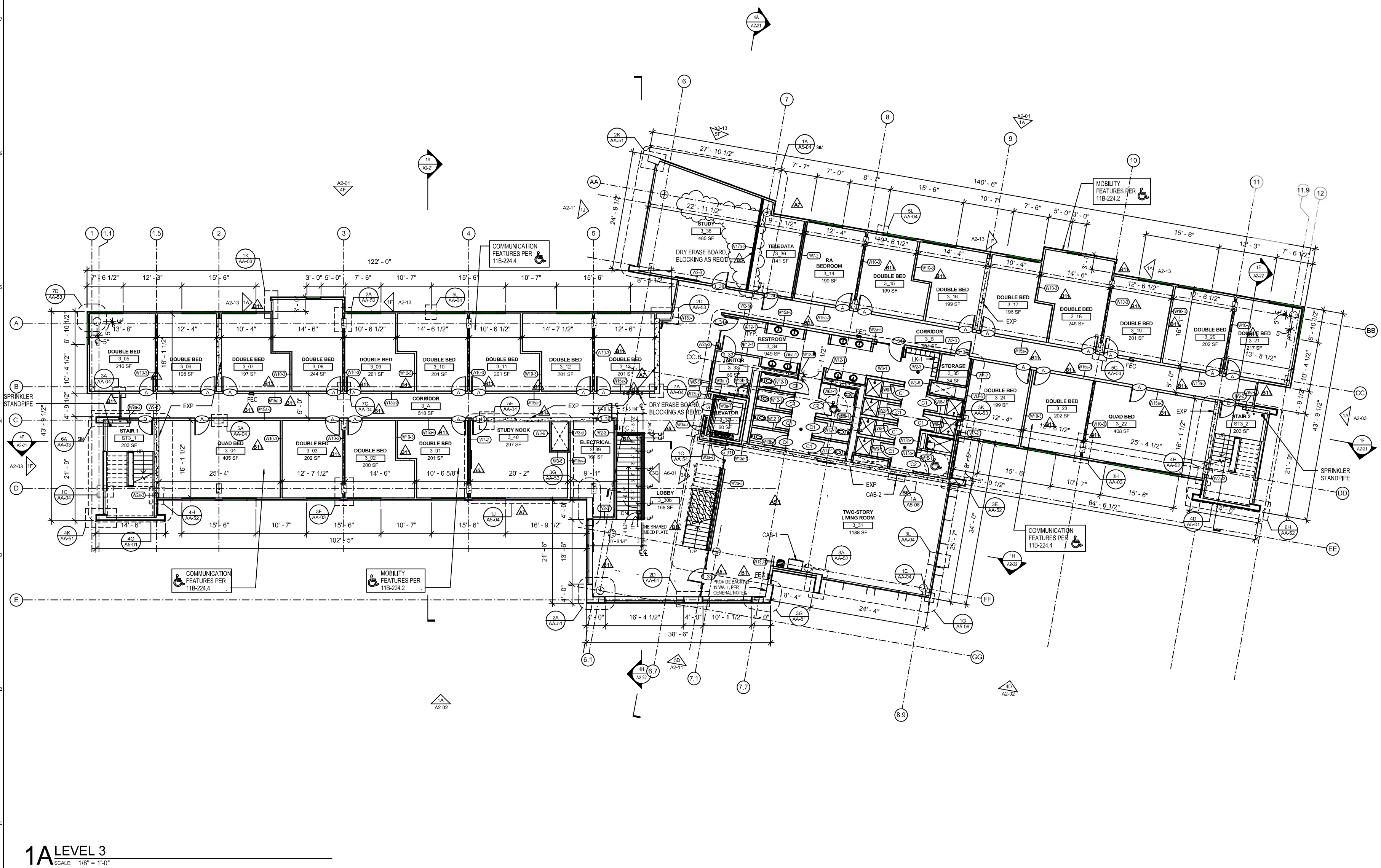

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THIRD FLOOR PLAN

BUILDING

3B

SHEET NUMBER

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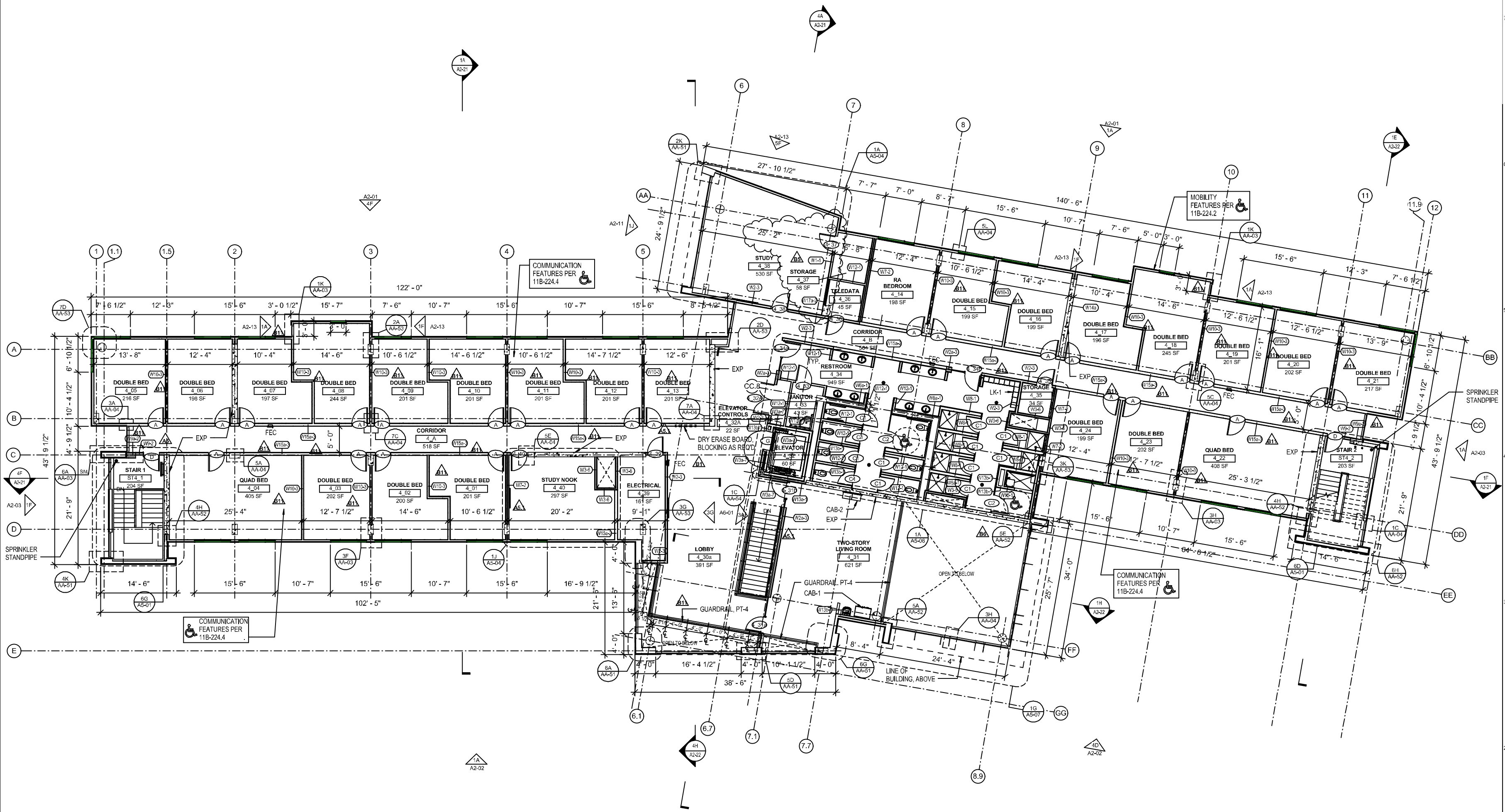

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SHEET TITLE

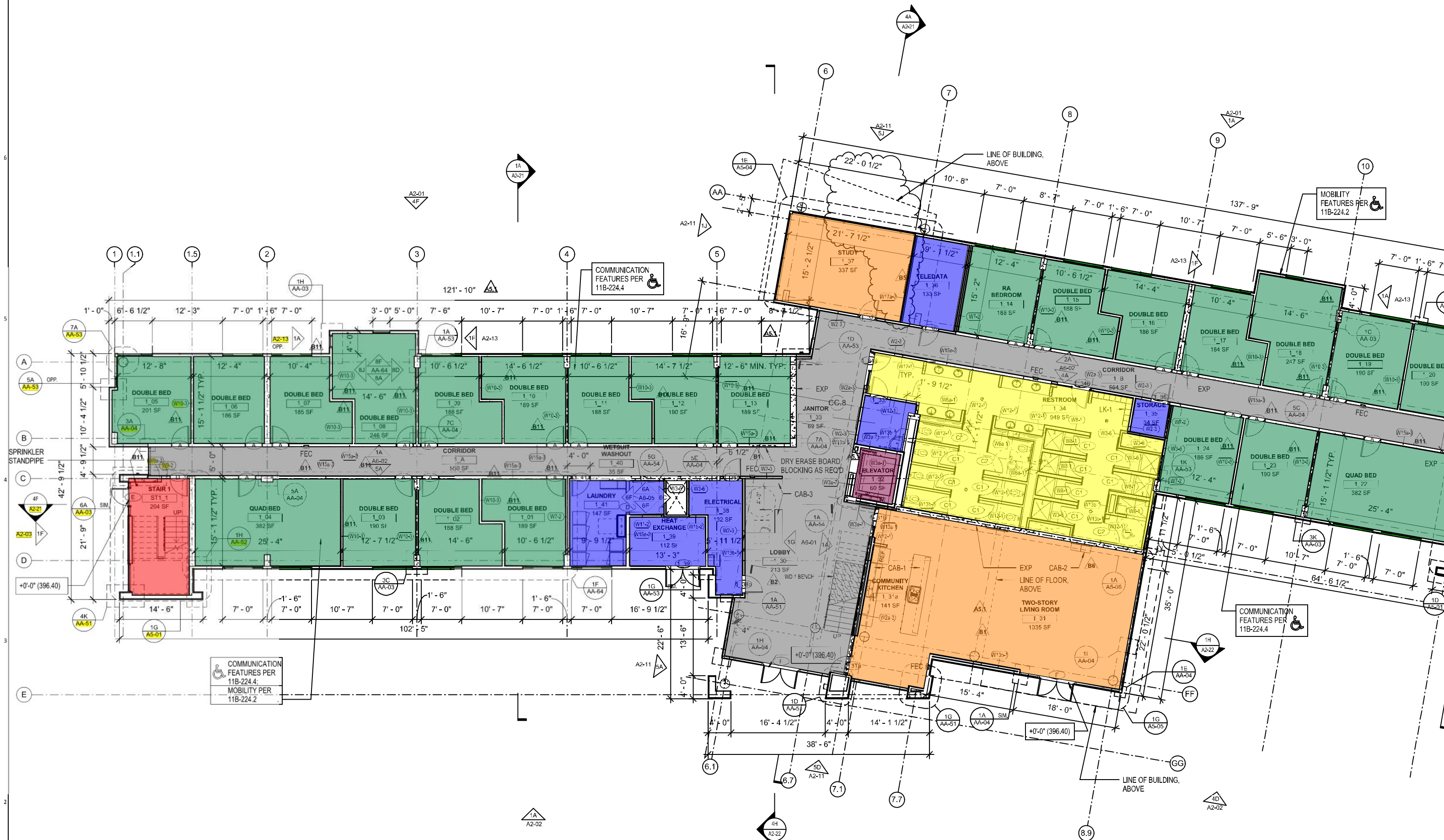
FOURTH FLOOR PLAN

BUILDING

3B

SHEET NUMBER

A1-04



Legend

- R-2 Dormitory Dwellings
- A-3 Assembly Space
- Restrooms
- Storage/Utility Rooms
- Stairs
- Elevator
- Corridor

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

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SHEET TITLE
FIRST FLOOR PLAN

BUILDING
3B

SHEET NUMBER
A1-01

1A LEVEL 2
SCALE: 1/8" = 1'-0"

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A5.1	ADD-005.1 / ARCHITECTURE	10.14.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017
B15	ADD-009 / 3B RESNET	03.24.2017

SHEET TITLE
SECOND FLOOR PLAN

BUILDING
3B

SHEET NUMBER
A1-02

GENERAL NOTES

1. TOP OF CONCRETE AT SLAB-ON-GRADE VARIES; COORDINATE WITH CIVIL
2. SEE STRUCTURAL DRAWINGS FOR COLUMN GRID, EDGE OF SLAB LOCATIONS AND MAJOR CHANGES IN ELEVATION; COORDINATE WITH ARCHITECTURAL
3. SEE CIVIL DRAWINGS FOR ALL SITE WORK, INCLUDING SITE UTILITIES; COORDINATE ALL CIVIL DETAILS WITH ARCHITECTURAL
4. SEE LIFE SAFETY PLANS FOR COORDINATION OF ALL FIRE-RATED ASSEMBLIES
5. SEE A2 AND A3 SERIES FOR EXTERIOR FINISH LEGEND; ALL ITEMS LISTED SHALL BE COORDINATED WITH SPECIFICATIONS
6. SEE A5 AND A6 SERIES FOR INTERIOR FINISH LEGEND; ALL ITEMS LISTED SHALL BE COORDINATED WITH SPECIFICATIONS
7. SEE AA SERIES FOR PARTITION TYPES AND DETAILS.
8. PRIOR TO INSTALLATION OF ALL VERTICAL DRAIN UTILITIES, PIPING, SANITARY RISERS, GAS PIPING AND DUCT SHAFTS, CONTRACTOR TO COORDINATE WITH ARCHITECT TO VERIFY ALL UTILTIES SHALL BE CONCEALED AS REQUIRED AND DO NOT CONFLICT WITH ARCHITECTURAL DETAILS.
9. ALL CONCRETE WALLS AND COLUMNS TO BE LEFT EXPOSED, UNO.
10. SEE AA SERIES AND G1 SERIES FOR WALL RATING DESIGNTATIONS.
11. SEE STRUCTURAL DRAWINGS FOR ALL BEARING AND SHEAR WALL LOCATIONS.
12. DIMENSIONS FOR REFERENCE ONLY. REFER TO A1-10 SERIES FOR CONSTRUCTION DIMENSIONS.
13. ADD BLOCKING BEHIND ALL NOTED WALL MOUNTED ITEMS.
14. PROVIDE STAIR NOSING AT ALL EXIT STAIRS, LOBBY STAIRS AND STAIRS AT TWO-STORY LIVING ROOM PER FI #012 & RFI #703.

1A LEVEL 3
SCALE: 1/8" = 1'-0"

3/10/2017 5:22:32 PM

PROJECT NAME

CAL POLY HOUSING SOUTH

PROJECT ADDRESS

1 GRAND AVE
SAN LUIS OBISPO, CA
93407

ARCHITECT

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ARCHITECT STAMP

LICENSED ARCHITECT
JOSEPH MASTRO VALERIO
C-21000
12/31/2017
RENEWAL DATE
STATE OF CALIFORNIA

VDTA PROJECT NUMBER

14031.00

CONSULTANT

CONSULTANT PROJECT NUMBER

ISSUE		
No.	REVISION DESCRIPTION	DATE
1	PACKAGE 2, 50% PD	03.02.2015
2	PACKAGE 2, 100% PD	05.11.2015
3	GLAZING ENCLOSURE PACKAGE	06.05.2015
4	PACKAGE 2, 50% CD	07.22.2015
7	PACKAGE 2, 95% CD	10.15.2015
B1	P2: PLAN CHECK CORRECTIONS	12.10.2015
B2	P2: PLAN CHECK CORRECTIONS	01.20.2016
10	DSA PERMIT ISSUANCE	01.28.2016
B5	P2: PLAN CHECK CORRECTIONS	04.08.2016
B6	DSA BACK CHECK	04.14.2016
11	OSFM REVIEW - ARCHITECTURE	06.21.2016
B11	OSFM ARCH. - BACK CHECK	08.19.2016
A5	ADD-005 / ARCHITECTURE	09.23.2016
A5.1	ADD-005.1 / ARCHITECTURE	10.14.2016
A7	ADD-007 / TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017

SHEET TITLE

THIRD FLOOR PLAN

BUILDING

3B

SHEET NUMBER

A1-03

3/10/2017 5:22:35 PM

1 LEVEL 4
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. TOP OF CONCRETE AT SLAB-ON-GRADE VARIES; COORDINATE WITH CIVIL
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A5.1	ADD-005.1 / ARCHITECTURE	10.14.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017

SHEET TITLE

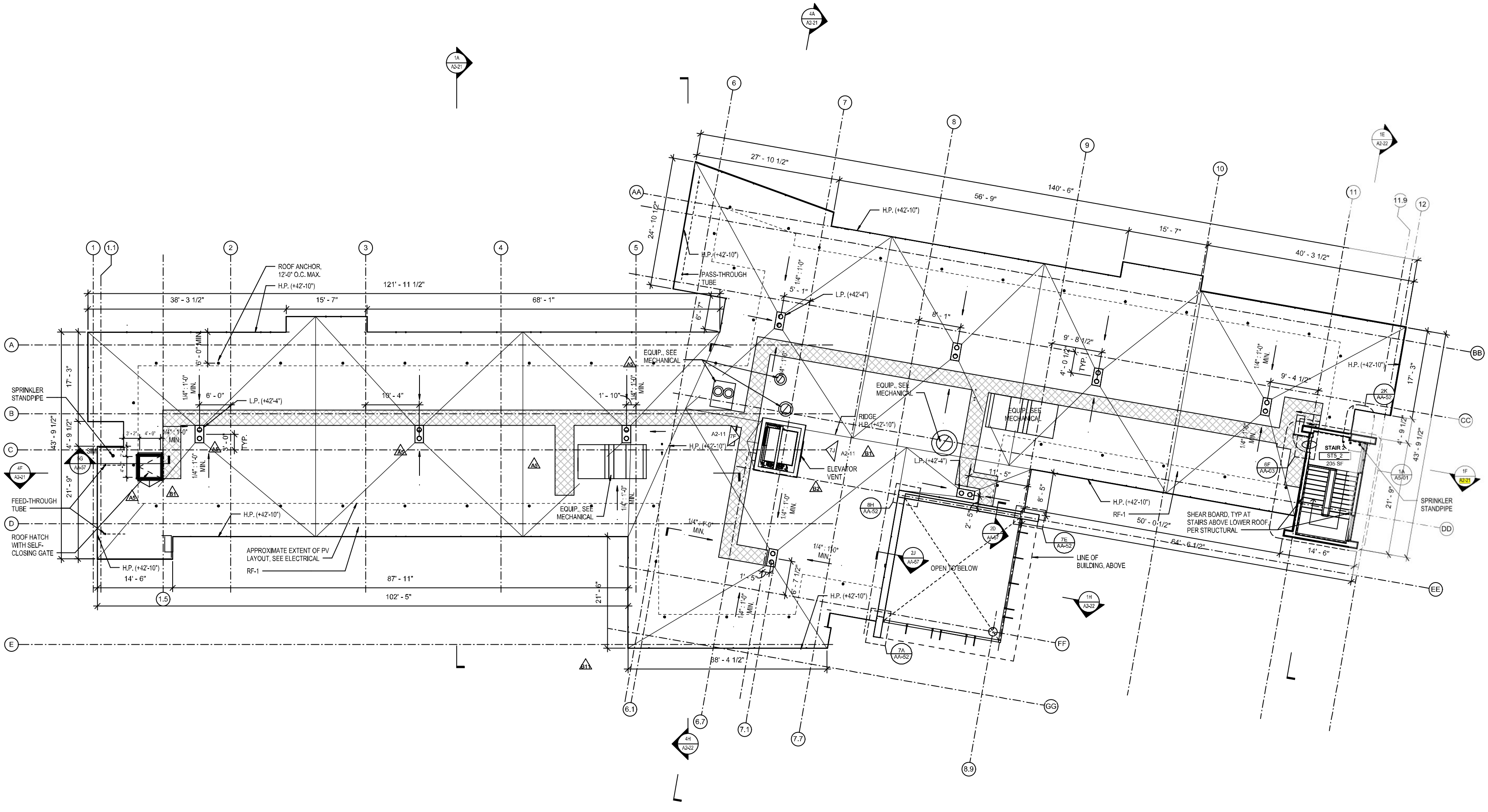
FOURTH FLOOR PLAN

BUILDING

3B

SHEET NUMBER

A1-04



1A LOWER ROOF
SCALE: 1/8" = 1'-0"

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A5	ADD-005 / ARCHITECTURE	09.23.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017

SHEET TITLE
LOWER ROOF PLAN

BUILDING
3B

SHEET NUMBER
A1-05

3/10/2017 5:22:38 PM

1A UPPER ROOF
SCALE: 1/8" = 1'-0"

LEGEND

PHOTOVOLATIC PANEL

NOTE: PANELS ARE SHOWN FOR REFERENCE ONLY. SIZE, LAYOUT AND QUANTITY ARE THE RESPONSIBILITY OF THE PPA PROVIDER.

SLOPED INSULATION

GENERAL NOTES

1. TOP OF CONCRETE AT SLAB-ON-GRADE VARIES; COORDINATE WITH CIVIL
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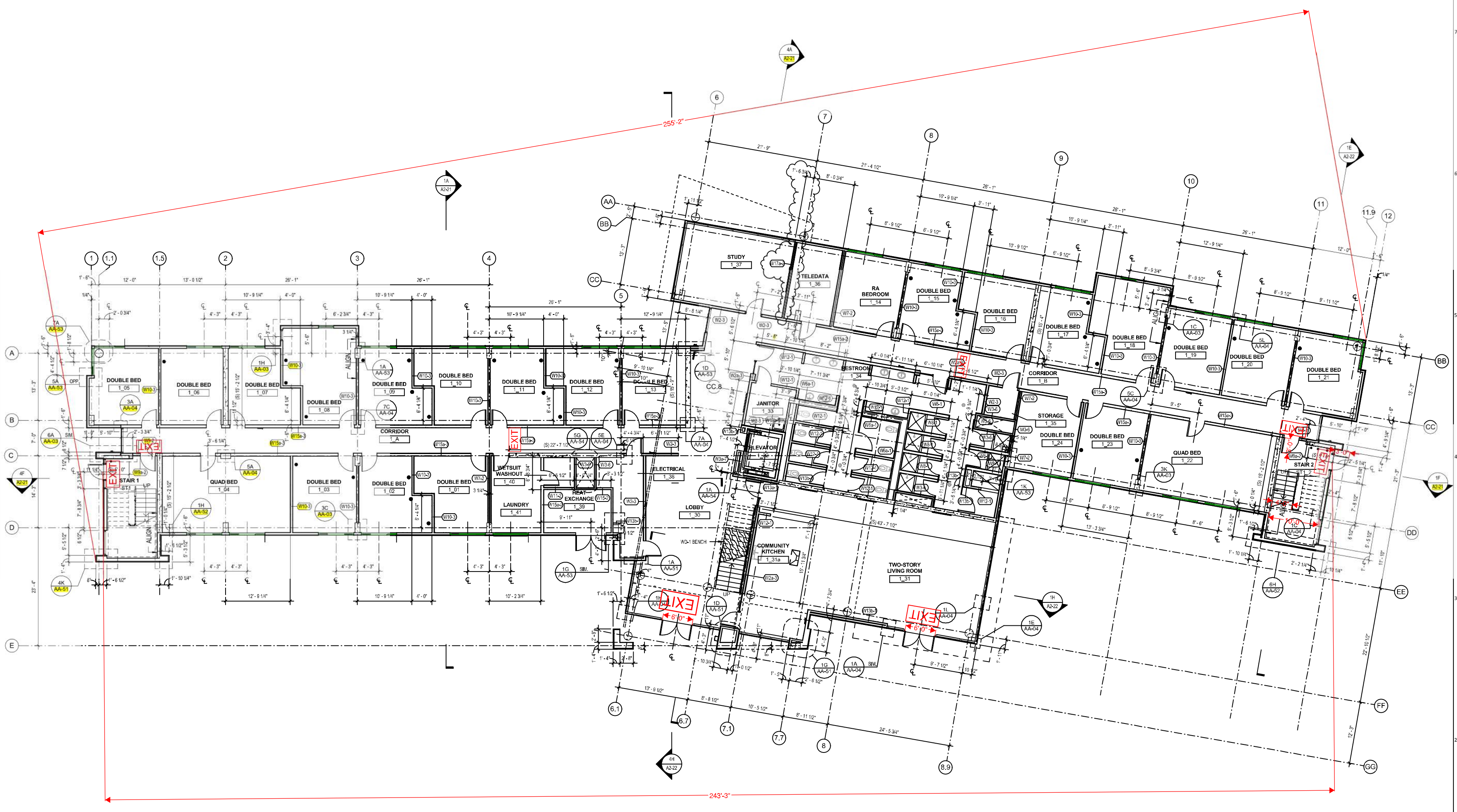
B11	OSFM ARCH. - BACK CHECK	08.19.2016
A5	ADD-005 / ARCHITECTURE	09.23.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017

SHEET TITLE
UPPER ROOF PLAN

BUILDING
3B

SHEET NUMBER
A1-06



1A DIMENSION PLAN - LEVEL 1
SCALE: 1/8" = 1'-0"

3/10/2017 5:22:43 PM

GENERAL NOTES

1. ALL WALLS LOCATED ON GRID LINES ARE ASSUMED TO BE CENTERLINE OF STUD, UNLESS DIMENSIONED OTHERWISE.

LEGEND

- INDICATES SINGLE LAYER GYP. FOR ASYMMETRICAL WALLS

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ARCHITECT STAMP

VDTA PROJECT NUMBER
14031.00

CONSULTANT

CONSULTANT PROJECT NUMBER

ISSUE		
No.	REVISION DESCRIPTION	DATE
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017

SHEET TITLE
FIRST FLOOR DIMENSION PLAN

BUILDING
3B

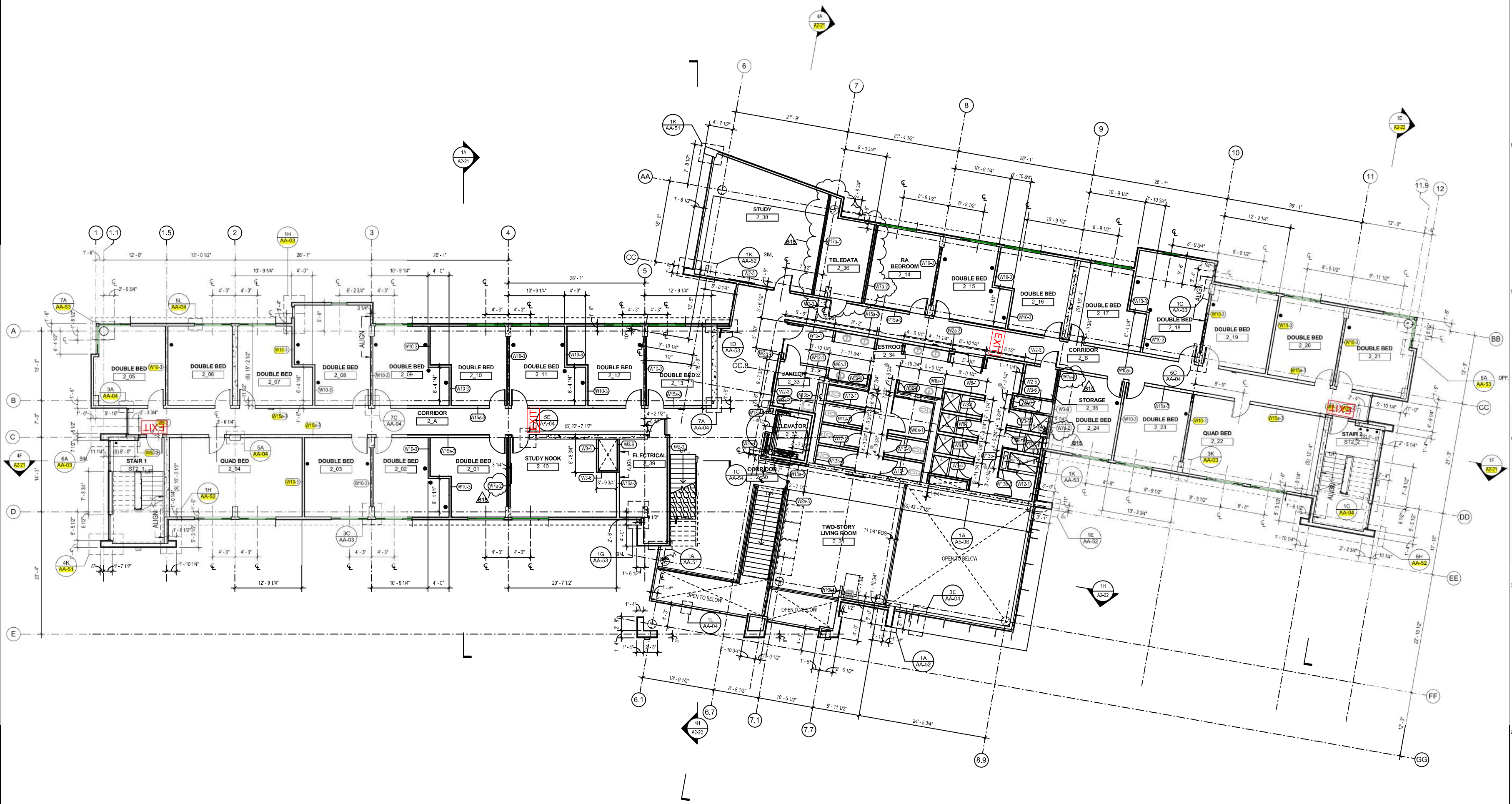
SHEET NUMBER
A1-11

GENERAL NOTES

1. ALL WALLS LOCATED ON GRID LINES ARE ASSUMED TO BE CENTERLINE OF STUD, UNLESS DIMENSIONED OTHERWISE.

LEGEND

- INDICATES SINGLE LAYER GYP. FOR ASYMMETRICAL WALLS



1A DIMENSION PLAN - LEVEL 2
SCALE: 1/8" = 1'-0"

PROJECT NAME
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B15	ADD-009 / 3B RESNET	03.24.2017

SHEET TITLE
SECOND FLOOR
DIMENSION PLAN

BUILDING
3B

SHEET NUMBER
A1-12

1A DIMENSION PLAN - LEVEL 3

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

3/10/2017 5:22:44 PM

GENERAL NOTES

1. ALL WALLS LOCATED ON GRID LINES ARE ASSUMED TO BE CENTERLINE OF STUD, UNLESS DIMENSIONED OTHERWISE.

LEGEND

● INDICATES SINGLE LAYER GYP. FOR ASYMMETRICAL WALLS

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SHEET TITLE
THIRD FLOOR DIMENSION PLAN

BUILDING
3B

SHEET NUMBER
A1-13

3/10/2017 5:22:47 PM

1A DIMENSION PLAN - LEVEL 4

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

GENERAL NOTES

1. ALL WALLS LOCATED ON GRID LINES ARE ASSUMED TO BE CENTERLINE OF STUD, UNLESS DIMENSIONED OTHERWISE.

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SHEET TITLE

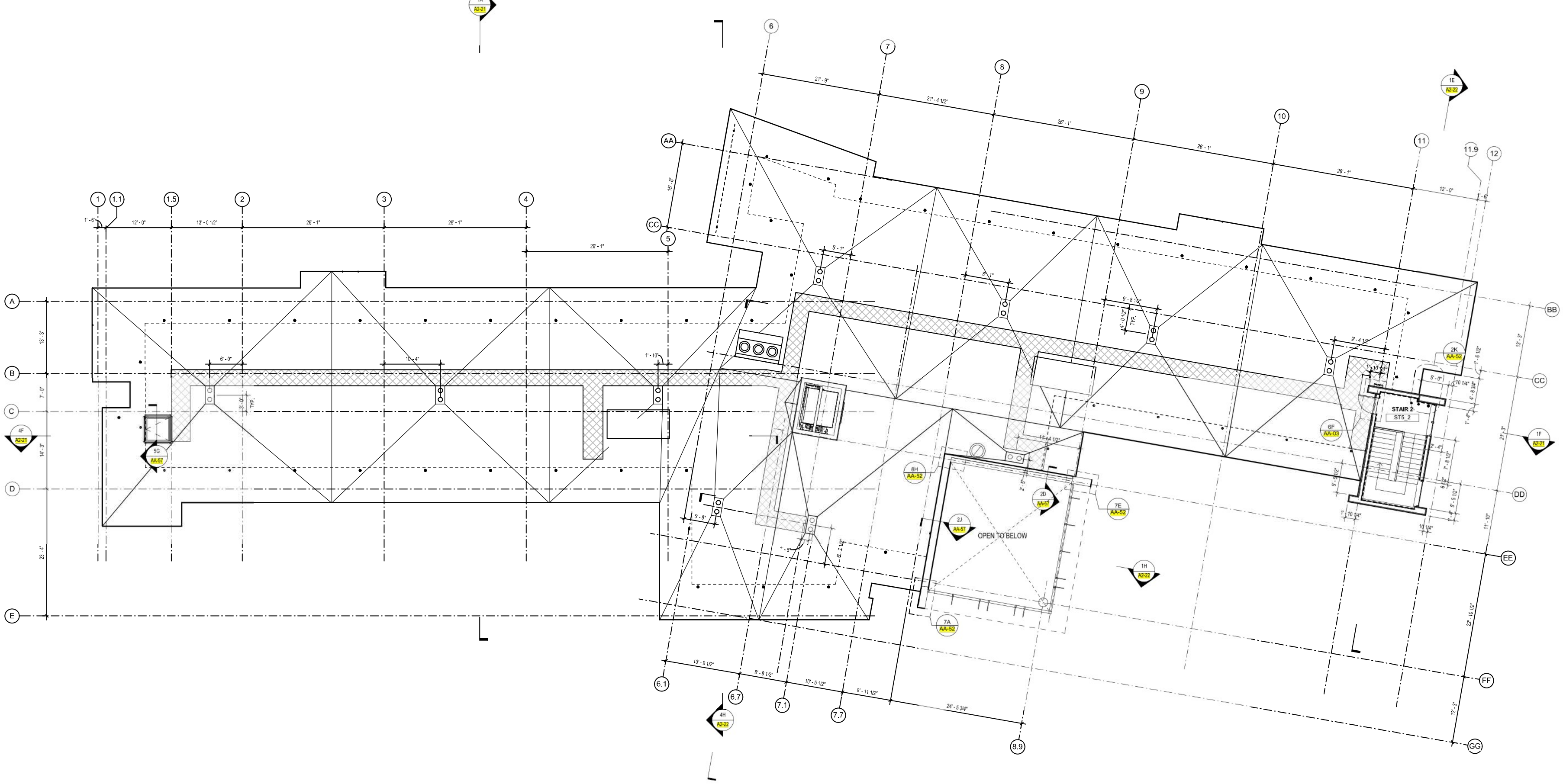
FOURTH FLOOR DIMENSION PLAN

BUILDING

3B

SHEET NUMBER

A1-14



1A DIMENSION PLAN - LOWER ROOF
SCALE: 1/8" = 1'-0"

3/10/2017 5:22:47 PM

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SHEET TITLE
LOWER ROOF DIMENSION PLAN

BUILDING
3B

SHEET NUMBER
A1-15

UNPROTECTED OPENINGS

2013 CBC TABLE 602 - R OCCUPANCY - EXCEPTION (H):
WHERE TABLE 705.8 PERMITS NONBEARING EXTERIOR WALLS WITH UNLIMITED AREA OF UNPROTECTED OPENINGS, THE REQUIRED FIRE-RESISTANCE RATING FOR THE EXTERIOR WALLS IS 0 HOURS.

2013 CBC 705.8.1 ALLOWABLE AREA OF OPENINGS, EXCEPTION 2:
BUILDINGS WHOSE EXTERIOR BEARING WALLS, EXTERIOR NONBEARING WALLS, AND EXTERIOR PRIMARY STRUCTURAL FRAME ARE NOT REQUIRED TO BE FIRE-RESISTANCE RATED SHALL BE PERMITTED TO HAVE UNLIMITED UNPROTECTED OPENINGS.

ALL R IIB BUILDINGS THEREFORE HAVE UNLIMITED UNPROTECTED OPENINGS = NO RATINGS ON EXTERIOR NON-BEARING WALLS.

UNENCLOSED STAIRS

THE CENTER STAIRS IN ALL RESIDENTIAL DORM BUILDINGS ARE NOT REQUIRED FOR EGRESS.

2013 CBC 712.1.12 UNENCLOSED STAIRS AND RAMPS:
VERTICAL FLOOR OPENINGS CREATED BY UNENCLOSED STAIRS OR RAMPS IN ACCORDANCE WITH SECTIONS 1009.2 & 1009.3 SHALL BE PERMITTED.

2013 CBC 1009.3 EXCEPTION 4:
IN OTHER THAN GROUPS B, I-2, 2-2.1, I-3 AND M OCCUPANCIES, EXIT ACCESS STAIRWAY OPENINGS ARE NOT REQUIRED TO BE ENCLOSED PROVIDED THAT THE BUILDING IS EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.3.1.1, THE FLOOR OPENING DOES NOT CONNECT MORE THAN FOUR STORIES, THE AREA OF THE FLOOR OPENING BETWEEN STORIES DOES NOT EXCEED TWICE THE HORIZONTAL PROJECTED AREA OF THE EXIT ACCESS STAIRWAY, AND THE OPENING IS PROTECTED BY A DRAFT CURTAIN AND CLOSELY SPACED SPRINKLERS IN ACCORDANCE WITH NFPA 13.

SEE INFORMATION ON ALL RESIDENTIAL LIFE SAFETY PLANS FOR HORIZONTAL OPENING AREAS.

EGRESS WIDTH & ENCROACHMENT

2013 CBC 1005.5 DISTRIBUTION OF EGRESS CAPACITY:
WHERE MORE THAN ONE EXIT, OR ACCESS TO MORE THAN ONE EXIT, IS REQUIRED, THE MEANS OF EGRESS SHALL BE CONFIGURED SUCH THAT THE LOSS OF ANY ONE EXIT, OR ACCESS TO ONE EXT, SHALL NOT REDUCE THE AVAILABLE CAPACITY TO LESS THAN 50 PERCENT OF THE REQUIRED CAPACITY.

WORST CASE FLOOR = LEVEL 3 WITH 434 OCC.:
334 OCC. / 2 EXITS = 167 OCC. x 0.15" PER OCC =
26" REQ'D PER EGRESS PATH

2013 CBC 1018.1: MIN. CORRIDOR WIDTH = **44" / 2 = 22" < 60" PROV.**

2013 CBC 1005.7.1:
DOORS, WHEN FULLY OPEN, CANNOT REDUCE THE REQUIRED WIDTH BY MORE THAN 7". DOORS IN ANY POSITION SHALL NOT REDUCE THE REQUIRED WIDTH BY MORE THAN ONE-HALF.

CORRIDORS PROVIDED:
60" MIN. - 36" DOOR LEAF = 24" REMAINING.
33" REQ'D PER PATH / 2 = 16.5"

16.5" < 24" = OK

R-1 / R-2

THE UNIVERSITY HAS CONFIRMED THAT ONLY BUILDING 2 TYPE (2A, 2C & 2F) BUILDINGS 3B, 4E, 5D, & 5G WOULD FALL UNDER THE TRANSIENT LODGING DEFINITION FOR SUMMER OCCUPANCY WHICH STATES:

A BUILDING OR FACILITY CONTAINING ONE OR MORE GUEST ROOM(S) FOR SLEEPING THAT PROVIDES ACCOMMODATIONS THAT ARE PRIMARILY SHORT-TERM IN NATURE (GENERALLY 30 DAYS OR LESS)...

BUILDINGS 3B, 4E, 5D, & 5G WOULD NOT BE USED FOR SUMMER ACCOMMODATIONS UNDER 30 DAYS OF OCCUPANCY.

PER CBC 11B-224.4 & 11B-806.3 -9-12 UNITS PER RESIDENTIAL BUILDING ARE PROVIDED WITH VISUAL ALARM NOTIFICATION APPLIANCES. ALTHOUGH THE PROJECT HAS PROVIDED DEVICE READY LOCATIONS FOR THE REMAINING DORMITORY BUILDINGS NOT CLASSIFIED AS R-1 AS WELL. PLEASE REFER TO THE BUILDING CODE ANALYSIS ON THIS SHEET WHICH INCORPORATES ALL OTHER ACCESSIBILITY AND EXITING CODE REQUIREMENTS AS DESIGNED IN THESE BUILDING TYPES.

R5

BUILDING TYPE 3B

ARTICLE	SUBJECT	REQUIREMENT	PROPOSED	REMARKS
302	OCCUPANCY CLASSIFICATION(S)		R-2, RESIDENTIAL	DORMITORY
602	TYPES OF CONSTRUCTION		TYPE IIB	
503	HEIGHT / AREA LIMITATIONS (PER STORY)	R-2: 4 STORIES @ 16,000 SF 96,000 TOTAL, ALLOWABLE, REFER TO G4-31 FOR BUILDING AREA MODIFICATIONS	4 STORIES 41,146 SF TOTAL, ACTUAL	49,146 SF ACTUAL < 96,000 SF ALLOWABLE NO STORY INCREASES TAKEN
508	MIXED OCCUPANCY SEPARATIONS	NON-SEPARATED		ALL SPACES ARE IN SUPPORT OF R-2 OCCUPANCY; ASSEMBLY VALUES ASSIGNED TO SOME SPACES FOR THE PURPOSE OF EGRESS CALCULATION ONLY
601	REQ'D HOURS OF FIRE RESISTANCE (IIB)			
	PRIMARY STRUCTURAL FRAME (SEC 202)	0 HOUR	4 HOUR	ALL COLUMNS CONCRETE
	EXTERIOR BEARING WALLS	0 HOUR	4 HOUR	CONCRETE SHEAR WALLS ONLY
	INTERIOR BEARING WALLS	0 HOUR	4 HOUR	CONCRETE SHEAR WALLS ONLY
	EXTERIOR NON-BEARING WALLS (R-2)			
	x < 5'	1 HOUR	N/A	
	5' ≦ x <10'	1 HOUR		
	10' ≦ x <30'	0 HOUR	0 HOUR	SEE SITE PLAN, A0-02: BUILDING IS ≧ 10' TO PROPERTY LINE BUILDING IS ≧ 30' TO OTHER BUILDINGS
	x ≧ 30'	0 HOUR		
	INTERIOR NON-BEARING WALLS	0 HOUR	VARIES	SEE LIFE SAFETY
	FLOORS & ASSOCIATED SECONDARY MEMBERS	0 HOUR	1 HOUR	PT CONCRETE FLOOR SLAB, TYPICAL
	ROOFS & ASSOCIATED SECONDARY MEMBERS	0 HOUR		PT CONCRETE ROOF SLAB
	SEE CBC TABLE 721.2.1.1 FOR FIRE-RESISTANCE OF C.I.P. CONCRETE WALLS			
707	FIRE-RESISTIVE REQUIREMENTS			
	STAIRWAY ENCLOSURES	1 HOUR < 4 STORIES; 2 HOUR > 4 OR MORE	2 HOUR	B3 - 4 STORY, B4 - 3 STORY, B5 - 5 STORY
	ELEVATOR ENCLOSURES	1 HOUR < 4 STORIES; 2 HOUR > 4 OR MORE	2 HOUR	B3 - 4 STORY, B4 - 3 STORY, B5 - 5 STORY
	ENCLOSURES OF PIPE SHAFTS AND DUCTS	2 HOUR	2 HOUR	
	ENCLOSURES OF HEATING ROOMS	XX		
1018	CORRIDORS	1 HOUR	1 HOUR	
803	INTERIOR WALL AND CEILING FINISHES (R-2)			
	INTERIOR EXIT STAIRWAYS, RAMPS & EXIT PASSAGEWAYS	CLASS C		
	CORRIDORS AND ENCLOSURE FOR EXIT ACCESS STAIRWAYS AND RAMPS	CLASS C		
R5	ROOMS AND ENCLOSED SPACES	CLASS C		
509	HEATING PLANTS / BOILERS (INCIDENTAL)	1 HOUR < 400,000 BTU/HR	1 HOUR	
	LAUNDRY ROOMS (INCIDENTAL)	1 HOUR > 100 SF	1 HOUR	
420	DWELLING UNIT SEPARATION			
	WALLS	1/2 HOUR	1 HOUR	
	FLOORS	1/2 HOUR	1 HOUR	
903	FIRE PROTECTION EQUIPMENT			
	SPRINKLER SYSTEM (R-2)	REQUIRED	PROVIDED THROUGHOUT	
905	STANDPIPE SYSTEMS	CLASS 1		
EXIT REQUIREMENTS				
1015	MINIMUM NUMBER OF EXITS	2 EXITS PER STORY FOR 1-500 OCC.	2 PER STORY	
	R OCCUPANCIES	2 EXITS FOR > 10 < 501 OCCUPANTS	VARIES, SEE PLAN	
1016	TRAVEL DISTANCE TO EXITS			
	R OCCUPANCIES	250'	VARIES, SEE PLAN	
	DEAD END CORRIDORS	50'		
1016	COMMON PATH OF EGRESS TRAVEL			
	R-2 OCCUPANCIES	125'		
1018	CORRIDOR WIDTH (MIN)	44" MIN	60" TYPICAL	
	WITHIN RESIDENTIAL UNITS OR CAPACITY < 50	36"		
	ACCESS TO & USE OF MEP SYSTEMS	24"		
1005	CAPACITY OF EXITS	STAIRS: 0.2" / OCCUPANT DOORS: 0.15" / OCCUPANT	R5	PER 2013 CBC 1005.3.2 EXCEPTION 1, VOICE EVACUATION SYSTEM AND SPRINKLER BUILDING PROVIDED
1009 & 1008	MINIMUM WIDTH OF EXITS	STAIRS: 44" DOORS: 32" & 80" TALL		
1008	SWING OF EXIT DOORS	IN DIRECTION OF TRAVEL		EXCEPTION WHERE OCCUPANT LOAD IS < 50
1008	HARDWARE	KNURLED HARDWARE WHERE REQ'D		
1009	STAIRS	7" MAX. HT. RISER; 11" MIN. DEPTH TREAD		
	LANDINGS	MAX. HT. TO LANDING = 12'-0"		
	HANDRAILS	BOTH SIDES		
	HEADROOM	80"		
1003	HEADROOM IN A MEANS OF EGRESS	7'-6" GENERAL		

OSFM BUILDING CODE ANALYSIS

NOTE: FOR BASE CODE REQUIREMENTS REFER TO THE TABLE ABOVE

		PROPOSED:
1.	OCCUPANCY CLASSIFICATION AND USE:	R2, RESIDENTIAL DORMITORY
2.	BUILDING CONSTRUCTION TYPE:	TYPE IIB
3.	NUMBER OF STORIES:	4 STORIES
4.	ACTUAL BUILDING HEIGHT:	52' - 8" HEIGHT
5.	BUILDING AREA IN SQUARE FEET:	49,146 SF (INCLUDES 844 SF OF PROJECTIONS)
6.	AREA OF PROJECT IN SQUARE FEET:	560,225 SF (ALL BUILDINGS PER COVER SHEET)
7.	SEPARATED OR NON-SEPARATED USE:	NON-SEPARATED ALL SPACES ARE IN SUPPORT OF R-2 OCCUPANCY; ASSEMBLY VALUES ASSIGNED TO SOME SPACES FOR THE PURPOSE OF EGRESS CALCULATION ONLY.
8.	ALLOWABLE AREA PER (CBC):	96,000 SF
9.	AREA INCREASE:	YES
10.	HEIGHT INCREASE:	NO
11.	FIRE SPRINKLERS: TYPE:	YES MANUAL FIRE SPRINKLER SYSTEM
12.	FIRE ALARM: TYPE:	YES, WITH VOICE EVACUATION SYSTEM AUTOMATIC SYSTEM
13.	OTHER FIRE PROTECTION SYSTEM, IF ANY:	NO
14.	SMOKE CONTROL SYSTEM:	NO
15.	OCCUPANT LOAD FOR ENTIRE BUILDING AND EACH FLOOR:	TOTAL # OCCUPANTS: 1045 LEVEL 1 TOTAL # OCCUPANTS: 244 LEVEL 2 TOTAL # OCCUPANTS: 240 (B15) LEVEL 3 TOTAL # OCCUPANTS: 298 LEVEL 4 TOTAL # OCCUPANTS: 263 (A7)
16.	YEAR BUILDING WAS CONSTRUCTED:	N/A NEW CONSTRUCTION
17.	IN A HIGH FIRE HAZARD SEVERITY ZONES:	NO
18.	SEISMIC JOINTS. IF YES, PROVIDE LOCATION:	NO
19.	EMERGENCY RESPONDER RADIO COVERAGE:	PER 2013 CFC 510 ALL NEW BUILDINGS SHALL HAVE APPROVED RADIO COVERAGE AMPLIFICATIONS SYSTEM IF, UPON BUILDING COMPLETION, IT DOES NOT MEET THE MINIMUM RADIO SIGNAL TRANSMISSION AND RECEIPT REQUIREMENTS OF SECTION 510 FOLLOWING TESTING PRIOR TO BUILDING FINAL BY AN APPROVED TESTING CONTRACTOR MEETING THE REQUIREMENTS OF SECTION 510.5.3.

PROJECT NAME
STUDENT HOUSING SOUTH

PROJECT ADDRESS
1 GRAND AVENUE, SAN LUIS OBISPO, CA 93407

ARCHITECT
VALERIO DEWALT TRAIN ASSOCIATES, INC.
424 WAVERLEY STREET
PALO ALTO, CALIFORNIA 94301
650.561.7000
www.buildordie.com

PROJECT TEAM
JOE VALERIO
RANDY MATTHEIS
LAUREN SHELTON
ELIZABETH UTLEY
JEROME HAMMAN
VICTORIA CHU
OLIVIA CALALO
HANNAH AMBROSE

ARCHITECT STAMP
LICENSED ARCHITECT JOSEPH MASTRO VALERIO C-21000 12/31/2017 RENEWAL DATE STATE OF CALIFORNIA

VDTA PROJECT NUMBER
14031.00

CONSULTANT

CONSULTANT PROJECT NUMBER

ISSUE		
No.	REVISION DESCRIPTION	DATE
9	OSFM PERMIT ISSUANCE	01.12.2016
B2	P2: PLAN CHECK CORRECTIONS	01.20.2016
10	P2: DSA PERMIT ISSUANCE	01.28.2016
R5	OSFM BACK CHECK	04.08.2016
B5	P2: PLAN CHECK CORRECTIONS	04.08.2016
R6	OSFM ISSUNC - BLDG ANALYSIS	05.11.2016
12	OSFM REVIEW - ARCHITECTURE	06.21.2016
B11	OSFM ARCH. - BACK CHECK	08.19.2016
A7	ADD-007 / TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTR. DOCUMENTS	02.21.2017
B15	ADD-009 / 3B RESNET	03.24.2017

SHEET TITLE
CODE INFORMATION

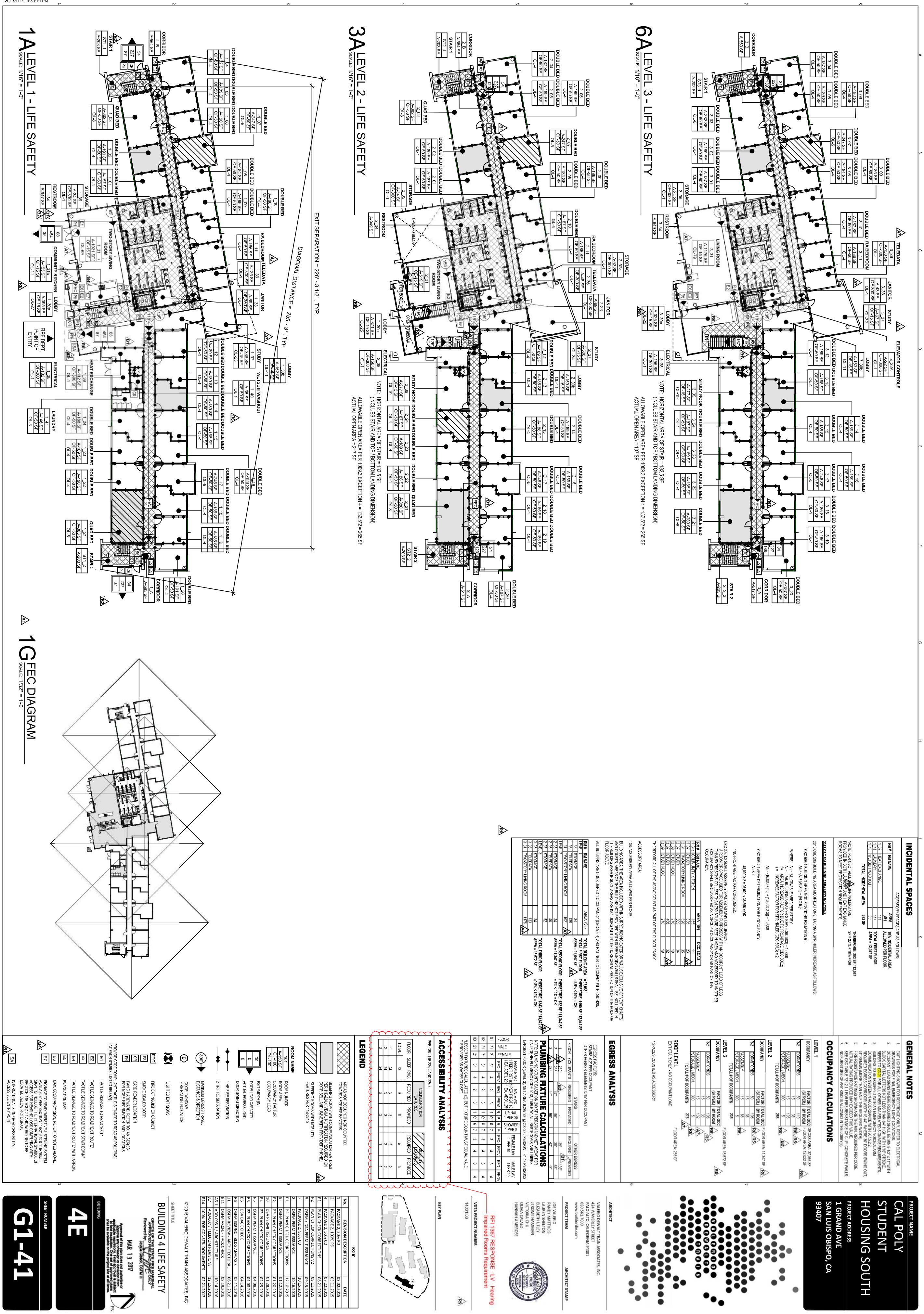
OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Joshua Gibson, DSFM III
MAR 13 2017
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

BUILDING
3B

SHEET NUMBER
G1-32

Appendix B

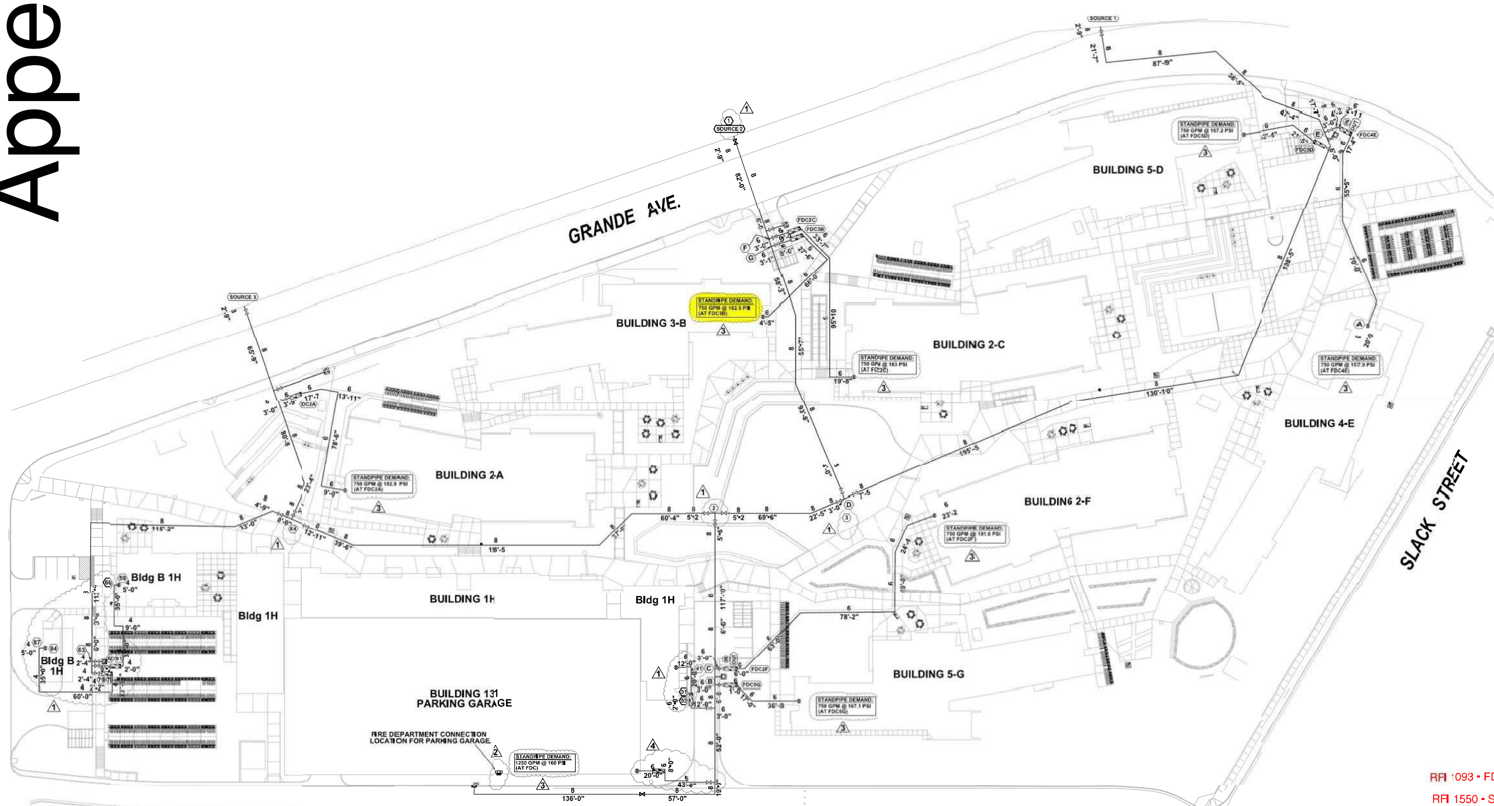
2/21/2017 10:39:19 PM



Appendix C

CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE, SAN LUIS OBISPO, CA 93407

David Adkins
Senior FP Design Technician
NICET #96442
Automatic Sprinkler System Layout, Level III



A UNDERGROUND FIRE SERVICE SITE PLAN
FP0.1
SCALE: 1" = 40'-0"

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND LIFE ONLY
Reviewed by
Aaron Greer, DSFM III
JUL 20 2017
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

AUTOMATIC FIRE SPRINKLER SET

Drawing Index:

FP-0.1 Cover Sheet
FP-0.2 Notes and Details
FP-1 Building 2F Level 1 Fire Sprinkler Plan
FP-2 Building 2F Level 2 Fire Sprinkler Plan
FP-3 Building 2F Level 3 Fire Sprinkler Plan
FP-4 Building 2F Level 4 Fire Sprinkler Plan
FP-5 Building 2F Level 1 Fire Sprinkler Reflected Ceiling Plan
FP-6 Building 2F Level 2 Fire Sprinkler Reflected Ceiling Plan
FP-7 Building 2F Level 3 Fire Sprinkler Reflected Ceiling Plan
FP-8 Building 2F Level 4 Fire Sprinkler Reflected Ceiling Plan
FP-9 Building 2A,C Level 1 Fire Sprinkler Plan
FP-10 Building 2A,C Level 2 Fire Sprinkler Plan
FP-11 Building 2A,C Level 3 Fire Sprinkler Plan
FP-12 Building 2A,C Level 4 Fire Sprinkler Plan
FP-13 Building 2A,C Level 1 Fire Sprinkler Reflected Ceiling Plan
FP-14 Building 2A,C Level 2 Fire Sprinkler Reflected Ceiling Plan
FP-15 Building 2A,C Level 3 Fire Sprinkler Reflected Ceiling Plan
FP-16 Building 2A,C Level 4 Fire Sprinkler Reflected Ceiling Plan
FP-17 Building 3B Level 1 Fire Sprinkler Plan
FP-18 Building 3B Level 2 Fire Sprinkler Plan
FP-19 Building 3B Level 3 Fire Sprinkler Plan
FP-20 Building 3B Level 4 Fire Sprinkler Plan
FP-21 Building 3B Level 1 Fire Sprinkler Reflected Ceiling Plan
FP-22 Building 3B Level 2 Fire Sprinkler Reflected Ceiling Plan
FP-23 Building 3B Level 3 Fire Sprinkler Reflected Ceiling Plan
FP-24 Building 3B Level 4 Fire Sprinkler Reflected Ceiling Plan
FP-25 Building 4E Level 1 Fire Sprinkler Plan
FP-26 Building 4E Level 2 Fire Sprinkler Plan
FP-27 Building 4E Level 3 Fire Sprinkler Plan
FP-28 Building 4E Level 1 Fire Sprinkler Reflected Ceiling Plan
FP-29 Building 4E Level 2 Fire Sprinkler Reflected Ceiling Plan
FP-30 Building 4E Level 3 Fire Sprinkler Reflected Ceiling Plan
FP-31 Building 5D,G Level 1 Fire Sprinkler Plan
FP-32 Building 5D,G Level 2 Fire Sprinkler Plan
FP-33 Building 5D,G Level 3 Fire Sprinkler Plan
FP-34 Building 5D,G Level 4 Fire Sprinkler Plan
FP-35 Building 5D,G Level 5 Fire Sprinkler Plan
FP-36 Building 5D,G Level 1 Fire Sprinkler Reflected Ceiling Plan
FP-37 Building 5D,G Level 2 Fire Sprinkler Reflected Ceiling Plan
FP-38 Building 5D,G Level 3 Fire Sprinkler Reflected Ceiling Plan
FP-39 Building 5D,G Level 4 Fire Sprinkler Reflected Ceiling Plan
FP-40 Building 5D,G Level 5 Fire Sprinkler Reflected Ceiling Plan
FP-41 Building 2F Standpipe Plan
FP-42 Building 2A,C Standpipe Plan
FP-43 Building 3B Standpipe Plan
FP-44 Building 4E Standpipe Plan
FP-45 Building 5D,G Standpipe Plan
FP-46 Typical Student Housing Building Section
FP-47 Parking Structure Standpipe Piping Plan
FP-48 Parking Structure Standpipe Isometric View
FP-49 Parking Structure Standpipe Site Plan
FP-50 Level 1 1H West Fire Sprinkler Plan
FP-51 Level 1 1H East Fire Sprinkler Plan
FP-52 Level 2 1H Fire Sprinkler Plan
FP-53 Level 1 1H West Reflected Ceiling Plan
FP-54 Level 1 1H East Reflected Ceiling Plan
FP-55 Level 2 1H Reflected Ceiling Plan

Specifications Index: Division 21 Fire Suppression

21 1200 Fire Protection System

CSFM FILE #18-40-03-0001

FIRE SERVICE LEGEND:
- UNDERGROUND GATE VALVE
- FIRE SPRINKLER SYSTEM RISER
- DOUBLE CHECK DETECTOR ASSEMBLY & FIRE DEPARTMENT CONNECTION
- FIRE HYDRANT
- UG FIRE SERVICE PIPE: PVC DR18 CLASS 150

RFI 1093 - FD Knox Box Location
RFI 1550 - Smoke Curtain Addition
RFI 1550.1 - Smoke Curtain Addition

FIRE SPRINKLER NOTES:
1. ALL UNDERGROUND FIRE SERVICE PIPE, FITTINGS, APPURTENANCES AS WELL AS INSTALLATIONS BY OTHERS. COSCO FIRE PROTECTION POINT OF CONNECTION SHALL BE AT ±12" ABOVE FINISH FLOOR IN BUILDINGS. THRUST BLOCKS NOT SHOWN FOR CLARITY.
2. UNDERGROUND FIRE SERVICE PLAN IS SHOWN FOR HYDRAULIC REFERENCE ONLY.

NO.	DESCRIPTION	DATE	BY
1	ADDED HYDRAULIC CALCULATION NODE FOR BLDG. 1H	1-16-17	D.A.
2	REVISED PARKING GARAGE FIRE DEPARTMENT CONNECTION.	3-3-17	H.J.
3	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE.	4-4-17	D.A.
4	REVISED UNDERGROUND FIRE SERVICE TO PARKING GARAGE, PER CANNON PLAN C-7.0B, DATED 2-21-17.	5-4-17	D.A.

SPRINKLER HEAD LEGEND: SYMBOL | S/N | ORIFICE | NPT | K-FACT. | HEAD FINISH | ESCUT. TYPE | ESCUTCH. FINISH | TEMP. | QUAN.
TOTAL SPRINKLERS =

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
FRESNO OFFICE
4233 W. Sierra Madre, Suite 108
Fresno, California 93722
cal (559) 275-3795 • fax (559) 275-8006
California C-16 Lic. # 577631
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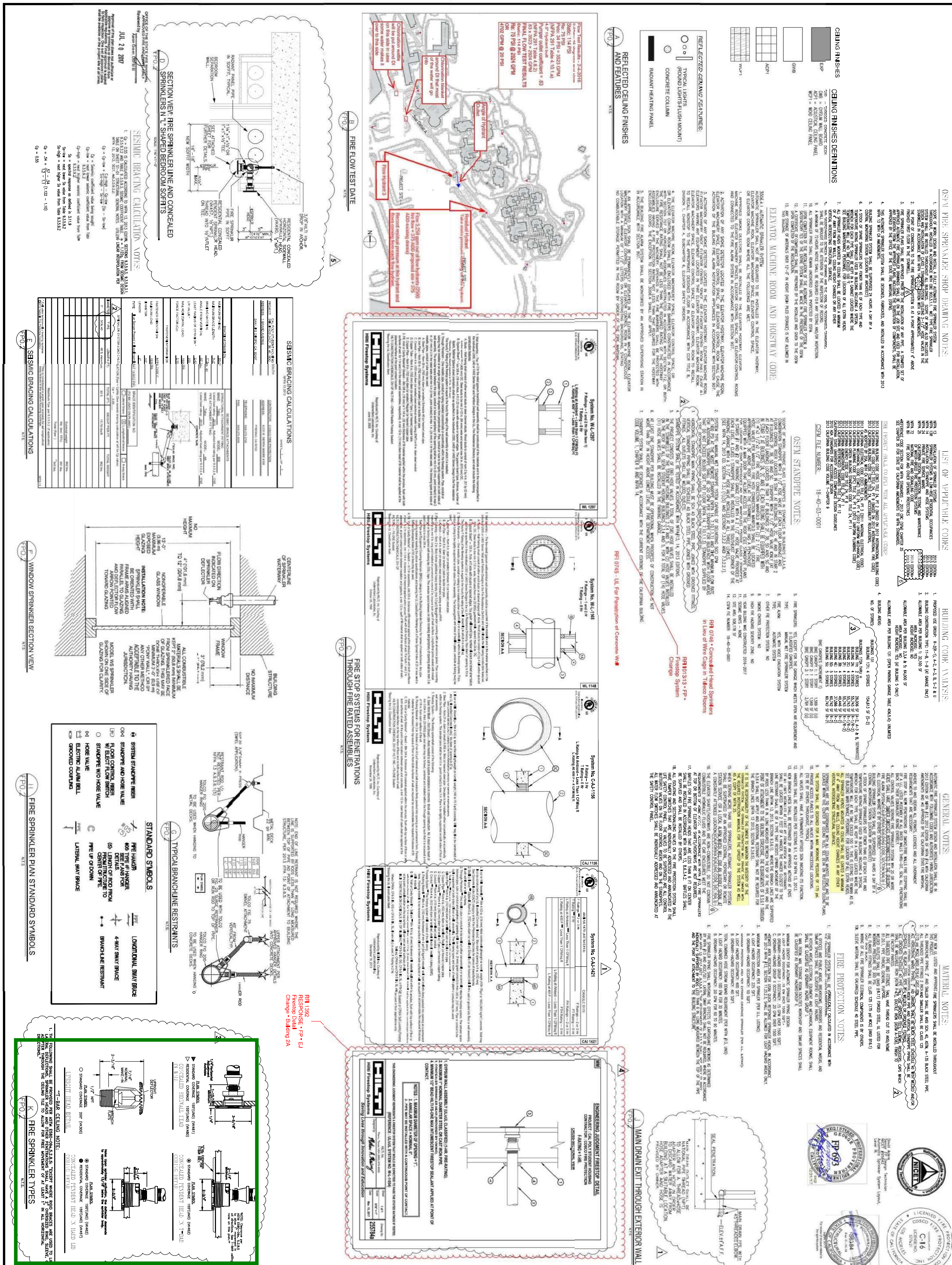
PROJECT: CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407
CONTRACT WITH: WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107
DRAWING TITLE: COVER SHEET AND UNDERGROUND FIRE SERVICE SITE PLAN

DATE: 10-24-16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP0.1 4



REVISIONS			
NO.	DESCRIPTION	DATE	BY
1	REPLACED HILTI FIRESTOP SYST. NO. C-AJ-1226 WITH HILTI FIRE STOP SYST. NO. C-AJ-1421. ADDED MAIN DRAIN EXIT DETAIL	1-26-17	D.A.
2	REVISED NOTES AND DETAILS TO REFLECT USE OF SCHEDULE 40 PIPE IN LIEU OF SCHEDULE 10.	2-6-17	D.A.
3	REVISED BUILDING SQUARE FOOTAGES. ADDED FIRE SPRINKLER TYPES.	2-13-17	D.A.
4	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEAD IN RATED WALL ASSEMBLY.	3-17-17	D.A.
5	REVISED DETAIL "D" PER RFI #513.	3-17-17	D.A.
6	REVISED PER BUREAU VERITAS REVIEW DATED 06-09-17	6-12-17	D.A.

SPRINKLER HEAD LEGEND	SYMBOL	S/N	ORIFICE	NPT	K-FACT	HEAD FINISH	ESCUT. TYPE	ESCUTCH FINISH	TEMP.	QUAN.

TOTAL SPRINKLERS =

COSCO Fire Protection
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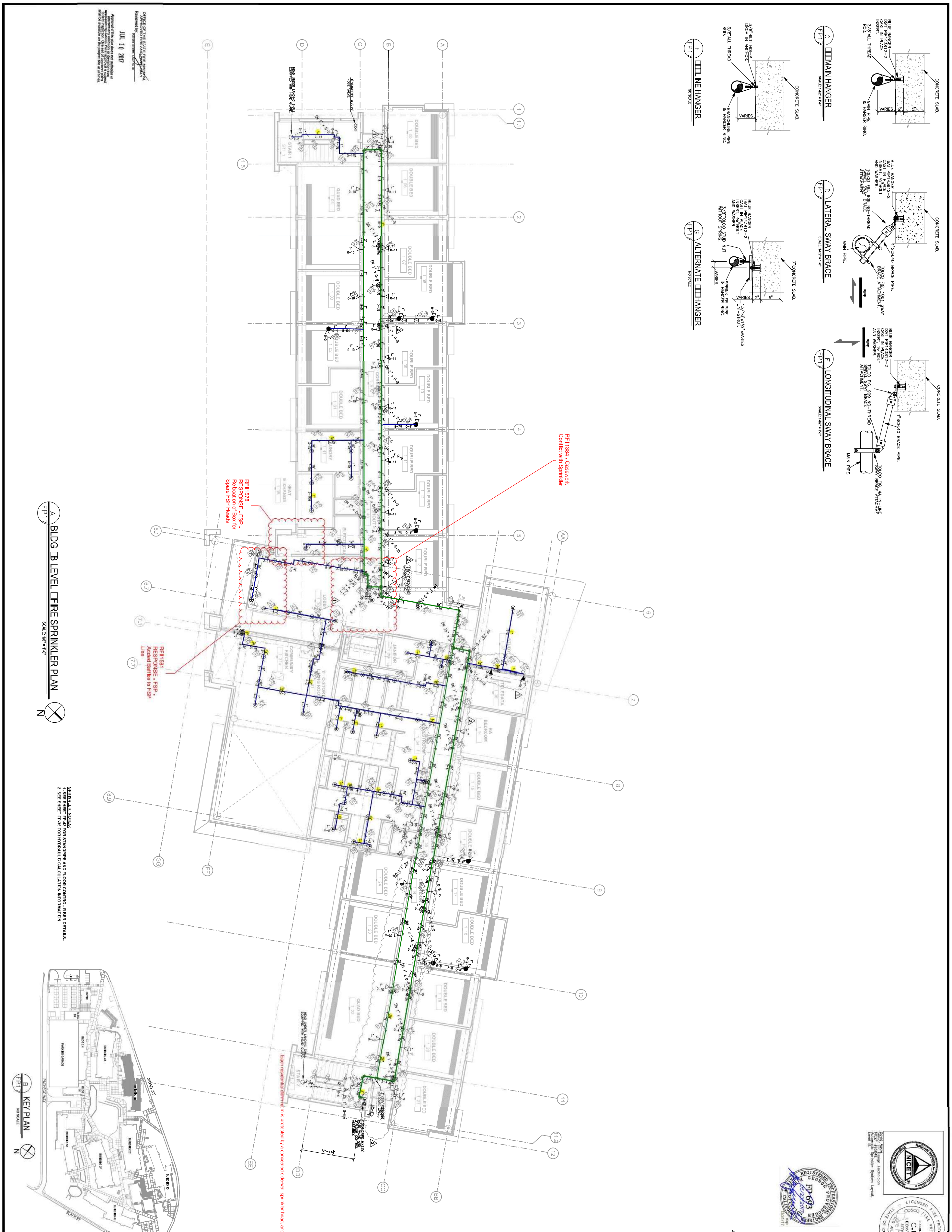
PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
FIRE PROTECTION NOTES AND DETAILS

DATE: 10-24-16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP-0.2
6



SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	7

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	⦿	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	49
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	-	-	200	2
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER	◐	TY3488	1/2"	1/2"	5.6	CHROME	-	-	200	8
VIKING QUICK RESPONSE PENDENT	◎	VK302	1/2"	1/2"	5.6	CHROME	-	-	175	26
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	28
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT	⊗	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	0
									TOTAL SPRINKLERS =	120

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	1.27.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	REVISED HEAD TEMPERATURES TO INTERMEDIATE PER OWNER'S REQUEST.	4.4.17	D.A.

Each residential dorm room is protected by a concealed sidewall sprinkler head, and the common areas are protected by concealed overhead

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 1 FIRE PROTECTION PLAN

DATE: 9.7.16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP17
3

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
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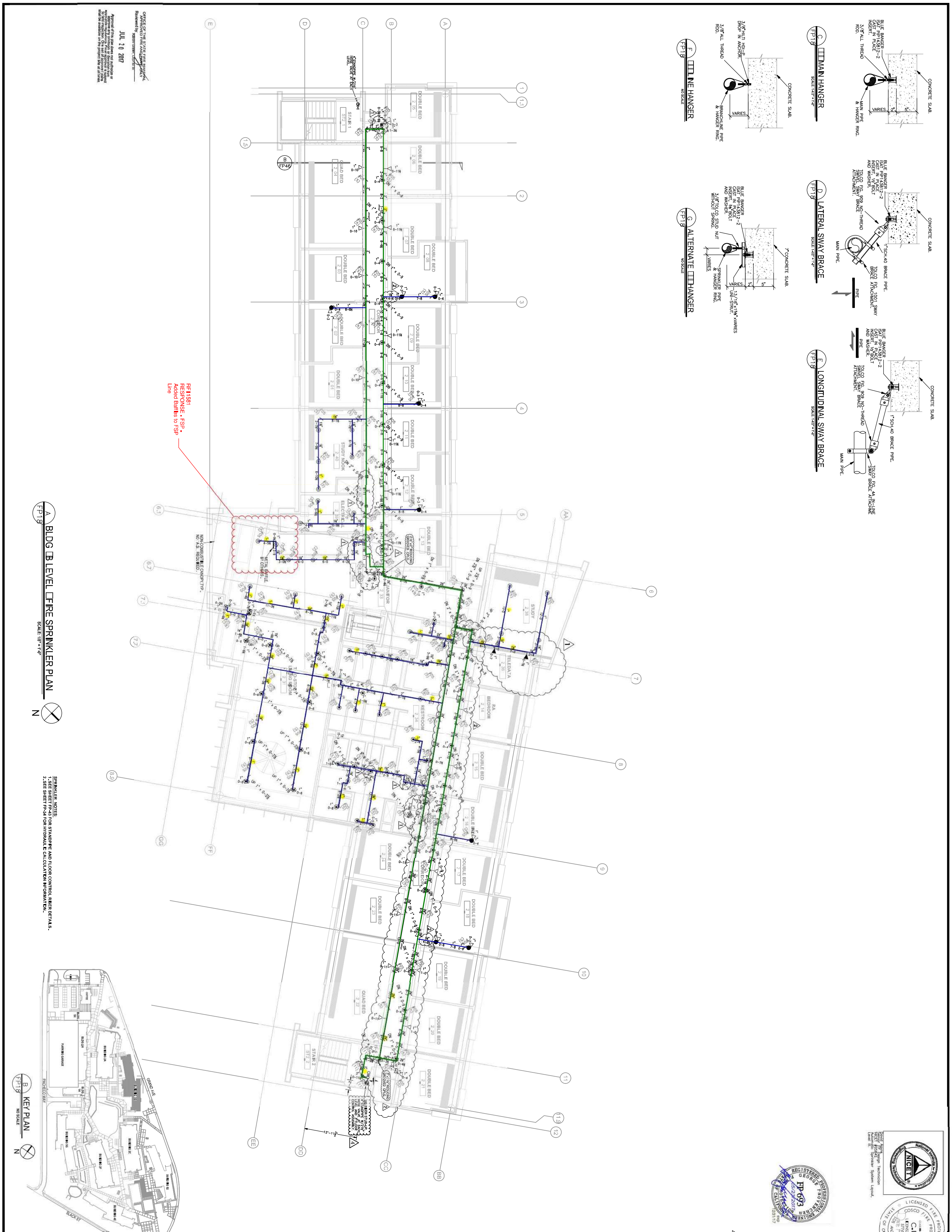

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	7

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	47
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	.	.	200	0
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER		TY3488	1/2"	1/2"	5.6	CHROME	.	.	200	10
VIKING QUICK RESPONSE PENDENT ON LINE	◎	VK302	1/2"	1/2"	5.6	CHROME	.	.	175	23
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	27
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT		VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	9
								TOTAL SPRINKLERS =		125

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.3.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEADER IN RATED WALL ASSEMBLY.	4.4.17	D.A.
4	CORRECTED MISSPELLING PER BV REVIEW, DATED 06.09.17	6.12.17	D.A.

SHEET NO. FP-18 | JOB NO. FC-1212 | DRAWN BY: DA | SCALE: AS SHOWN | DATE: 10.24.16 | Revision 4

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 2 FIRE PROTECTION PLAN

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS

FRESNO OFFICE
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Fresno, California 93722
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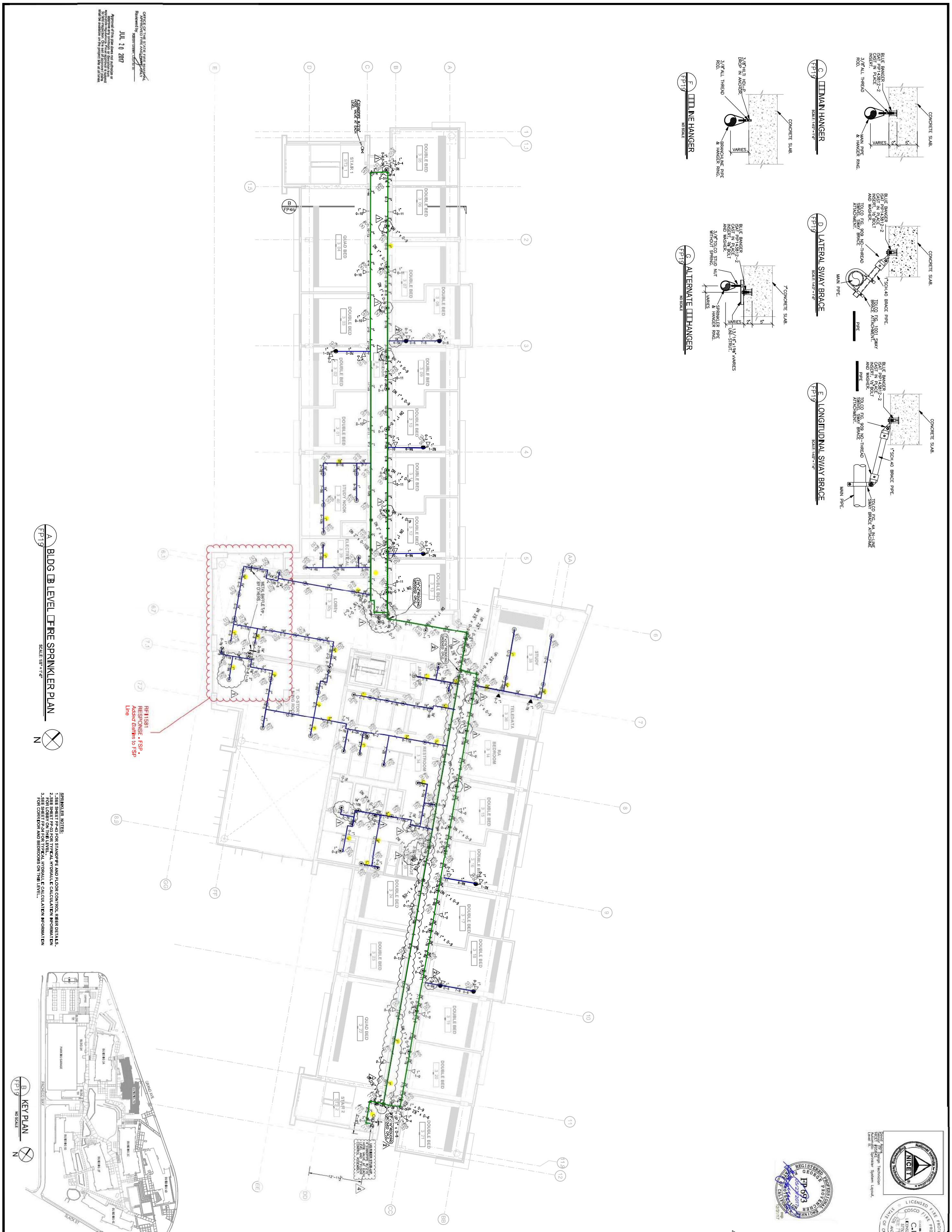

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	8

PROJECT: CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE SAN LUIS OBISPO, CALIFORNIA 93407
CONTRACT WITH: WEBCOR BUILDERS 207 KING STREET, SUITE 300 SAN FRANCISCO, CALIFORNIA 94107
DRAWING TITLE: BUILDING 3B LEVEL 3 FIRE PROTECTION PLAN

DATE: 10.24.16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP19
4

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
FRESNO OFFICE
4233 W. Sierra Madre, Suite 108
Fresno, California 93722
call (559) 275.3795 • fax (559) 275.8006
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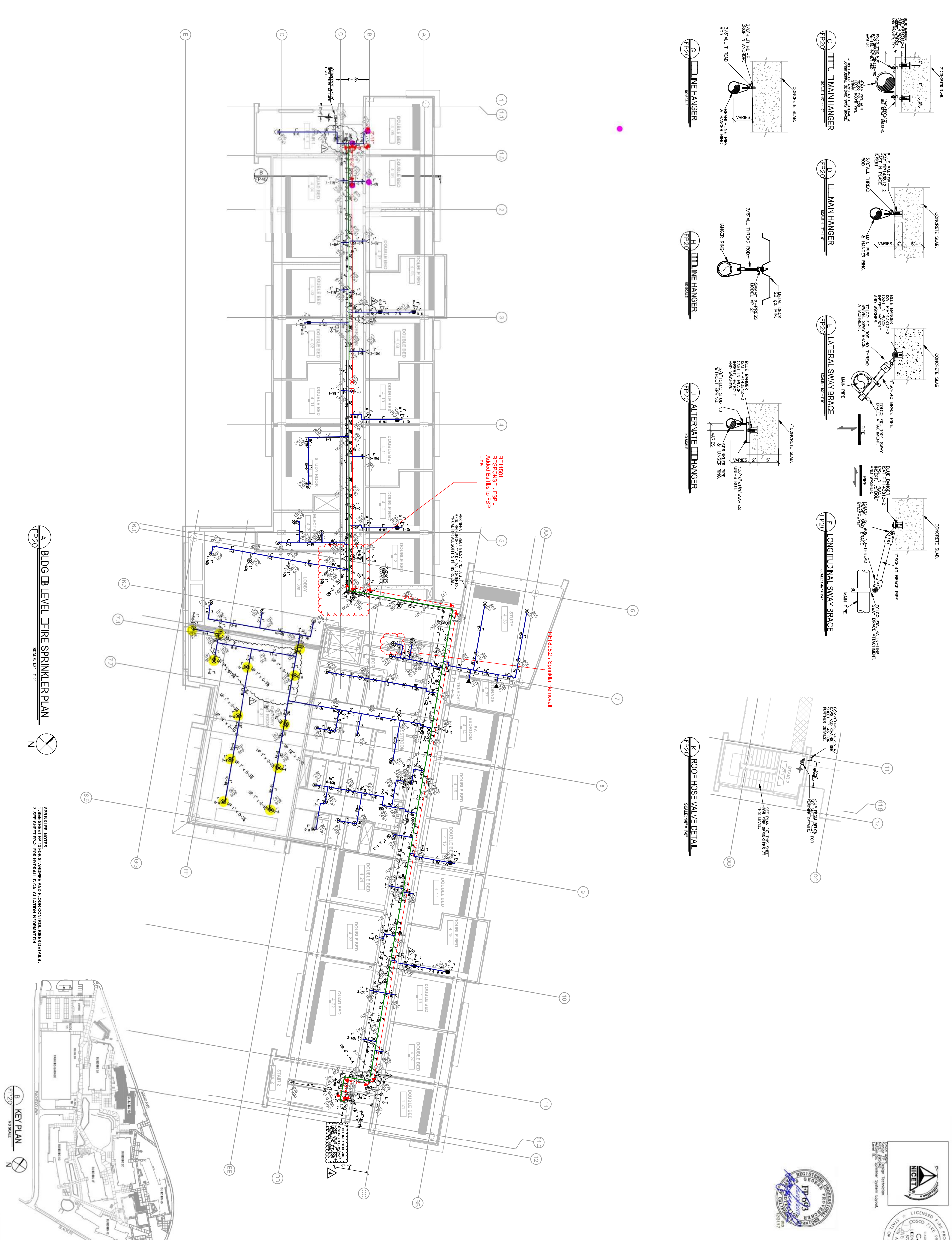
SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	46
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	.	.	200	0
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER		TY3488	1/2"	1/2"	5.6	CHROME	.	.	200	10
VIKING QUICK RESPONSE PENDENT	◎	VK302	1/2"	1/2"	5.6	CHROME	.	.	175	32
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	32
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT		VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	0
								TOTAL SPRINKLERS =		130

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.3.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEAD IN RATED WALL ASSEMBLY.	4.4.17	D.A.
4	CORRECTED MISSPELLING PER BV REVIEW, DATED 06.09.17	6.12.17	D.A.



SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	8

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	42
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	-	-	200	4
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER	◐	TY3488	1/2"	1/2"	5.6	CHROME	-	-	200	10
VIKING QUICK RESPONSE PENDENT ON LINE	◎	VK302	1/2"	1/2"	5.6	CHROME	-	-	175	19
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	32
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT	⊗	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	9
								TOTAL SPRINKLERS = 126		

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.17.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL [?] SIDEWALL HEAD IN [?] RATED WALL ASSEMBLY.	4.4.17	D.A.
4	CORRECTED MISSPELLING PER BV REVIEW, DATED 06.09.17	6.12.17	D.A.

LICENSED FIRE PROTECTION CONTRACTOR – COSCO FIRE PROTECTION INC. – LOS ANGELES – CLASSIFICATION C-16 – LICENSE NO. 577621 – STATE OF CALIFORNIA

DATE: 10.24.16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP20
4

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 4 FIRE PROTECTION PLAN

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
FRESNO OFFICE
California C-16
LIC. # 577621
4233 W. Sierra Madre, Suite 108
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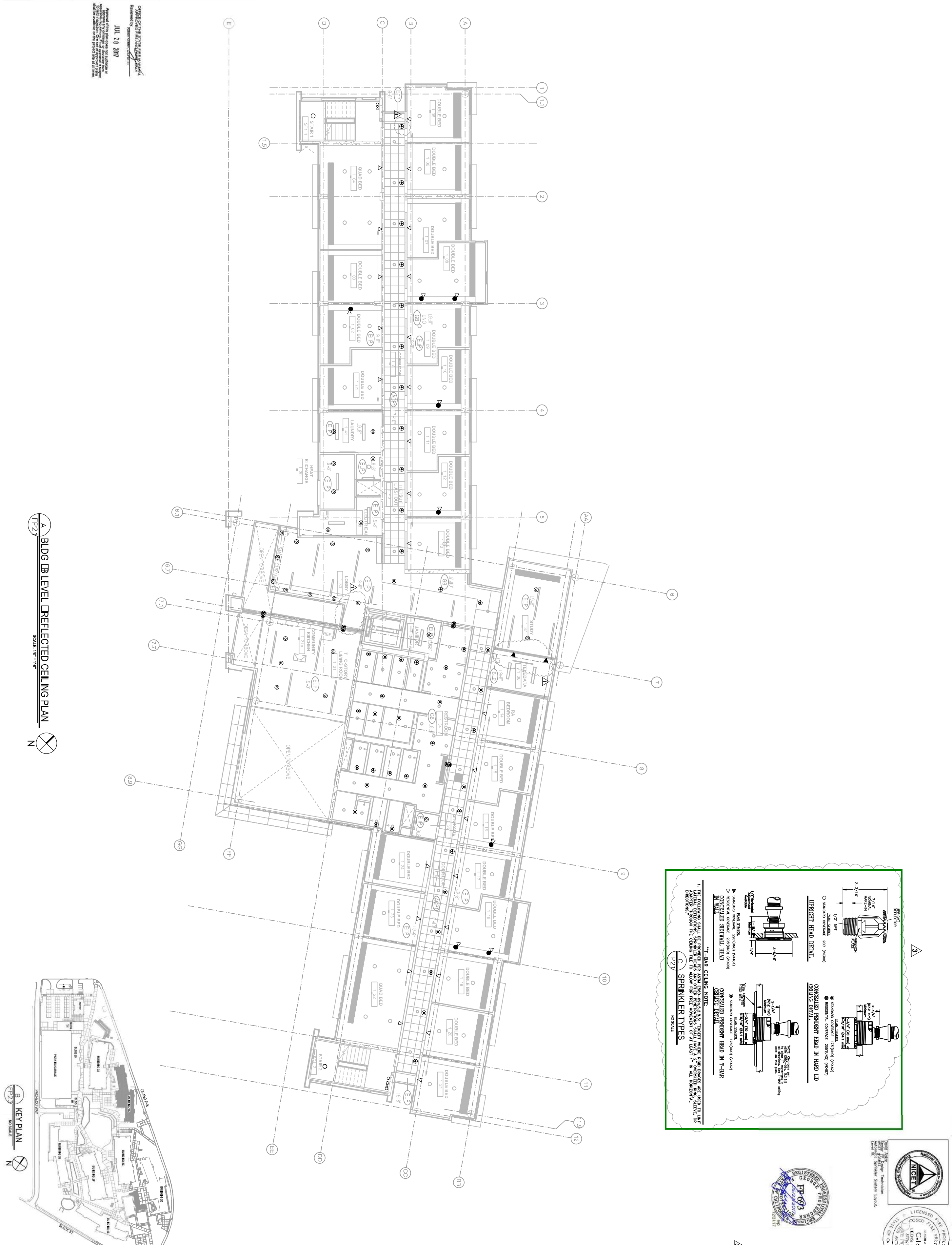

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1" SCH.40	SYMBOL	S/N	ORIFICE	NPT	K. FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	7

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1" SCH.40	SYMBOL	S/N	ORIFICE	NPT	K. FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	49
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	.	.	200	2
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER		TY3488	1/2"	1/2"	5.6	CHROME	.	.	200	8
VIKING QUICK RESPONSE PENDENT	◎	VK302	1/2"	1/2"	5.6	CHROME	.	.	175	26
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	28
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT		VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	0
								TOTAL SPRINKLERS =		120

DATE: 10.24.16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP21 (3)

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 1 REFLECTED CEILING PLAN

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
California C-16
LIC. # 577621
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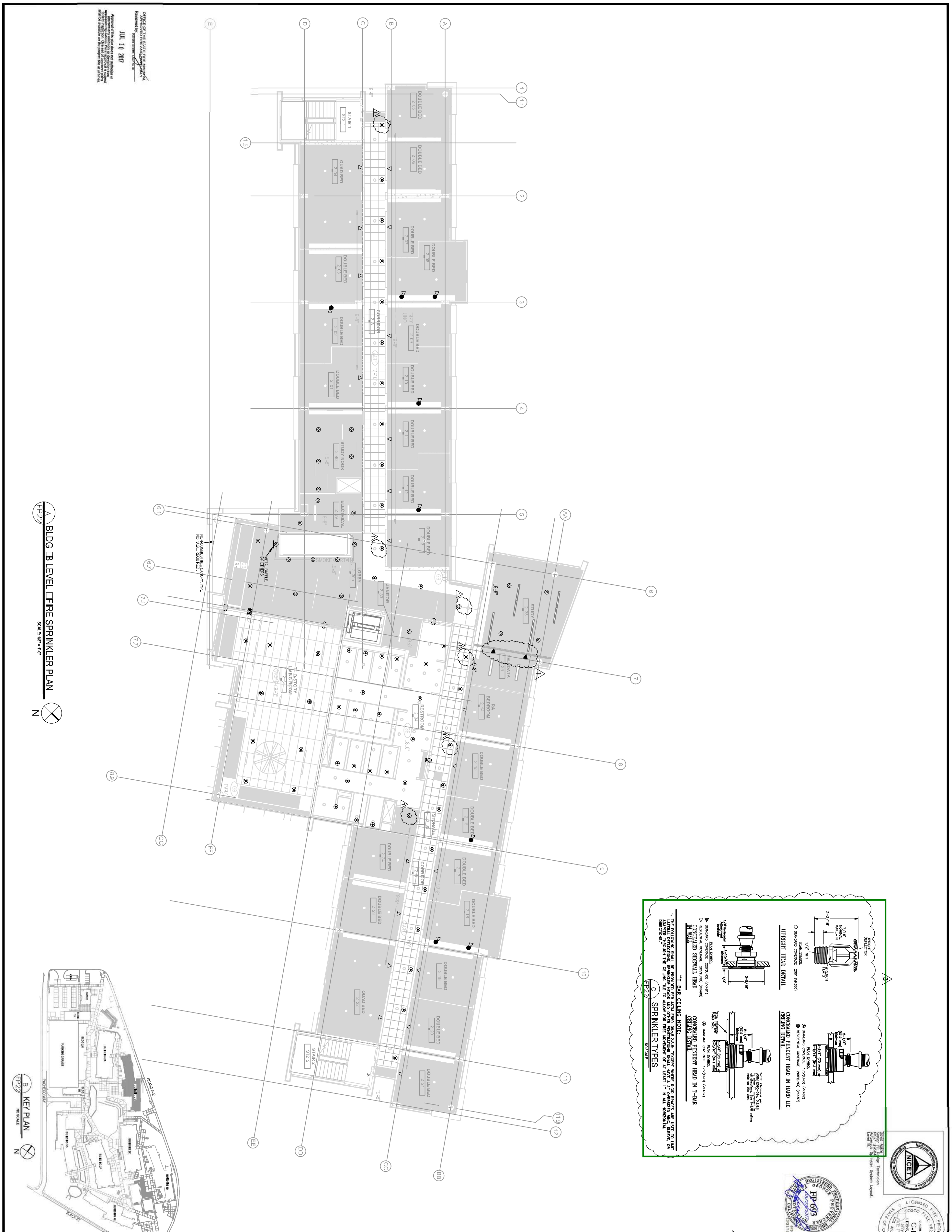
REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	1.27.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED SPRINKLER TYPES DETAILS. REVISED HEAD TEMPERATURES TO INTERMEDIATE PER OWNER'S REQUEST.	4.4.17	D.A.



SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1" SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	7

PROJECT:	
CAL POLY STUDENT HOUSING SOUTH 1 GRAND AVENUE SAN LUIS OBISPO, CALIFORNIA 93407	DATE: 10.24.16
CONTRACT WITH: WEBCOR BUILDERS 207 KING STREET, SUITE 300 SAN FRANCISCO, CALIFORNIA 94107	SCALE: AS SHOWN
DRAWING TITLE BUILDING 3B LEVEL 2 FIRE PROTECTION PLAN	DRAWN BY: DA
	JOB NO. FC-1212
	SHEET NO. FP-22 (3)

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California C-16
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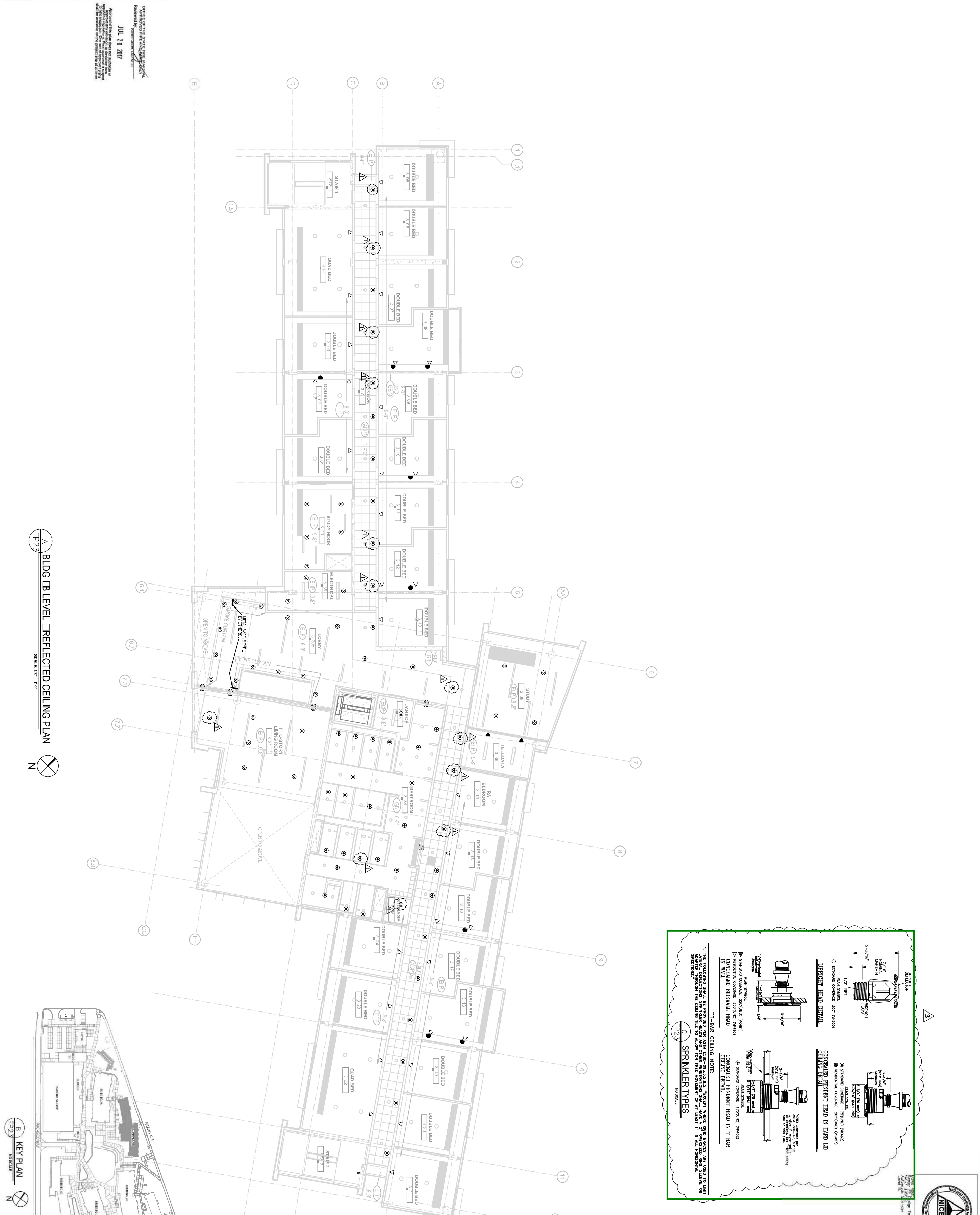
SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1" SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	47
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	-	-	200	0
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER	◐	TY3488	1/2"	1/2"	5.6	CHROME	-	-	200	10
VIKING QUICK RESPONSE PENDENT ON LINE	◎	VK302	1/2"	1/2"	5.6	CHROME	-	-	175	23
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK480	1/2"	1/2"	4.0	BRASS	CONCEAL PLATE	WHITE	205	27
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT	⊗	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	9
								TOTAL SPRINKLERS =		125

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.3.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEAD IN RATED WALL ASSEMBLY.	4.4.17	D.A.



SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	155	8

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K.FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	155	46
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	-	-	200	0
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER	◐	TY3488	1/2"	1/2"	5.6	CHROME	-	-	155	10
VIKING QUICK RESPONSE PENDENT ON LINE	◎	VK302	1/2"	1/2"	5.6	CHROME	-	-	155	32
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK480	1/2"	1/2"	4.0	BRASS	CONCEAL PLATE	WHITE	165	32
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	165	2
VIKING QUICK RESPONSE CONCEALED PENDENT	⊗	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	155	0
								TOTAL SPRINKLERS =		130

SHEET NO. FP23 △3

JOB NO. FC-1212

DRAWN BY: DA

SCALE: AS SHOWN

DATE: 10.24.16

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 3 REFLECTED CEILING PLAN

COSCO Fire Protection
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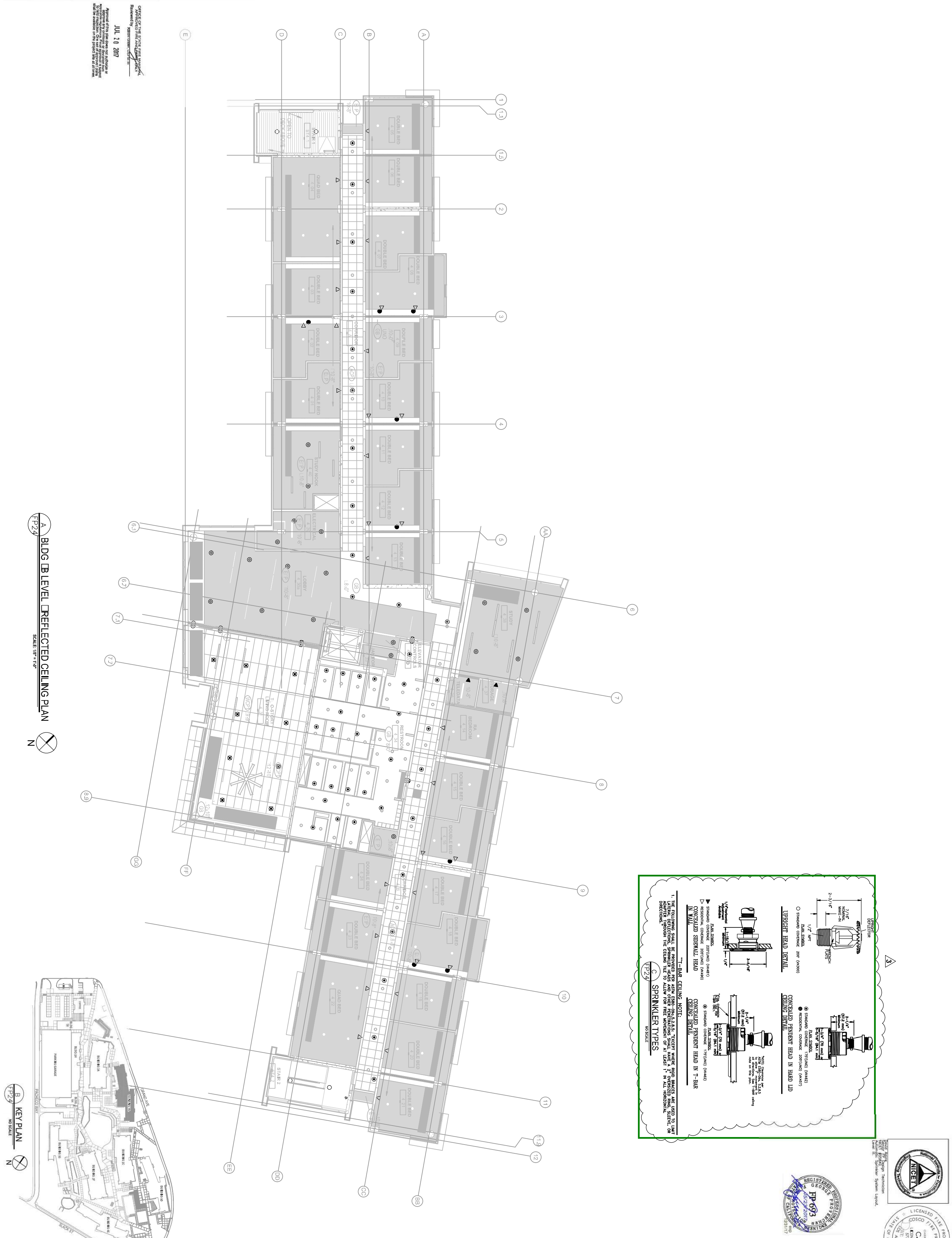
REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.3.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEAD IN RATED WALL ASSEMBLY.	4.4.17	D.A.



SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESP. RESIDENTIAL CONCEALED PENDENT	●	VK457	1/2"	1/2"	4.9	BRASS	CONCEAL PLATE	WHITE	205	8

SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1"SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.
VIKING QUICK RESPONSE CONCEALED PENDENT	◉	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	WHITE	175	42
VIKING QUICK RESPONSE UPRIGHT	○	VK300	1/2"	1/2"	5.6	BRASS	.	.	200	4
TYCO MODEL WS VERT. SIDEWALL WINDOW SPRINKLER	◐	TY3488	1/2"	1/2"	5.6	CHROME	.	.	200	10
VIKING QUICK RESPONSE PENDENT ON LINE	◎	VK302	1/2"	1/2"	5.6	CHROME	.	.	175	19
VIKING Q.R. RESIDENTIAL CONCEALED HOR. SIDEWALL	◁	VK490	1/2"	1/2"	5.8	BRASS	CONCEAL PLATE	WHITE	205	32
VIKING QUICK RESPONSE CONCEALED HOR. SIDEWALL	◀	VK481	1/2"	1/2"	5.6	CHROME	CONCEAL PLATE	WHITE	220	2
VIKING QUICK RESPONSE CONCEALED PENDENT	⊠	VK462	1/2"	1/2"	5.6	BRASS	CONCEAL PLATE	BRUSHED CHROME	175	9
								TOTAL SPRINKLERS =		126

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	COORDINATION REVISION	2.17.17	D.A.
2	REVISIONS PER DESIGN INTENT REQUIREMENTS FOR SCH. 40 PIPE AND 20% HYDRAULIC CALCULATION CUSHION.	2.27.17	D.A.
3	ADDED ENGINEERED FIRESTOP DETAIL FOR HORIZONTAL SIDEWALL HEAD IN RATED WALL ASSEMBLY.	4.4.17	D.A.

SHEET NO. FP24 3

JOB NO. FC-1212

DRAWN BY : DA

SCALE : AS SHOWN

DATE : 10.24.16

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
BUILDING 3B LEVEL 4 REFLECTED CEILING PLAN

COSCO Fire Protection
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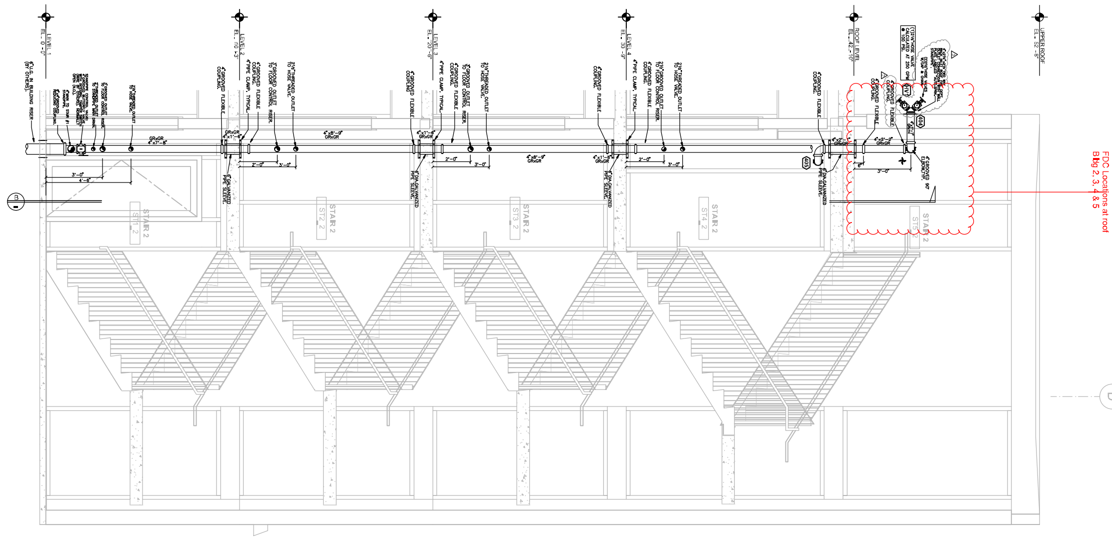
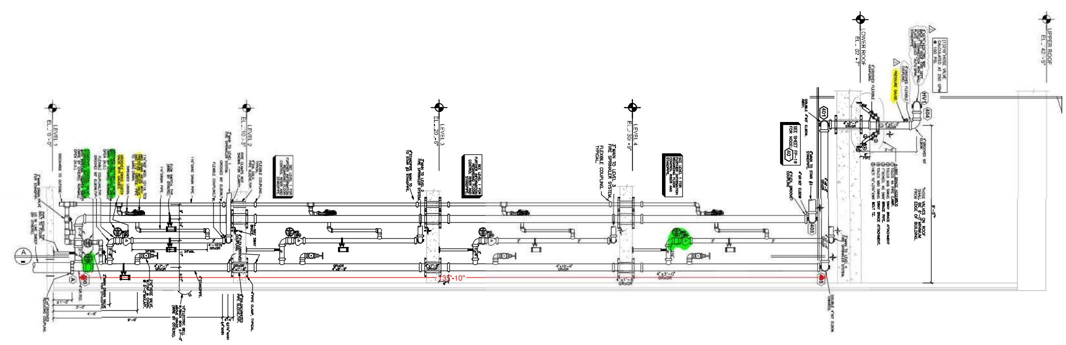
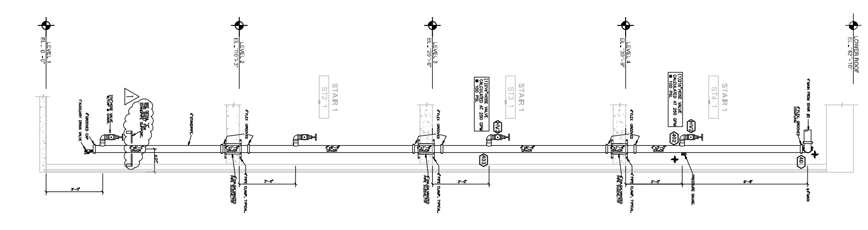


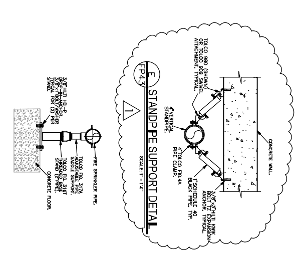
A TYPICAL SECTION VIEW: BUILDING 3B STAIR 2 STANDPIPE PLAN
FP-43 SCALE: 1/2" = 1'-0"



B TYPICAL SECTION VIEW: BUILDING 3B STAIR 2 STANDPIPE PLAN
FP-43 SCALE: 1/2" = 1'-0"



C TYPICAL SECTION VIEW: BUILDING 3B STAIR 1 STANDPIPE PLAN
FP-43 SCALE: 1/2" = 1'-0"



D FLOOR STAND DETAIL
E STANDPIPE SUPPORT DETAIL

PROJECT:
CAL POLY STUDENT HOUSING SOUTH
1 GRAND AVENUE
SAN LUIS OBISPO, CALIFORNIA 93407

CONTRACT WITH:
WEBCOR BUILDERS
207 KING STREET, SUITE 300
SAN FRANCISCO, CALIFORNIA 94107

DRAWING TITLE
STANDPIPE PLAN FOR BUILDING 3B

DATE: 10.24.16
SCALE: AS SHOWN
DRAWN BY: DA
JOB NO. FC-1212
SHEET NO. FP-43
3

COSCO Fire Protection
FIRE PROTECTION AND LIFE SAFETY SPECIALISTS
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SPRINKLER HEAD LEGEND : *ALL DROPS TO HEADS SHALL BE 1" SCH.40	SYMBOL	S/N	ORIFICE	NPT	K-FACT.	HEAD FINISH	ESCUT. TYPE	ESCUTCH. FINISH	TEMP.	QUAN.

TOTAL SPRINKLERS =

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	ADDED STANDPIPE SUPPORT DETAIL	3._.17	D.A.
2	FIELD OR COORDINATION REVISION	3._.17	D.A.
3	REVISED ROOF HOSE VALVE OUTLET FROM 2-WAY ANGLE INLET TO 2-WAY BACK OUTLET AS SHOWN IN APPROVED PRODUCT SUBMITTAL	3._.17	D.A.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Project name:			FPE 523 Project, Most Remote Sprinkler Branch Lines - 4th Floor											Date:		3/20/2019
2	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	D = 0.1 gpm/ft^2 k = 5.8
3				q			45 Elb - 1	L	3.75	C=	140	Pt	19.5	Pt			Q = (16x16) * 0.1 = 60gpm
4	1		Spkl. 2			1.049		F	1			Pe	0.0	Pv		Q=	25.6
5				Q	25.6			T	4.75	pf	0.154	Pf	0.7	Pn		Pt=	19.5
6				q	25.2			L	1	C=	140	Pt	20.2	Pt			q = k*(Pt)^0.5
7	2		Spkl. 2			1.049		F	0			Pe	0.0	Pv			q = 5.6*(122.5^0.5) = 62
8				Q	50.8			T	1	pf	0.548	Pf	0.5	Pn			
9			BL1	q	25.5			L	9.166667	C=	140	Pt	20.8	Pt			Kbl = Q/(Pt^0.5)
10	3		to			1.049		F	0			Pe		Pv			
11			BL 2	Q	76.3			T	9.166667	pf	1.165	Pf	10.7	Pn		Kbl=	11.1
12			BL 2	q	62.5		45 Elb - 3	L	98.83333	C=	140	Pt	31.4	Pt			
13	4		to			2.469		F	3			Pe		Pv			
14			Core	Q	138.8			T	101.8333	pf	0.055	Pf	5.6	Pn			
15			Core	q				L	4.333333	C=	140	Pt	37.0	Pt			
16	5		to			2.469		F	20			Pe		Pv			
17			Reducer	Q	138.8			T	24.33333	pf	0.055	Pf	1.3	Pn			
18			Reducer	q			45 Elb - 3	L	136.5	C=	140	Pt	38.3	Pt			
19	6		to			3.068	T - 15	F	18			Pe		Pv			
20			East Hlwy	Q	138.8			T	154.5	pf	0.019	Pf	2.9	Pn			
21			East Hlwy	q			90 Elb - 7	L	12.58333	C=	140	Pt	41.2	Pt			
22	7		to			3.068	90 Elb - 7	F	14			Pe		Pv			
23			TOR	Q	138.8			T	26.58333	pf	0.019	Pf	0.5	Pn			
24			TOR - 4th	q			Butfly - 12	L	135.8333	C=	140	Pt	41.7	Pt			
25	8		to			4.026	Butfly - 12	F	24			Pe	58.8	Pv			
26			BOR	Q	138.8			T	159.8333	pf	0.005	Pf	0.8	Pn			
27				q				L		C=		Pt	101.4	Pt			
28	9							F				Pe		Pv			
29				Q				T		pf		Pf		Pn			
30				q				L		C=		Pt		Pt			
31	10							F				Pe		Pv			
32				Q				T		pf		Pf		Pn			
33				q				L		C=		Pt		Pt			
34	11							F				Pe		Pv			
35				Q				T		pf		Pf		Pn			
36				q				L		C=		Pt		Pt			
37	12							F				Pe		Pv			
38				Q				T		pf		Pf		Pn			
39				q				L		C=		Pt		Pt			
40								F				Pe		Pv			
41				Q				T		pf		Pf		Pn			
42				**q**				**L**		**C=**		**Pt**		**Pt**			
43								**F**				**Pe**		**Pv**			
44				**Q**				**T**		**pf**		**Pf**		**Pn**			

Appendix D

RFI 1557 RESPONSE - FA - 4E
Drawings

PROJECT DESCRIPTION

BUILDING 131 – PARKING STRUCTURE
1. OCCUPANCY CLASSIFICATION AND USE — S-2 PARKING GARAGE; S-1 STORAGE RM.
2. BUILDING CONSTRUCTION TYPE — TYPE IB
3. Number of stories — 4 TIERS
4. Actual building height — 29' 10"
5. Building area in Square Feet — 36,521 SF
6. Area of project in Square Feet (i.e. T-I) — 154,613 SF
7. Separated or Non-separated Use — SEPARATED
8. Allowable area per (CBC) — 79,000 SF
9. Area increase — NO
10. Height increase — NO
11. Fire Sprinklers (Y or N) — NO
 Type: (Wet, Dry, Pre-action or Deluge) N/A
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 759
 LOWER LEVEL: 168; LEVEL 1: 183; LEVEL 2: 183; LEVEL 3: 183; LEVEL 4: 42
16. Year building was constructed — N/A NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

BUILDING 1H
1. Occupancy classification and use — A-2, A-3 ASSEMBLY B, BUSINESS
2. Building construction type — TYPE IIB
3. Number of stories — 2
4. Actual building height — 32'0"
5. Building area in Square Feet — 24,940 SF
6. Area of project in Square Feet (i.e. T-I) — 555,385 SF
7. Separated or Non-separated Use — SEPARATED
8. Allowable area per (CBC) — 65,000 SF
9. Area increase — YES
10. Height increase — YES
11. Fire Sprinklers (Y or N) — YES
 Type: (Wet, Dry, Pre-action or Deluge) WET, MANUAL SYSTEM
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC SYSTEM
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 1070
 LEVEL 0: 3; LEVEL 1: 990; LEVEL 2: 77;
16. Year building was constructed — NA/NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

BUILDING 2A, 2C & 2F
1. Occupancy classification and use — R-1, R-2 RESIDENTIAL DORMITORY
2. Building construction type — TYPE IIB
3. Number of stories — 4
4. Actual building height — 51'7"
5. Building area in Square Feet — 55,743 SF
6. Area of project in Square Feet (i.e. T-I) — 560,225 SF
7. Separated or Non-separated Use — NON-SEPARATED
8. Allowable area per (CBC) — 96,000 SF
9. Area increase — YES
10. Height increase — NO
11. Fire Sprinklers (Y or N) — YES
 Type: (Wet, Dry, Pre-action or Deluge) WET, MANUAL SYSTEM
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC SYSTEM
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 1076
 LEVEL 1: 275; LEVEL 2: 263; LEVEL 3: 312; LEVEL 4: 253
16. Year building was constructed — N/A NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

BUILDING 3B
1. Occupancy classification and use — R-2 RESIDENTIAL DORMITORY
2. Building construction type — TYPE IIB
3. Number of stories — 4
4. Actual building height — 52'8"
5. Building area in Square Feet — 49,146 SF
6. Area of project in Square Feet (i.e. T-I) — 560,225 SF
7. Separated or Non-separated Use — NON-SEPARATED
8. Allowable area per (CBC) — 96,000 SF
9. Area increase — YES
10. Height increase — NO
11. Fire Sprinklers (Y or N) — YES
 Type: (Wet, Dry, Pre-action or Deluge) WET, MANUAL SYSTEM
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC SYSTEM
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 995
 LEVEL 1: 243; LEVEL 2: 224; LEVEL 3: 283; LEVEL 4: 245
16. Year building was constructed — N/A NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

BUILDING 4E
1. Occupancy classification and use — R-2 RESIDENTIAL DORMITORY
2. Building construction type — TYPE IIB
3. Number of stories — 3
4. Actual building height — 42'5"
5. Building area in Square Feet — 37,066 SF
6. Area of project in Square Feet (i.e. T-I) — 560,225 SF
7. Separated or Non-separated Use — NON-SEPARATED
8. Allowable area per (CBC) — 96,000 SF
9. Area increase — YES
10. Height increase — NO
11. Fire Sprinklers (Y or N) — YES
 Type: (Wet, Dry, Pre-action or Deluge) WET, MANUAL SYSTEM
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC SYSTEM
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 720
 LEVEL 1: 241; LEVEL 2: 216; LEVEL 3: 263
16. Year building was constructed — N/A NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

BUILDING 5D & 5G
1. Occupancy classification and use — R-2, RESIDENTIAL DORMITORY
2. Building construction type — TYPE IIA
3. Number of stories — 5
4. Actual building height — 62'11"
5. Building area in Square Feet — 60,742 SF
6. Area of project in Square Feet (i.e. T-I) — 560,225 SF
7. Separated or Non-separated Use — NON-SEPATAYED
8. Allowable area per (CBC) — 80,640 SF
9. Area increase — NO
10. Height increase — YES
11. Fire Sprinklers (Y or N) — YES
 Type: (Wet, Dry, Pre-action or Deluge) WET, MANUAL SYSTEM
12. Fire Alarm (Y or N) — YES
 Type: (Manual, Automatic, etc.) — AUTOMATIC SYSTEM
13. Other Fire Protection System, if any (Y or N) NO
14. Smoke Control System (Y or N) — NO
15. Occupant load for entire building and each floor TOTAL OCCUPANT LOAD 1255
 LEVEL 1: 237; LEVEL 2: 205; LEVEL 3: 287; LEVEL 4: 241; LEVEL 5: 285
16. Year building was constructed — N/A NEW CONSTRUCTION
17. In a High Fire Hazard Severity Zone? (Y or N) NO
18. Seismic Joints (Y or N) if yes, provide location NO
19. Emergency Responder Radio Coverage (Y or N) YES, CBC 2013 510

CABLE DESIGNATIONS

2 L 1 — LOOP/CIRCUIT; CABLE TYPE; CABLE QTY

NOTE: REFER TO CABLE SCHEDULE FOR CABLE TYPE SPECIFICATIONS

SLC DEVICE LABEL

L1M001 — SIGNALING LINE CIRCUIT (LOOP) NUMBER; DEVICE TYPE (D = DETECTOR, M = MODULE); DEVICE NUMBER

NAC DEVICE LABEL

S1-1 — NOTIFICATION APPLIANCE CIRCUIT NUMBER; DEVICE NUMBER

DRAWING INDEX

SHEET:	DESCRIPTION:
FA0-01	NOTE, CODES & DRAWINGS INDEX
FA0-02	MATERIAL LIST & SEQUENCE OF OPERATION
FA0-03	SITE PLAN
FA0-04	SITE PLAN-NORTH UNDERGROUND
FA1-00A	BUILDING 131 – PARTIAL FLOOR PLAN LOWER LEVEL NORTH
FA1-00B	BUILDING 131 – PARTIAL FLOOR PLAN LOWER LEVEL SOUTH
FA1-01A	BUILDING 131 – PARTIAL FLOOR PLAN GROUND LEVEL NORTH
FA1-01B	BUILDING 131 – PARTIAL FLOOR PLAN GROUND LEVEL SOUTH
FA1-02A	BUILDING 131 – PARTIAL FLOOR PLAN SECOND LEVEL NORTH
FA1-02B	BUILDING 131 – PARTIAL FLOOR PLAN SECOND LEVEL SOUTH
FA1-03A	BUILDING 131 – PARTIAL FLOOR PLAN THIRD LEVEL NORTH
FA1-03B	BUILDING 131 – PARTIAL FLOOR PLAN THIRD LEVEL SOUTH
FA1-04A	BUILDING 131 – PARTIAL FLOOR PLAN FOURTH LEVEL NORTH
FA1-04B	BUILDING 131 – PARTIAL FLOOR PLAN FOURTH LEVEL SOUTH
FA1H-00	BUILDING 1H – CENTRAL PLANT & KIOSK
FA1H-01A	BUILDING 1H – PARTIAL FLOOR PLAN GROUND LEVEL NORTH
FA1H-01B	BUILDING 1H – PARTIAL FLOOR PLAN GROUND LEVEL SOUTH
FA1H-02A	BUILDING 1H – PARTIAL FLOOR PLAN SECOND LEVEL NORTH
FA1H-02B	BUILDING 1H – PARTIAL FLOOR PLAN SECOND LEVEL SOUTH
FA2A-01	BUILDING 2A, 2C, 2F – FIRST & SECOND FLOOR PLAN
FA2A-02	BUILDING 2A, 2C, 2F – THIRD & FOURTH FLOOR PLAN
FA2A-02A	BUILDING 2A – FOURTH FLOOR PLAN
FA2A-03	BUILDING 2A, 2C, 2F – ROOF PLAN
FA3-01	BUILDING 3B – FIRST & SECOND FLOOR PLAN
FA3-02	BUILDING 3B – THIRD & FOURTH FLOOR PLAN
FA3-03	BUILDING 3B – ROOF PLAN
FA4-01	BUILDING 4E – FIRST & SECOND FLOOR PLAN
FA4-02	BUILDING 4E – THIRD FLOOR & ROOF PLAN
FA5A-01	BUILDING 5D, 5G – FIRST & SECOND FLOOR PLAN
FA5A-02	BUILDING 5D, 5G – THIRD & FOURTH FLOOR PLAN
FA5A-03	BUILDING 5D, 5G – FIFTH FLOOR & ROOF PLAN
FA6-01A	BUILDINGS 131 & 1H – RISER DIAGRAM
FA6-01B	BUILDINGS 2A – RISER DIAGRAM
FA6-01C	BUILDINGS 2C – RISER DIAGRAM
FA6-02A	BUILDINGS 2F – RISER DIAGRAM
FA6-02B	BUILDINGS 3B – RISER DIAGRAM
FA6-02C	BUILDINGS 4E – RISER DIAGRAM
FA6-03A	BUILDINGS 5D – RISER DIAGRAM
FA6-03B	BUILDINGS 5G – RISER DIAGRAM
FA7-01	CALCULATIONS
FA7-02	CALCULATIONS
FA7-02A	CALCULATIONS
FA7-03	CALCULATIONS
FA7-04	CALCULATIONS
FA7-05	CALCULATIONS
FA8-01	DETAILS – ELECTRICAL ROOM LAYOUTS
FA8-02	DETAILS – ELECTRICAL ROOM LAYOUTS
FA8-03	DETAILS – ELECTRICAL ROOM LAYOUTS
FA8-04	DETAILS – ELECTRICAL ROOM LAYOUTS
FA8-05A	DETAILS – ELECTRICAL ROOM LAYOUTS
FA8-05B	DETAILS – ELECTRICAL ROOM LAYOUTS
FA9-01	DETAILS

RFI 1627 - Dialer Communication to UPD

RFI 1627.1 - Revised Battery Calculations

PROJECT: FIRE ALARM SYSTEM

STUDENT HOUSING SOUTH
CAL POLY SAN LUIS OBISPO

1 GRAND AVENUE
SAN LUIS OBISPO, CA 93407

SCOPE OF WORK

FURNISH EQUIPMENT, CABLE AND DEVICES. FURNISH SHOP DRAWINGS, AND PROGRAMMING FOR A FIRE ALARM/CO DETECTION SYSTEM AS SHOWN ON THESE DRAWINGS.
SUPPLY AND INSTALL ADDRESSABLE AUTOMATIC COMPLETE SMOKE DETECTION SYSTEM WITH DIGITAL VOICE EVACUATION IN BUILDINGS 1H,2A,2C,2F,3B,4E,5D & 5G. PARKING STRUCTURE 131 SHALL CONSIST OF SPRINKLER MONITORING AND ELEVATOR RECALL.
NEW FIRE ALARM CONTROL PANELS WILL INTER CONNECT THROUGH A FIBER OPTIC NETWORK AND REPORT TO A NETWORK ANNUNCIATOR LOCATED IN BUILDING #172H. FIBER OPTIC NETWORK WILL EXTEND TO ADMINISTRATION BUILDING #1. FOR CONNECTION TO AN ONYX WORKSTATION AT UNIVERSITY POLICE DEPARTMENT.
NOTIFICATION PATHWAYS SHALL BE WIRED CLASS 'B'.
SIGNAL LINE PATHWAYS SHALL BE WIRED CLASS 'B'.
ENTIRE SYSTEM IS POWER LIMITED AND SHALL BE INSTALLED IN CONDUIT.

GENERAL NOTES

1. ALL WIRING, INITIATING DEVICES AND ANNUNCIATOR PANEL SHALL BE SUPERVISED TO THE PRINCIPAL POINT OF ANNUNCIATION (F/A PANEL TO SUPERVISE THE ANNUNCIATOR PANEL ALL CIRCUITS AND INITIATING DEVICES)
2. WIRE SHALL NOT BE LOOPED THROUGH DEVICES, BUT MUST BE CUT FOR EACH IN COMING AND OUT GOING WIRE.
3. POINT AND COMMON ANNUNCIATION AND T-TAPPING FOR NOTIFICATION APPLIANCES PROHIBITED.
4. ALL DEVICES IN THE ALARM SYSTEM SHALL BE COMPATIBLE AND INSTALLED TO MANUFACTURES SPECIFICATIONS
5. AUDIBILITY OF ALARM AND VOICE COMMUNICATION SHALL BE NOT LESS THAN 15 dBA ABOVE AMBIENT SOUND, BUT NOT LESS 75dBA THROUGH-OUT AREA OF ALARM.
6. AREA HAVING MORE THAN TWO(2) STROBES IN THE FIELD OF VIEW SHALL BE SYNCHRONIZED (2013 NFPA 72, 18.5.5.4.2(3)).
7. SMOKE DETECTORS AND HEAT DETECTOR LOCATIONS ARE BASED ON SMOOTH CEILING WITH MAXIMUM HEIGHT OF 10 FEET UNLESS OTHERWISE NOTED.
8. STROBE LOCATION IS BASED ON 10 FEET CEILING HEIGHT AND ARE INSTALLED ACCORDING TO NFPA-72 REQUIREMENTS UNLESS OTHERWISE NOTED. ANYTHING ABOVE 10 FEET SHALL BE DERATED PER NFPA 72.
9. WALL MOUNTED STROBES SHALL HAVE THEIR ENTIRE LENS NOT LESS THAN 80 INCHES ABOVE FINISHED FLOOR AND NO GREATER THAN 96 INCHES ABOVE FINISHED FLOOR.
10. STROBES IN SLEEPING AREAS SHALL BE LOCATED WITHIN 16 FEET OF PILLOW AND HAVE MINIMUM INTENSITY OF 110cd. FOR STROBES LOCATED LESS THAN 24 INCHES FROM CEILING, MINIMUM INTENSITY SHALL BE 177cd.
11. MANUAL PULL STATIONS SHALL BE MOUNTED AT 48 INCHES TOP OF OUTLET BOX PER 2013 CBC ADA CH 1136A.2 AND 1142A.2.
12. FIRE ALARM SIGNAL SHALL MEET ANSI S3.41, AUDIBLE EMERGENCY EVACUATION SIGNAL (TEMPORAL PATTERN).
13. ALL NEW WIRING, CONDUIT, INITIATING DEVICES, AND INDICATING DEVICES SHALL CONFORM TO: THE NATIONAL ELECTRICAL CODE (NEC) 2013, ARTICLE 760 OF THE CALIFORNIA EDITION; TITLE 24 2013, CALIFORNIA EDITION; THE NATIONAL FIRE PROTECTION ASSOCIATION (N.F.P.A.), STANDARD 72 2013 EDITION.
14. ALL NEW DEVICES SHOWN ON THIS FIRE / LIFE SAFETY SYSTEM PLAN SHALL BE TIED INTO THE FIRE ALARM SYSTEM. INSTALLATION SHALL CONFORM TO NEC ARTICLE 760.
15. ALL NEW DEVICES SHOWN AND SPECIFIED ON THIS FIRE / LIFE SAFETY SYSTEM PLAN SHALL BE APPROVED AND LISTED BY THE CALIFORNIA STATE FIRE MARSHAL.
16. FIRE ALARM SYSTEM INITIATION DEVICE CIRCUITS ARE RATED POWER LIMITED.
17. FIRE ALARM SYSTEM AUDIBLE AND VISUAL ALARM SIGNALING CIRCUITS ARE RATED POWER LIMITED.
18. NON ADDRESSABLE INITIATION DEVICE CIRCUITS, AUDIBLE AND VISUAL SIGNALING CIRCUITS ARE SUPERVISED. THEREFORE, POLARITY MUST BE OBSERVED AND NO T-TAPPING OR PARALLEL BRANCHING IS ALLOWED.
19. T-TAPPING OR PARALLEL BRANCHING OF ADDRESSABLE INITIATING DEVICE CIRCUITS IS PERMITTED ON CLASS B CIRCUIT ONLY.
20. SPRINKLER WATER FLOW AND SPRINKLER VALVE TAMPER SWITCHES SHALL BE IDENTIFIED SEPARATELY AND CONNECTED TO FIRE ALARM SYSTEM.
21. DOOR HOLDERS SHALL BE RELEASED BY ANY ALARM INITIATING DEVICE INCLUDING SMOKE DETECTORS; SMOKE DETECTOR SHALL BE ANNUNCIATED AND IDENTIFIED BY ZONE DETECTOR LOCATIONS SHALL BE PER NFPA-72 STANDARD.
22. PENETRATION THROUGH ANY FIRE-RATED ASSEMBLY SHALL BE PROTECTED BY A U. L. APPROVED THROUGH-PENETRATION FIRE-STOP SYSTEM.
23. ALL WIRE WILL BE 12/14 THHN STRANDED 600V, AND WILL BE RUN IN CONDUIT.
24. ALL WIRE RUNS ARE SHOWN DIAGRAMMATICALLY. EXACT LOCATION OF ALL EQUIPMENT TO BE DETERMINED IN THE FIELD.
25. WHERE SHIELDED CABLE IS USED, THE SHIELD SHALL BE CONTINUOUS AND GROUNDED ONLY AT THE RESPECTIVE CONTROL PANEL.
26. A CERTIFICATE OF COMPLIANCE SHALL BE PREPARED BY THE INSTALLER AND GIVEN TO F.D. UPON COMPLETION OF INSTALL/TESTING.
27. SMOKE DETECTORS SHALL NOT BE INSTALLED WITHIN A 36 INCH HORIZONTAL PATH FROM THE SUPPLY REGISTERS OF A FORCED AIR HEATING OR COOLING SYSTEM AND SHALL BE INSTALLED OUTSIDE OF THE DIRECT AIRFLOW FROM THOSE REGISTERS. (NFPA 72 2013 29.8.3.4(7))
28. ALL CEILING MOUNT SMOKE DETECTORS SHALL BE MOUNTED @ CENTER OF TILE AND 30 FEET (MAXIMUM) APART BETWEEN DEVICES IN OPEN SPACES.
29. WHERE THE DEPTH OF WALL SECTION ABOVE A DOOR IS 24" INCHES OR LESS, ONE CEILING MOUNTED DETECTOR SHALL BE REQUIRED ON ONE SIDE OF THE DOORWAY ONLY (NFPA 72, 2013 17.7.5.6.5.1(A)) THE SMOKE DETECTOR SHALL BE LOCATED A MAXIMUM OF 5 FEET FROM THE DOOR BUT NOT CLOSER THAN 12 INCHES.
30. ELECTRICAL TO PROVIDE PROVIDE 120VAC (2#12 THHN WITH 20A. CIRCUIT BREAKER FOR OVERCURRENT PROTECTION). PROVIDE LOCATION OF FIRE ALARM CONTROL PANEL DEDICATED CIRCUIT IN PANEL SCHEDULE(S).
31. THE DEPICTED CIRCUIT BREAKER PROVIDING POWER TO THE FACP AND POWER SUPPLIES SHALL BE IDENTIFIED AS "FIRE ALARM CIRCUIT" HAVE RED MARKING AND SHALL BE ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL. (NFPA 72 2013 10.6.5.2.5). SHOW MARKINGS, LABELING AND BREAKER LOCK AS REQUIRED BY 2013 CFB/CBC 907. 2013 NFPA 72 18.5 – ***SEE STRUCTURAL DETAILS.
32. MONITORING SHALL BE PROVIDED BY TRI-SIGNAL INTEGRATION INC.
 NATIONAL MONITORING CENTER. (NMC)
 26800 ALISO VIEJO PKY, SUITE 250, ALISO VIEJO, CA 92656
 (800) 662-1711 UUFX: S5708-1, UUJS: S3027-1, CRZH: BP9513-1
NOTE: FIRE ALARM MONITORING SHALL BE PROVIDED FOR A MINIMUM 1 YEAR BY A UL CENTRAL STATION COMPANY AS MENTIONED ABOVE U.O.N.
33. PER 2013 CMC 608.1 EXCEPTION #1, TOTAL COVERAGE SMOKE DETECTION SHALL BE USED TO ACCOMPLISH THE REQUIRED SHUTOFF OF ALL AIR-MOVING EQUIPMENT SERVING SPACES IN EXCESS OF 2000 CUBIC FEET PER MINUTE.
34. ALL R1 AND R2 OCCUPANCIES SHALL HAVE DESIGNATED HEARING IMPAIRED ROOMS INCLUSIVE OF A VISIBLE ALARM NOTIFICATION APPLIANCE, ACTIVATED BY BOTH THE IN-ROOM SMOKE ALARM AND THE BUILDING FIRE ALARM SYSTEM PER TABLE 907.5.2.3.3 OF 2013 EDITION CALIFORNIA BUILDING CODE.
35. PER 2013 CFC 907.5.2.3.1 VISUAL DEVICES ARE NOT PROVIDED IN ALL NON-COMMON USE AREAS INCLUDING SINGLE PERSON OFFICES, ELECTRICAL ROOMS, TELEDATA ROOMS, JANITOR ROOMS, HEAT EXCHANGE ROOMS UNLESS OTHERWISE SHOWN ON THESE DRAWINGS.

LIST OF CALIFORNIA CODE OF REGULATIONS

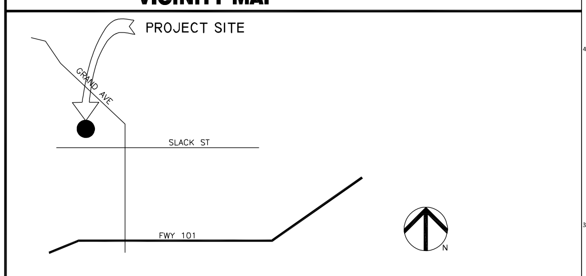
2013 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE, PART 1, TITLE 24 C.C.R.
2013 CALIFORNIA BUILDING CODE (CBC), PART 2, TITLE 24 C.C.R. (2012 INTERNATIONAL BUILDING CODE (IBC) WITH CALIFORNIA AMENDMENTS)
2013 CALIFORNIA ELECTRICAL CODE (CEC), PART 3, TITLE 24 C.C.R. (2011 NATIONAL ELECTRICAL CODE WITH CALIFORNIA AMENDMENTS)
2013 CALIFORNIA MECHANICAL CODE (CMC), PART 4, TITLE 24 C.C.R. (2012 UNIFORM MECHANICAL CODE (UMC) WITH CALIFORNIA AMENDMENTS)
2013 CALIFORNIA FIRE CODE (CFC), PART 9, TITLE 24 C.C.R. (2012 INTERNATIONAL FIRE CODE (IFC) WITH CALIFORNIA AMENDMENTS)
2013 CALIFORNIA REFERENCED STANDARDS CODE, PART 12, TITLE 24, C.C.R.
2013 TITLE 19, CCR, PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS

PARTIAL LIST OF APPLICABLE NFPA STANDARDS

NFPA 13-AUTOMATIC SPRINKLER SYSTEMS, (CALIFORNIA AMENDED)	2013 EDITION
NFPA 14-STANDPIPES SYSTEMS,	2013 EDITION
NFPA 24-PRIVATE FIRE MAINS,	2013 EDITION
NFPA 72-NATIONAL FIRE ALARM CODES, (CALIFORNIA AMENDED)	2013 EDITION

REFERENCE CODE SECTION FOR NFPA STANDARDS-CBC (SFM) 3503

VICINITY MAP



OWNER INFORMATION

COMPANY NAME: CALIFORNIA POLYTECHNIC STATE UNIVERSITY
ADDRESS: CAL POLY BUILDING # 70, SAN LUIS OBISPO, CA 93407
PHONE #: 805.756.6540
FAX #: 805.756.7566

ARCHITECT INFORMATION

COMPANY NAME: VALERIO DEWALT TRAIN ASSOCIATES, INC
ADDRESS: 424 WAVERLEY STREET, PALO ALTO, CA 94301
PHONE #: 650.561.7000
FAX #: 312.260.7372

ARCHITECT INFORMATION FOR BUILDING 131 ONLY

COMPANY NAME: WATRY DESIGN, INC
ADDRESS: 100 CENTURY CENTER COURT, SUITE 600, SAN JOSE, CA 65112
PHONE #: 408.392.7900
FAX #: 408.532.5004

PROJECT NAME
STUDENT HOUSING SOUTH

PROJECT ADDRESS
1 GRAND AVENUE,
SAN LUIS OBISPO, CA 93407

ARCHITECT
VALERIO DEWALT TRAIN ASSOCIATES, INC.
424 WAVERLEY STREET
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ARCHITECT STAMP
OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Joshua Gibson, DSFM III
JUL 02 2018
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

VDTA PROJECT NUMBER
14031.00

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CONSULTANT PROJECT NUMBER
15-002-55

ISSUE		
NO.	REVISION DESCRIPTION	DATE
1	PACKAGE 2, 50% PD	03.02.2015
2	PACKAGE 2, 100% PD	05.11.2015
3	PACKAGE 2, 50% CD	07.22.2015
5	PACKAGE 2, 95% CD	10.15.2015
B1	P2: PLAN CHECK CORRECTIONS	12.10.2015
B2	P2: PLAN CHECK CORRECTIONS	01.20.2016
6	DSA PERMIT ISSUANCE	01.28.2016
B5	P2: PLAN CHECK CORRECTIONS	04.08.2016
B6	DSA BACK CHECK	04.14.2016
B7	P2: PLAN CHECK CORRECTIONS	05.10.2016
B8	DSA BACKCHECK V2	06.03.2016
B9	P2: PLAN CHECK CORRECTIONS	07.01.2016
7	OSFM ISSUANCE - FA, LV & SEC	07.26.2016
B10	P2: PLAN CHECK CORRECTIONS	07.29.2016
B13	OSFM BACK CHECK- FIRE ALARM	11.01.2016
A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017
	RFI I00394	03.15.2017
	RFI I00822	03.17.2017
B15	ADD-009/3B RESNET	03.24.2017
	RFI I00742	03.23.2017
	RFI I00915	05.01.2017
	RFI I00688.1	06.19.2017
	DOOR HOLDER PENDING	01.16.2018
	RFI I01415	01.19.2018
	RFI I01345.2	04.11.2018
RS1	FIRE ALARM PROGRAMING ADDRESSING	06.08.2018
RS2	MATCH MECHANICAL AS-BUILTS	06.08.2018
895.2	RFI I 00895.2	03.30.2018
1396.1	RFI I01396.1	01.15.2018
1345.2	RFI I001345.2	04.11.2018
523	RFI I0523	11.08.2016

SHEET TITLE
NOTE, CODES & DRAWING INDEX

BUILDING

SHEET NUMBER
FA0-01

CONDUIT WIRE FILL CHART ELECTRICAL METALLIC TUBING

Total Areas of Electrical Metallic Tubing (Based on Table 4, Chapter 9, 2013 CEC)

	1/2" CONDUIT	3/4" CONDUIT	1" CONDUIT	1 1/4" CONDUIT	1 1/2" CONDUIT	2" CONDUIT
TOTAL AREA	0.304 in²	0.533 in²	0.864 in²	1.496 in²	2.036 in²	3.356 in²
40% FILL	0.122 in²	0.213 in²	0.346 in²	0.598 in²	0.814 in²	1.342 in²

Maximum Number of Conductors in Trade Sizes of Conduit or Tubing (Based on 40% Conduit Fill per 2013 CEC)

CONDUCTOR SIZE AWG	1/2" CONDUIT	3/4" CONDUIT	1" CONDUIT	1 1/4" CONDUIT	1 1/2" CONDUIT	2" CONDUIT
14	12	22	35	61	84	138
12	9	16	26	45	61	101

CONDUIT WIRE FILL CHART PVC SCHEDULE 40

Total Areas of PVC SCHEDULE 40 (Based on Table 4, Chapter 9, 2013 CEC)

	1/2" CONDUIT	3/4" CONDUIT	1" CONDUIT	1 1/4" CONDUIT	1 1/2" CONDUIT	2" CONDUIT
TOTAL AREA	0.285 in²	0.508 in²	0.832 in²	1.453 in²	1.986 in²	3.291 in²
40% FILL	0.114 in²	0.203 in²	0.333 in²	0.581 in²	0.794 in²	1.316 in²

Maximum Number of Conductors in Trade Sizes of Conduit or Tubing (Based on 40% Conduit Fill per 2013 CEC)

CONDUCTOR SIZE AWG	1/2" CONDUIT	3/4" CONDUIT	1" CONDUIT	1 1/4" CONDUIT	1 1/2" CONDUIT	2" CONDUIT
14	11	21	34	60	82	135
12	8	15	25	43	59	99

SEQUENCE OF OPERATION MATRIX

Columns: (1) ACTIVATE ALARM AT FACP; (2) ACTIVATE ALARM AT REMOTE ANNUNCIATOR; (3) ACTIVATE TROUBLE SIGNAL AT FACP; (4) ACTIVATE TROUBLE SIGNAL AT REMOTE ANNUNCIATOR; (5) ACTIVATE SUPERVISORY SIGNAL AT FACP; (6) ACTIVATE SUPERVISORY SIGNAL AT REMOTE ANNUNCIATOR; (7) SEND ALARM OFF-SITE VIA COMMUNICATOR; (8) SEND TROUBLE SIGNAL OFF-SITE VIA COMMUNICATOR; (9) SEND SUPERVISORY SIGNAL OFF-SITE VIA COMMUNICATOR; (10) ACTIVATE AUDIBLE/VISIBLE SIGNALS; (11) ACTIVATE SOUNDER BASE IN ROOM OF ALARM ONLY TEMPORAL 3; (12) ACTIVATE SOUNDER BASE IN ROOM OF ALARM ONLY TEMPORAL 4; (13) ACTIVATE HEARING IMPAIRED ROOM AUDIBLE/VISUAL ONLY IN ROOM CONTAINING ALARM; (14) ACTIVATE WATERFLOW BELL; (15) PRIMARY FLOOR RECALL*; (16) SECONDARY FLOOR RECALL*; (17) ELEVATOR SHUNT TRIP DISABLE; (18) ACTIVATE FIRE FIGHTERS HAT LAMP; (19) GLOBAL SHUTDOWN HVAC UNITS EXCEEDING 2000 CFM; (20) HVLS FANS; (21) SHUT FIRE/SMOKE DAMPERS; (22) CLOSE FIRE DOORS; (23) UNLOCK SECURITY DOORS; (24) ELEV. SHUNT TRIP AFTER CAB REACHES PRIMARY FLR.**; (25) ACTIVATE BATTERY BACK-UP; (26) RESET 24V 4-WIRE DEVICES; (27) SYSTEM NORMAL

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
MANUAL PULL STATION	X	X					X			X									X		X	X	X				
SMOKE DETECTORS																											
ALL (EXCEPT LISTED BELOW)	X	X					X			X									X		X	X	X				
SLEEPING UNITS					X	X					X																
ADA/HEARING IMPAIRED ROOMS					X	X					X		X														
PRIMARY FLOOR ELEVATOR LOBBY	X	X					X			X						X			X		X	X	X				
ALL OTHER ELEVATOR LOBBIES	X	X					X			X					X				X		X	X	X				
ELEVATOR MACHINE ROOM/SHAFT	X	X					X			X					X				X		X	X	X				
HEAT DETECTORS																											
ALL (EXCEPT LISTED BELOW)	X	X					X			X									X		X	X	X				
ELEVATOR MACHINE ROOM/SHAFT	X	X					X			X					X			X	X		X	X	X	X			
CARBON MONOXIDE DETECTOR					X	X			X			X															
FIRE SPRINKLER WATERFLOW SWITCH	X	X					X			X				X					X	X	X	X	X				
FIRE SPRINKLER TAMPER SWITCH					X	X			X																		
DOUBLE DETECTOR CHECK VALVE					X	X			X																		
GENERATOR RUN					X	X			X																		
GENERATOR TROUBLE			X	X				X																			
GENERATOR FAIL					X	X			X																		
WIRING CONDITIONS																											
SIGNALING LINE CIRCUIT (SLC) -																											
WIRE-TO-WIRE SHORT			X	X				X																			
SINGLE OPEN			X	X				X																			
SINGLE GROUND			X	X				X																			
NOTIFICATION APPLIANCE CIRCUIT (NAC) -																											
WIRE-TO-WIRE SHORT			X	X				X																			
SINGLE OPEN			X	X				X																			
SINGLE GROUND			X	X				X																			
LOSS OF 120VAC POWER			X	X				X											X		X	X	X		X		
ELEVATOR PH. 2 SHUNT DISABLE SIGNAL					X	X											X	X									
RESET FACP																										X	X

*ELEVATOR RECALL TO PRIMARY OR ALTERNATIVE FLOOR AND VISUAL WARNING (FIRE FIGHTERS HAT) SHALL BE PERFORMED BY THE ELEVATOR CONTROLLER PER THE ELEVATOR CODE ASME A17.1-2004 REQUIREMENTS.

**VISUAL WARNING (SOLID OR FLASHING FIRE FIGHTERS HAT) SHALL BE PERFORMED BY THE ELEVATOR CONTROLLER PER THE ELEVATOR CODE ASME 17.1 2004 REQUIREMENTS.

FIRE ALARM RELAYS IN THE ELEVATOR MACHINE ROOM SHALL BE LABELED AS: "PRIMARY FLOOR RECALL" "ALTERNATE FLOOR RECALL" "ELEVATOR MACHINE ROOM SMOKE DETECTOR" OR "ELEVATOR MACHINE ROOM/HOISTWAY SMOKE DETECTOR".

RFI 1557 RESPONSE - FA - 4E
Drawings

RFI 1415 RESPONSE - FA - FAA Location
B1H Facilities Workshop

FIRE ALARM SYSTEM MATERIAL LIST (CONTINUED)

SYMBOL	PART #	QTY.	DESCRIPTION	MANUFACTURER	CSFM #	BACKBOX* MOUNTING	BACKBOX* SIZE* WxHxD	TRIM RING*
XPC	XP6-C	7 / 2	SIX-CIRCUIT SUPERVISED CONTROL MODULE	NOTIFIER	7300-0028:0219	SURFACE	PROVIDED (9"Wx12"Hx2.75"D)	N/A
	BB-XP	1	CABINET					
DHTPS	HPFF12	7 / 1	REMOTE POWER SUPPLY	NOTIFIER	7315-0028:0102	SURFACE	PROVIDED (16.65"Wx19"Hx5.2"D)	N/A
	BATT-1270	2	7 AH BATTERY	MK BATTERY	N/A			
F	NBG-12LX	8	ADDRESSABLE MANUAL PULL STATION	NOTIFIER	7150-0028:0199	FLUSH	4" SQ. DEEP	1-GANG
S	FSP-851 / B210LP	218	ADDRESSABLE PHOTO SMOKE DETECTOR / DETECTOR BASE	NOTIFIER	7272-0028:0206 / 7300-1653:0109	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
S	FSP-851 / B200S-LF	0	ADDRESSABLE PHOTO SMOKE DETECTOR / LOW FREQUENCY SOUNDER BASE	NOTIFIER	7272-0028:0206 / 7300-1653:0238	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
S	FSP-851 / B224RB	0	ADDRESSABLE PHOTO SMOKE DETECTOR / RELAY BASE	NOTIFIER	7272-0028:0206 / 7300-1653:0126	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
S	FCO-851 / B200S	601	ADDRESSABLE FIRE/CO DETECTOR / SOUNDER BASE	NOTIFIER	7275-0028:0264 / 7300-1653:0238	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
S	FCO-851 / B200S-LF	702	ADDRESSABLE FIRE/CO DETECTOR / LOW FREQUENCY SOUNDER BASE	NOTIFIER	7275-0028:0264 / 7300-1653:0238	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
H	FST-851 / B210LP	33	ADDRESSABLE HEAT DETECTOR / DETECTOR BASE	NOTIFIER	7270-0028:0196 / 7300-1653:0109	FLUSH	4" SQ. DEEP	3 "O" PLASTER RING
H	302-ET-194	5	HEAT DETECTOR 194°F	NOTIFIER	7270-0021:0001	SURFACE	4" SQ. DEEP	N/A
AM	FMM-1	37	ADDRESSABLE MONITOR MODULE	NOTIFIER	7300-0028:0219	FLUSH	4" SQ. DEEP	N/A
AM	FMM-101	-	ADDRESSABLE MINI MONITOR MODULE	NOTIFIER	7300-0028:0219	FLUSH	4" SQ. DEEP	N/A
AM	FDM-1	42	ADDRESSABLE DUAL MONITOR MODULE	NOTIFIER	7300-0028:0219	FLUSH	4" SQ. DEEP	N/A
AM	FRM-1	167	ADDRESSABLE RELAY MODULE	NOTIFIER	7300-0028:0219	FLUSH	4" SQ. DEEP	N/A
CM	FCM-1	0	ADDRESSABLE CONTROL MODULE	NOTIFIER	7300-0028:0219	FLUSH	4" SQ. DEEP	N/A
R	PAM-1	70	PAM RELAY	AIR PRODUCTS	7300-1004-0101	FLUSH	4" SQ. DEEP	W/COVER
	SCW	61	MULTI-CANDELA STROBE (CEILING MOUNT)	SYSTEM SENSOR	7125-1653:0186	FLUSH	4" SQ. DEEP	2-GANG
	SPSCW	544	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT)	SYSTEM SENSOR	7320-1653:0201	FLUSH	4" SQ. DEEP	4S EXTENSION BOX
	SPSCW	4	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT) (LOCATED IN PARKING STRUCTURE)	SYSTEM SENSOR	7320-1653:0201	SURFACE	4" SQ. DEEP	4S EXTENSION BOX
	SPSRK	1	OUTDOOR SPEAKER STROBE W/ MWBB (WALL MOUNT) (LOCATED IN PARKING STRUCTURE)	SYSTEM SENSOR	7320-1653:0201	SURFACE	6.5"x5.5"x2.9" (BY TSI)	N/A
	SPCW	774	SPEAKER W/ SA-WBB (CEILING MOUNT) (WEATHERPROOF BACK BOX)	SYSTEM SENSOR	7320-1653:0201	FLUSH	4" SQ. DEEP	4S EXTENSION BOX
	SPRK	35	EXTERIOR SPEAKER W/ SA-WBB (WALL MOUNT) (WEATHERPROOF BACK BOX)	SYSTEM SENSOR	7320-1653:0201	FLUSH	5.1"x5.7"x2.0" (BY TSI)	N/A
TC	(FBO)	-	FIRE ALARM TERMINAL CABINET	(FBO)	N/A	N/A	N/A	N/A
J		-	JUNCTION BOX					
DH		-	DOOR HOLDER					
DHD		-	DOOR HOLDER					
		-	DOUBLE DETECTOR CHECK VALVE					
		-	SPRINKLER BELL					
		-	TAMPER SWITCH					
		-	WATERFLOW SWITCH					

* NOTES: 1. ALL REQUIRED BACKBOXES, TRIM RINGS, ENCLOSURES, COVER PLATES, ETC. ARE TO BE PROVIDED AND INSTALLED BY ELECTRICAL CONTRACTOR UNLESS SPECIFICALLY NOTED ABOVE AS "(BY TSI)".
2. ANY DEVIATION FROM LISTED EQUIPMENT SHALL BE APPROVED BY TSI PRIOR TO "ROUGH-IN".

CABLE SCHEDULE

TYPE	DESCRIPTION	USE	PROVIDED BY	INSTALLED BY
	CABLES INSTALLED IN CONDUIT			
A	WEST PENN 994 (2#14 SOL, US, FPLR) (RED+/BLK-)	SPEAKER CIRCUIT	TSI	TSI
C	CME 1000 2#12 THHN/THWN (STR)(PINK+/PURPLE-)	SYNCHRONIZATION CIRCUIT		
D	CME 1000 2#14 THHN/THWN (STR)(YELLOW+/BLUE-)	DOOR HOLDER		
DAL	WEST PENN AQC293 (2#18 SOL, STP, W/ AQUASEAL) (RED+/BLK-)	DIGITAL AUDIO LOOP		
E	CME 1000 2#14 THHN/THWN (STR)(WHITE+/BLACK-)	MONITOR/CONTROL		
F5	COMMSCOPE 760103861 6 STRAND LOOSE TUBE OS2 SINGLE MODE, BLACK JKT	OUTDOOR FIBER OPTIC CABLE		
I	ENDOT ICE 125 24 12 02 1-1/4" CORRUGATED HDPE INNERDUCT	INNERDUCT		
L	GENESIS 4432 (2#16 STR, UTP, FPL) (RED+/BLACK-)	INITIATING INTERIOR		
LU	WEST PENN AQ225 (2#16 STR, UTP, AQUASEAL, FPL) (RED+/BLACK: RED JACKET)	INITIATING UNDERGROUND		
N	GENESIS 4441 (2#18 STR, STP, FPL) (RED+/BLACK-)	ANNUNCIATOR INTERIOR		
NU	WEST PENN AQC293 (2#18 SOL, STP, W/ AQUASEAL) (RED+/BLK-)	ANNUNCIATOR UNDERGROUND		
P	CME 1000 2#12 THHN/THWN (STR)(ORANGE+/BROWN-)	24 VDC SOUNDER BASE POWER		
P1	CME 1000 2#14 THHN/THWN (STR)(ORANGE+/BROWN-)	24 VDC RESETTABLE POWER		
P2	CME 1000 2#14 THHN/THWN (STR)(ORANGE+/BROWN-)	24 VDC NON-RESETTABLE POWER		
V	CME 1000 2#12 THHN/THWN (STR)(RED+/BLACK-)	VISUAL CIRCUIT		

CABLE DESCRIPTION ABBREVIATIONS

ABBREV.	DEFINITION	ABBREV.	DEFINITION	ABBREV.	DEFINITION
FPL	FIRE ALARM POWER-LIMITED	OS	OVERALL SHIELDED CABLE	STP	SHIELDED TWISTED PAIR
FPLP	FIRE ALARM POWER-LIMITED, PLENUM	SOL	SOLID CONDUCTOR	US	UNSHIELDED CABLE
FPLR	FIRE ALARM POWER-LIMITED, RISER	STR	STRANDED CONDUCTOR	UTP	UNSHIELDED TWISTED PAIR

NOTE: -CONDUIT SHALL BE 3/4" U.O.N.
-ALL WIRE MODEL NUMBERS ARE GENESIS EQUIVALENT BY OTHER MANUFACTURER IS ACCEPTABLE.

FIRE ALARM SYSTEM MATERIAL LIST CONTINUATION

SYMBOL	PART #	QTY.		DESCRIPTION	MANUFACTURER	CSFM #	BACKBOX* MOUNTING	BACKBOX* SIZE* WxHxD	TRIM RING*
BLDGS 5D&5G FACP @LVL 1 ELEC. RM	NFS2-3030 FIRE ALARM CONTROL PANEL	1			NOTIFIER (1627)	7165-0028:0224	SURFACE	PROVIDED (24"WX45.75"HX5.156"D)	N/A
	CPU2-3030D		1	CENTRAL PROCESSING UNIT					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
	MCBL-7		1	PHONE CORD					
	CHS-M3		1	CHASSIS					
	LCM-320		2	LOOP CONTROL MODULE					
	LEM-320		1	LOOP EXPANSION MODULE					
	HS-NCM-SF		1	HIGH-SPEED NETWORK COMMUNICATIONS MODULE-FIBER-OPTIC CABLE INTERFACE					
	DP-DISP		1	DRESS PANEL					
	BMP-1		2	BLANK MODULE					
	DVC-EM		1	DIGITAL VOICE COMMAND, EXT MEMORY, WIRE					
	DVC-KD		1	DIGITAL VOICE COMMAND KEYPAD					
	DS-AMP		1	DIGITAL SERIES AMPLIFIER					
	DS-DB		1	DIGITAL SERIES DISTRIBUTION BOARD					
	DS-BDA		1	BACK UP AMPLIFIER					
	DS-XF70V		1	TRANSFORMER					
	CMIC-1		1	CHASSIS WELL AND MICROPHONE					
	CA-1		1	CHASSIS, 2ND ROW					
	DPA-1		1	DRESS PLATE, 2ND ROW					
	DP-1B		3	BLANK PANEL					
	AMPS-24		1	POWER SUPPLY AND BATTERY CHARGER					
	ACPS-610		1	CHARGER/POWER SUPPLY					
	SBB-D4		1	BACKBOX ASSEMBLY, BLACK					
	DR-D4		1	BDOOR WITH LOCK AND KEYS (FOR DVC)					
	BB-100		1	BATTERY BOX					
	BP2-4		1	BATTERY DRESS PLATE					
	BATT-12100		2	100 AH BATTERY	MK BATTERY	N/A		(30"WX25"HX7.5"D)	
FC	AMP-0-0559094-1		1	FIBER OPTIC WALL BOX	COMMSCOPE	N/A	SURFACE	12"x9"x3.5"	N/A
	RMG-12ADPC8		1	SINGLEMODE SC 6 DUPLEX ADAPTERS			ON BOX	-	
	760018820		1	6 FIBER BREAKOUT KIT, LOOSE TUBE					
	FPC2-SPSC-1M		1	FIBER OPTIC PATCH CORD, DUPLEX, SINGLEMODE, SC/SC YEL, 1M					
-	1-339118-3		1	SINGLE GANG FACEPLATE, ALPINE WHITE			FLUSH	4-11/16"SQ.x 2-1/8" DEEP	EXTENSION W/ SINGLE GANG RING
	1-1375306-3		1	SINGLEMODE BLUE COUPLER, SC DUPLEX MOUDLE					
	1-1116410-3		2	BLANK MODULE					
ONYX	ONYXWORKS	1		INTEGRATED FACILITIES MONITORING NETWORK (LOCATED @ FACILITIES WORKSHOP)	NOTIFIER	7300-1525:0103	SURFACE	PROVIDED (19"WX7"HX17.7"D)	N/A
RPU	DVC-RPU	11	1	DIGITAL VOICE COMMAND REMOTE PAGING UNIT	NOTIFIER	7165-0028:0224	SEMI-FLUSH	PROVIDED (19.875"WX12"HX4.922"D)	N/A
	CAB-RP		1	CABINET, BLACK					
FAA	NCA-2	1	1	NETWORK CONTROL ANNUNCIATOR	NOTIFIER	7165-0028:0224	SEMI-FLUSH	19.87"x11.97"x3.50"	N/A
	ABS-4D		1	ANNUNCIATOR SURFACE BACKBOX					
	HS-NCM-SF		1	HIGH SPEED NETWORK COMMUNICATIONS MODULES					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
LCD	LCD-160	8	1	160 CHARACTER LCD ANNUNCIATOR	NOTIFIER	7120-0028:0227	SE[illegible]	[illegible]	[illegible]A
	ABS-2D		1	ANNUNCIATOR BACKBOX					
RPS	FCPS-24S6	37	1	REMOTE POWER SUPPLY	NOTIFIER	7315-0028:0225	[illegible]	[illegible]	[illegible]A
	BATT-1270 (1627)		2	7 AH BATTERY	MK BATTERY	N/A			
IPDACT	B465 (1627)	8	1	UNIVERSAL DUAL PATH COMMUNICATOR	BOSCH	7300-1615:0253	[illegible]	[illegible]	[illegible]A
	B11R		1	SMALL CONTROL PANEL ENCLOSURE					
	D101		1	LOCK AND KEY SET					

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2. ANY DEVIATION FROM LISTED EQUIPMENT SHALL BE APPROVED BY TSI PRIOR TO "ROUGH-IN".

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Joshua Gibson, DSFM III
MAR 24 2017
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

FIRE ALARM SYSTEM MATERIAL LIST

SYMBOL	PART #	QTY.		DESCRIPTION	MANUFACTURER	CSFM #	BACKBOX* MOUNTING	BACKBOX* SIZE* WxHxD	TRIM RING*
FACP	NFS2-3030 FIRE ALARM CONTROL PANEL	1			NOTIFIER (1627)	7165-0028:0224	SURFACE	PROVIDED (24"WX45.75"HX5.156"D)	N/A
	CPU2-3030D		1	CENTRAL PROCESSING UNIT					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
	MCBL-7		1	PHONE CORD					
	CHS-M3		1	CHASSIS					
	LCM-320		1	LOOP CONTROL MODULE					
	LEM-320		1	LOOP EXPANSION MODULE					
	HS-NCM-SF		1	HIGH-SPEED NETWORK COMMUNICATIONS MODULE-FIBER-OPTIC CABLE INTERFACE					
	DP-DISP		1	DRESS PANEL					
	BMP-1		2	BLANK MODULE					
	DVC-EM		1	DIGITAL VOICE COMMAND, EXT MEMORY, WIRE					
	DVC-KD		1	DIGITAL VOICE COMMAND KEYPAD					
	DS-AMP		1	DIGITAL SERIES AMPLIFIER					
	DS-DB		1	DIGITAL SERIES DISTRIBUTION BOARD					
	DS-BDA		1	BACK UP AMPLIFIER					
	DS-XF70V		1	TRANSFORMER					
	CMIC-1		1	CHASSIS WELL AND MICROPHONE					
	CA-1		1	CHASSIS, 2ND ROW					
	DPA-1		1	DRESS PLATE, 2ND ROW					
	DP-1B		3	BLANK PANEL					
	AMPS-24		1	POWER SUPPLY AND BATTERY CHARGER					
	ACPS-610		1	CHARGER/POWER SUPPLY					
	SBB-D4		1	BACKBOX ASSEMBLY, BLACK					
	DR-D4		1	BDOOR WITH LOCK AND KEYS (FOR DVC)					
	BB-100		1	BATTERY BOX					
	BP2-4		1	BATTERY DRESS PLATE					
	BATT-12100		2	100 AH BATTERY	MK BATTERY	N/A		(30"WX25"HX7.5"D)	
FACP	NFS2-3030 FIRE ALARM CONTROL PANEL	1			NOTIFIER (1627)	7165-0028:0224	SURFACE	PROVIDED (24"WX45.75"HX5.156"D)	N/A
	CPU2-3030D		1	CENTRAL PROCESSING UNIT					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
	MCBL-7		1	PHONE CORD					
	CHS-M3		1	CHASSIS					
	LCM-320		1	LOOP CONTROL MODULE					
	LEM-320		1	LOOP EXPANSION MODULE					
	HS-NCM-SF		1	HIGH-SPEED NETWORK COMMUNICATIONS MODULE-FIBER-OPTIC CABLE INTERFACE					
	DP-DISP		1	DRESS PANEL					
	BMP-1		2	BLANK MODULE					
	DVC-EM		1	DIGITAL VOICE COMMAND, EXT MEMORY, WIRE					
	DVC-KD		1	DIGITAL VOICE COMMAND KEYPAD					
	DS-AMP		1	DIGITAL SERIES AMPLIFIER					
	DS-DB		1	DIGITAL SERIES DISTRIBUTION BOARD					
	DS-BDA		1	BACK UP AMPLIFIER					
	DS-XF70V		1	TRANSFORMER					
	CMIC-1		1	CHASSIS WELL AND MICROPHONE					
	CA-1		1	CHASSIS, 2ND ROW					
	DPA-1		1	DRESS PLATE, 2ND ROW					
	DP-1B		3	BLANK PANEL					
	AMPS-24		1	POWER SUPPLY AND BATTERY CHARGER					
	ACPS-610		1	CHARGER/POWER SUPPLY					
	SBB-D4		1	BACKBOX ASSEMBLY, BLACK					
	DR-D4		1	BDOOR WITH LOCK AND KEYS (FOR DVC)					
	BB-100		1	BATTERY BOX					
	BP2-4		1	BATTERY DRESS PLATE					
	BATT-12100		2	100 AH BATTERY	MK BATTERY	N/A		(30"WX25"HX7.5"D)	
FACP	NFS2-3030 FIRE ALARM CONTROL PANEL	1			NOTIFIER (1627)	7165-0028:0224	SURFACE	PROVIDED (24"WX45.75"HX5.156"D)	N/A
	CPU2-3030D		1	CENTRAL PROCESSING UNIT					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
	MCBL-7		1	PHONE CORD					
	CHS-M3		1	CHASSIS					
	LCM-320		1	LOOP CONTROL MODULE					
	LEM-320		1	LOOP EXPANSION MODULE					
	HS-NCM-SF		1	HIGH-SPEED NETWORK COMMUNICATIONS MODULE-FIBER-OPTIC CABLE INTERFACE					
	DP-DISP		1	DRESS PANEL					
	BMP-1		2	BLANK MODULE					
	DVC-EM		1	DIGITAL VOICE COMMAND, EXT MEMORY, WIRE					
	DVC-KD		1	DIGITAL VOICE COMMAND KEYPAD					
	DS-AMP		1	DIGITAL SERIES AMPLIFIER					
	DS-DB		1	DIGITAL SERIES DISTRIBUTION BOARD					
	DS-BDA		1	BACK UP AMPLIFIER					
	DS-XF70V		1	TRANSFORMER					
	CMIC-1		1	CHASSIS WELL AND MICROPHONE					
	CA-1		1	CHASSIS, 2ND ROW					
	DPA-1		1	DRESS PLATE, 2ND ROW					
	DP-1B		3	BLANK PANEL					
	AMPS-24		1	POWER SUPPLY AND BATTERY CHARGER					
	ACPS-610		1	CHARGER/POWER SUPPLY					
	SBB-D4		1	BACKBOX ASSEMBLY, BLACK					
	DR-D4		1	BDOOR WITH LOCK AND KEYS (FOR DVC)					
	BB-100		1	BATTERY BOX					
	BP2-4		1	BATTERY DRESS PLATE					
	BATT-12100		2	100 AH BATTERY	MK BATTERY	N/A		(30"WX25"HX7.5"D)	
FACP	NFS2-3030 FIRE ALARM CONTROL PANEL	1			NOTIFIER (1627)	7165-0028:0224	SURFACE	PROVIDED (24"WX45.75"HX5.156"D)	N/A
	CPU2-3030D		1	CENTRAL PROCESSING UNIT					
	UDACT-2		1	UNIVERSAL DIGITAL ALARM COMMUNICATOR TRANSMITTER					
	MCBL-7		1	PHONE CORD					
	CHS-M3		1	CHASSIS					
	LCM-320		1	LOOP CONTROL MODULE					
	LEM-320		1	LOOP EXPANSION MODULE					
	HS-NCM-SF		1	HIGH-SPEED NETWORK COMMUNICATIONS MODULE-FIBER-OPTIC CABLE INTERFACE					
	DP-DISP		1	DRESS PANEL					
	BMP-1		2	BLANK MODULE					
	DVC-EM		1	DIGITAL VOICE COMMAND, EXT MEMORY, WIRE					
	DVC-KD		1	DIGITAL VOICE COMMAND KEYPAD					
	DS-AMP		1	DIGITAL SERIES AMPLIFIER					
	DS-DB		1	DIGITAL SERIES DISTRIBUTION BOARD					
	DS-BDA		1	BACK UP AMPLIFIER					
	DS-XF70V		1	TRANSFORMER					
	DP-1B		1	TRANSFORMER					
	CMIC-1		1	CHASSIS WELL AND MICROPHONE					
	CA-1		1	CHASSIS, 2ND ROW					
	DPA-1		1	DRESS PLATE, 2ND ROW					
	DP-1B		3	BLANK PANEL					
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	BATT-12100		2	100 AH BATTERY	MK BATTERY	N/A		(30"WX25"HX7.5"D)	

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VDTA PROJECT NUMBER
14031.00

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CONSULTANT PROJECT NUMBER
15-002-55

ISSUE

NO.	REVISION DESCRIPTION	DATE
1	PACKAGE 2, 50% PD	03.02.2015
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5	PACKAGE 2, 95% CD	10.15.2015
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B6	DSA BACK CHECK	04.14.2016
B7	P2: PLAN CHECK CORRECTIONS	05.10.2016
B8	DSA BACKCHECK V2	06.03.2016
B9	P2: PLAN CHECK CORRECTIONS	07.01.2016
7	OSFM ISSUANCE - FA, LV & SEC	07.26.2016
B10	P2: PLAN CHECK CORRECTIONS	07.29.2016
B13	OSFM BACK CHECK- FIRE ALARM	11.01.2016
A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
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	RFI I00394	03.15.2017
	RFI I00822	03.17.2017
B15	ADD-009/3B RESNET	03.24.2017
	RFI I00742	03.23.2017
	RFI I00915	05.01.2017
	RFI I00688.1	06.19.2017
	DOOR HOLDER PENDING	01.16.2018
	RFI I01415	01.19.2018
	RFI I01345.2	04.11.2018
RS1	FIRE ALARM PROGRAMING ADDRESSING	06.08.2018
RS2	MATCH MECHANICAL AS-BUILTS	06.08.2018
895.2	RFI I 00895.2	03.30.2018
1396.1	RFI I01396.1	01.15.2018
1345.2	RFI I001345.2	04.11.2018
523	RFI I0523	11.08.2016
1627	RFI I01627	07.11.2018

SHEET TITLE
MATERIAL LIST & SEQUENCE OF OPERATION

BUILDING

SHEET NUMBER
FA0-02

WIRE LEGEND

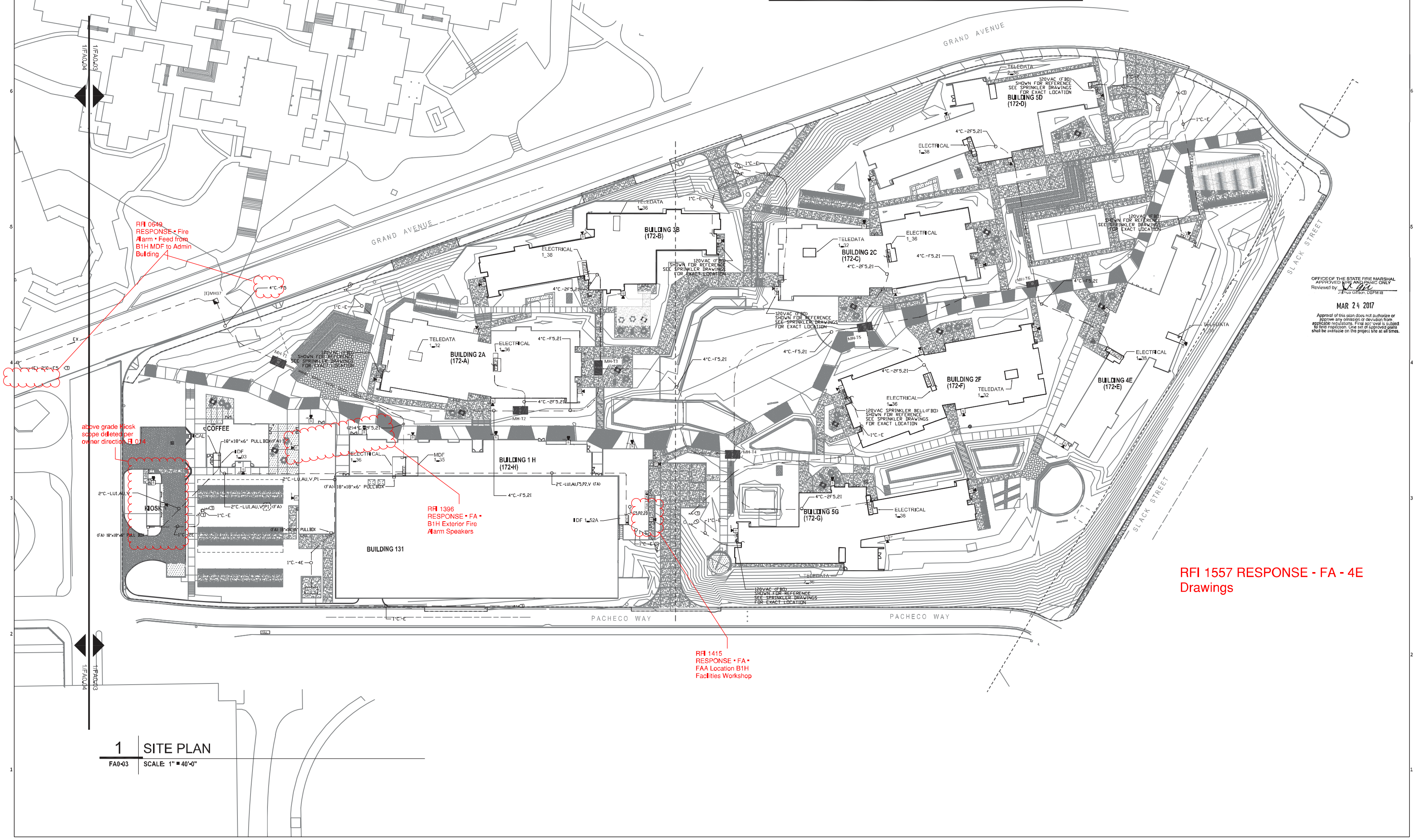
TYPE	USE
A	SPEAKER CIRCUIT
C	SYNCHRONIZATION CIRCUIT
D	DOOR HOLDER
DAL	DIGITAL AUDIO LOOP
E	MONITOR/CONTROL
F5	OUTDOOR FIBER OPTIC CABLE
I	INNERDUCT
L	INITIATING INTERIOR
LU	INITIATING UNDERGROUND
N	ANNUNCIATOR INTERIOR
NU	ANNUNCIATOR UNDERGROUND
P	24 VDC SOUNDER BASE POWER
P1	24 VDC RESETTABLE POWER
P2	24 VDC NON-RESETTABLE POWER
V	VISUAL CIRCUIT

SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	ADDRESSABLE RELAY MODULE	FACP	NFS2-3030 FIRE ALARM CONTROL PANEL
	ADDRESSABLE CONTROL MODULE	ONYX	INTEGRATED FACILITIES MONITORING NETWORK
	PAM RELAY	RPU	DIGITAL VOICE COMMAND REMOTE PAGING UNIT
	MULTI-CANDELA STROBE (CEILING MOUNT)	FAA	NETWORK CONTROL ANNUNCIATOR
	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT)	LCD	160 CHARACTER LCD ANNUNCIATOR
	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT) (SURFACE MOUNT FOR PARKING STRUCTURE)	RPS	REMOTE POWER SUPPLY
	HIGH CANDELA SPEAKER STROBE (CEILING MOUNT) (SURFACE MOUNT FOR PARKING STRUCTURE)	XPC	SIX-CIRCUIT SUPERVISED CONTROL MODULE
	SPEAKER W/ SA-WBB (WALL MOUNT) (WEATHERPROOF BACK BOX)	DH PS	DOOR HOLDER POWER SUPPLY
	EXTERIOR SPEAKER W/ SA-WBB (WALL MOUNT) (WEATHERPROOF BACK BOX)		ADDRESSABLE MANUAL PULL STATION
TC	FIRE ALARM TERMINAL CABINET (FBO)		ADDRESSABLE PHOTO SMOKE DETECTOR
	JUNCTION BOX		ADDRESSABLE PHOTO SMOKE/CARBON DETECTOR W/ SOUNDER BASE
DH	DOOR HOLDERS (FBO)		ADDRESSABLE PHOTO SMOKE/CARBON DETECTOR W/ LOW FREQUENCY SOUNDER BASE
	DOUBLE DETECTOR CHECK VALVE (FBO)		ADDRESSABLE HEAT DETECTOR
	SPRINKLER BELL (FBO)		HEAT DETECTOR 194°F
	TAMPER SWITCH (FBO)		ADDRESSABLE MONITOR MODULE
	WATERFLOW SWITCH (FBO)		ADDRESSABLE DUAL MONITOR MODULE

NUMBERED NOTES:

1. DOUBLE DETECTOR CHECK VALVE TO MONITOR MODULE IN BUILDING. LOCATED ADJACENT TO WATER FLOW (WF) & TAMPER SWITCH (TS). (LOCATED IN STAIRWELL).



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MAR 24 2017

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1 SITE PLAN
FA0-03 SCALE: 1" = 40'-0"

PROJECT NAME
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PROJECT ADDRESS
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ARCHITECT STAMP

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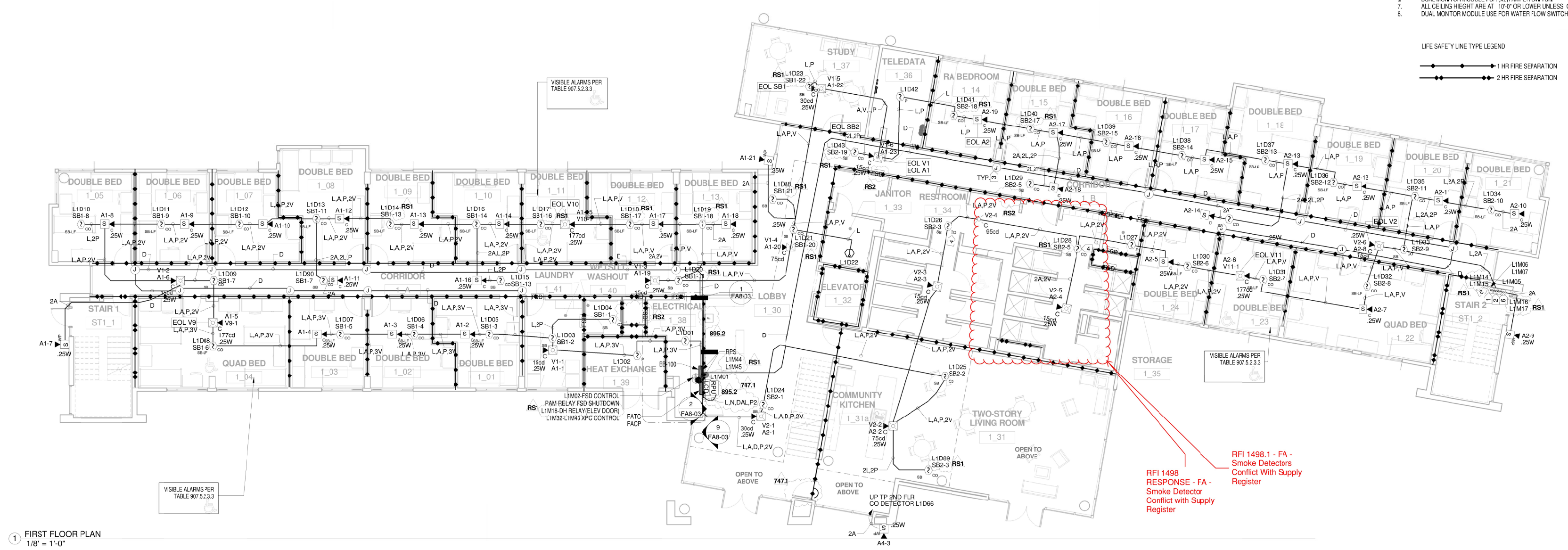
	DOOR HOLDER PENDING	01.16.2018
	RFI I01415	01.19.2018
	RFI I01345.2	04.11.2018
RS1	FIRE ALARM PROGRAMING ADDRESSING	05.11.2018

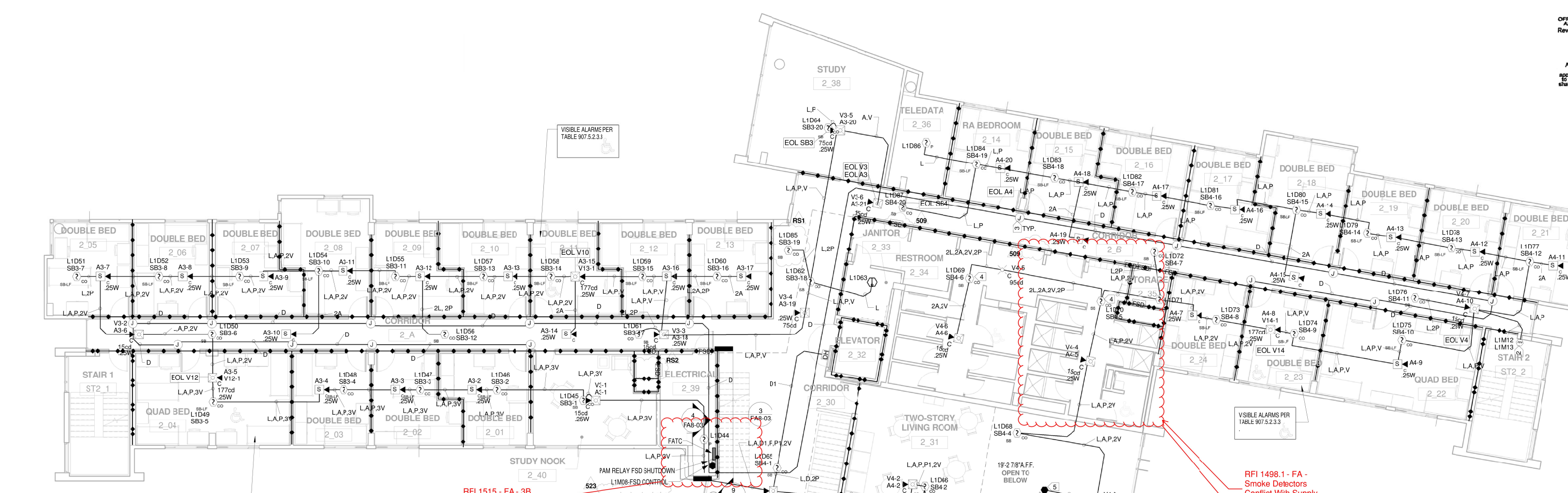
SHEET TITLE
SITE PLAN

BUILDING
SITE

SHEET NUMBER
FA0-03

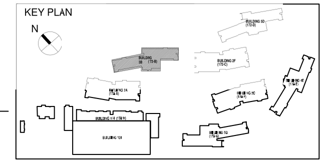


1 FIRST FLOOR PLAN
1/8" = 1'-0"



2 SECOND FLOOR PLAN
1/8" = 1'-0"

KEY PLAN



SHEET NOTE(S):

1. MONITOR MODULE USE FOR DOUBLE DETECTOR CHECK VALVE.
2. DUAL MONITOR MODULE USE FOR WATERFLOW AND TAMPER SWITCH.
3. ROUTE TO DOOR FRAME FOR CONNECTION TO DOOR CLOSER/HOLD OPEN DEVICE. TYPICAL ALL DORM ROOM ENTRY DOORS.
4. SMOKE/CARBON DETECTOR W/ SOUNDER BASE LOCATED AT RESTROOM SHALL BE SET AT SENSITIVITY LEVEL 4.
5. PAM RELAY FOR SHUTDOWN OF HVLS FAN UPON ACTIVATION OF WATER FLOW.
6. DUAL MONITOR MODULE FOR (X2)TAMPER SWITCH.
7. ALL CEILING HIEGHT ARE AT 10'-0" OR LOWER UNLESS OTHERWISE NOTED.
8. DUAL MONTOR MODULE USE FOR WATER FLOW SWITCHES.

LIFE SAFETY LINE TYPE LEGEND

- 1 HR FIRE SEPARATION
- 2 HR FIRE SEPARATION

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Reviewed by: Joshua Gibson, DSFM III

JUL 30 2018

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B9	P2: PLAN CHECK CORRECTIONS	06.24.2016
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B13	OSFM BACK CHECK FIRE ALARM	11.02.2016
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B15	ADD-009/3B RESNET	03.24.17
747.1	RFI I00747.1	10.18.2017
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RS1	FIRE ALARM PROGRAMMING ADDRESSING	06.08.2018
895.2	RFI I00895.2	03.30.2018
RS2	MATCH MECHANICAL AS-BUILTS	06.08.2018
523	RFI I0523	11.08.2016
509	RFI I0509	10.18.2016

SHEET TITLE

FIRST & SECOND FLOOR PLAN

N PN

BUILDING
3B

SHEET NUMBER
FA3-01

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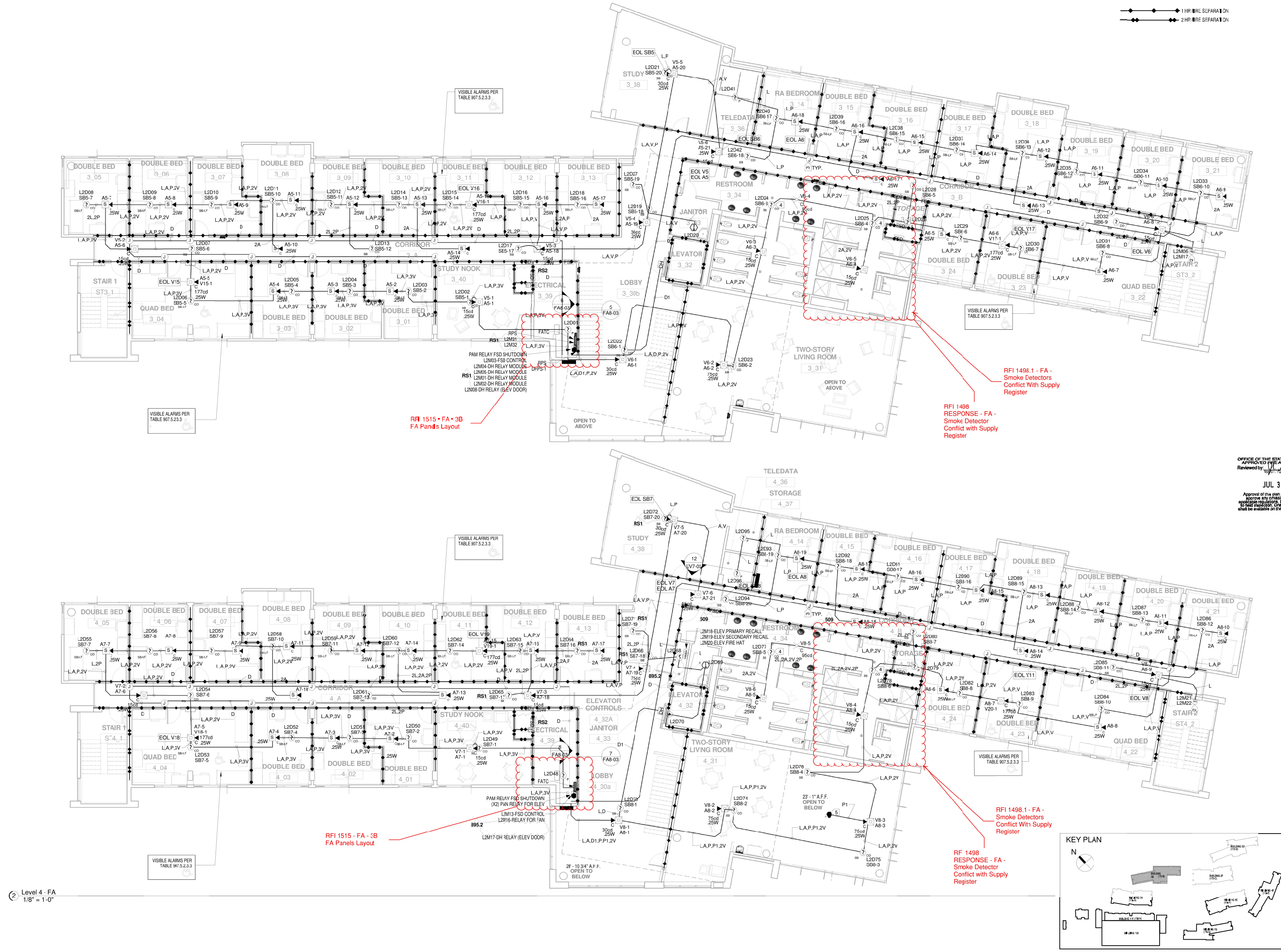
SHEET NOTE(S):

1. NOT USED.
2. DUAL MONITOR MODULE USE FOR WATERFLOW AND TAMPER SWITCH.
3. ROUTE TO DOOR FRAME FOR CONNECTION TO DOOR CLOSER/HOLD OPEN DEVICE. TYPICAL ALL DORM ROOM ENTRY DOORS.
4. SMOKE/CARBON DETECTOR W/ SOUNDER BASE LOCATED AT RESTROOM SHALL BE SET AT SENSITIVITY LEVEL 4.
5. PAM RELAY FOR SHUTDOWN OF HVLS FAN UPON ACTIVATION OF WATER FLOW.
6. ALL CEILING HEIGHT ARE AT 10'-0" OR LOWER UNLESS OTHERWISE NOTED.

LIFE SAFETY LINE TYPE LEGEND

1 HR FIRE SEPARATION

2 HR FIRE SEPARATION



2 Level 4 - FA
1/8" = 1'-0"

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895.2	RFI I00895.2	03.30.2018
RS2	MATCH MECHANICAL AS-BUILTS	06.08.2018
509	RFI I0509	10.18.2016

SHEET TITLE

THIRD & FOURTH FLOOR PLAN

BUILDING

3B

SHEET NUMBER

FA3-02

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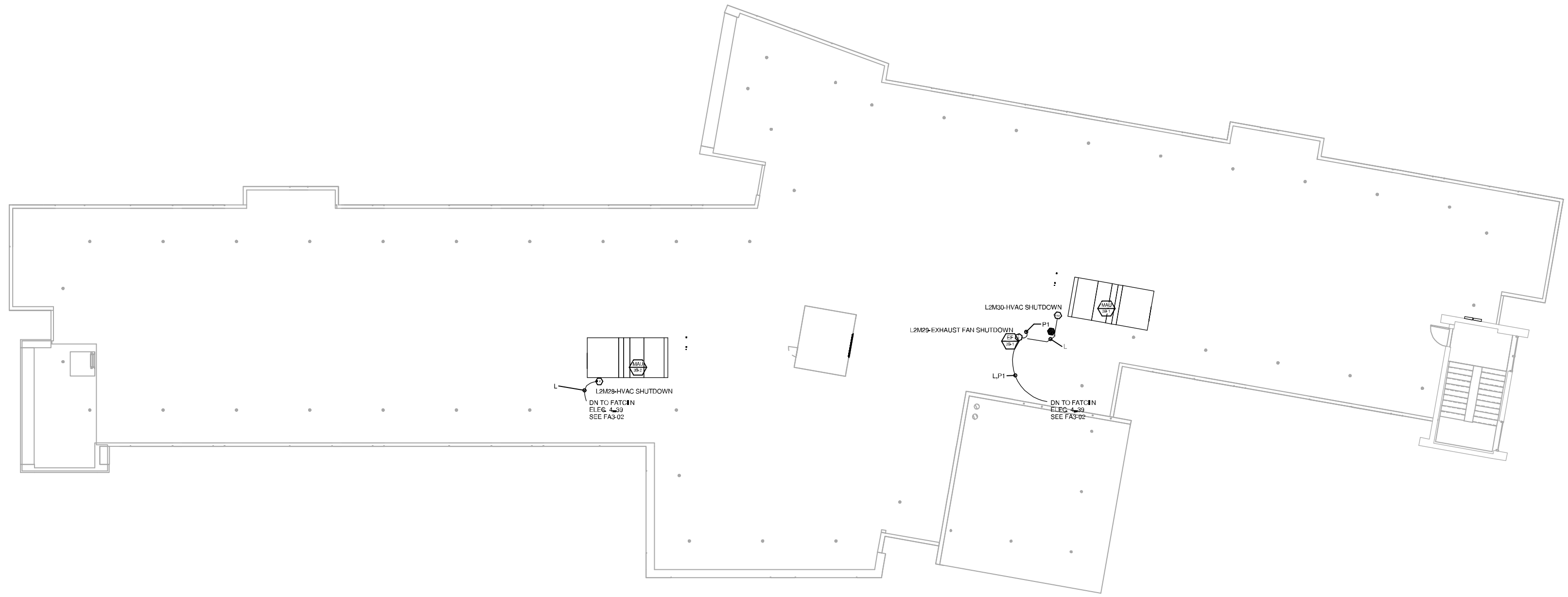

1 Roof • FA
1/8" = 1'-0"

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Reviewed by: ______ DSFM III

JUL 30 2018

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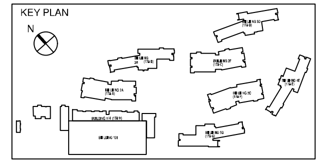
KEY PLAN



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B6	DSA BACK CHECK	04.14.2016
B7	P2 PLAN CHECK CORRECTIONS	05.10.2016
B9	P2: PLAN CHECK CORRECTIONS	06.24.2016
7	OSFM ISSUANCE - FA,LV & SEC	07.26.2016
B10	P2: PLAN CHECK CORRECTIONS	07.29.2016
B13	OSFM BACK CHECK FIRE ALARM	11.02.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

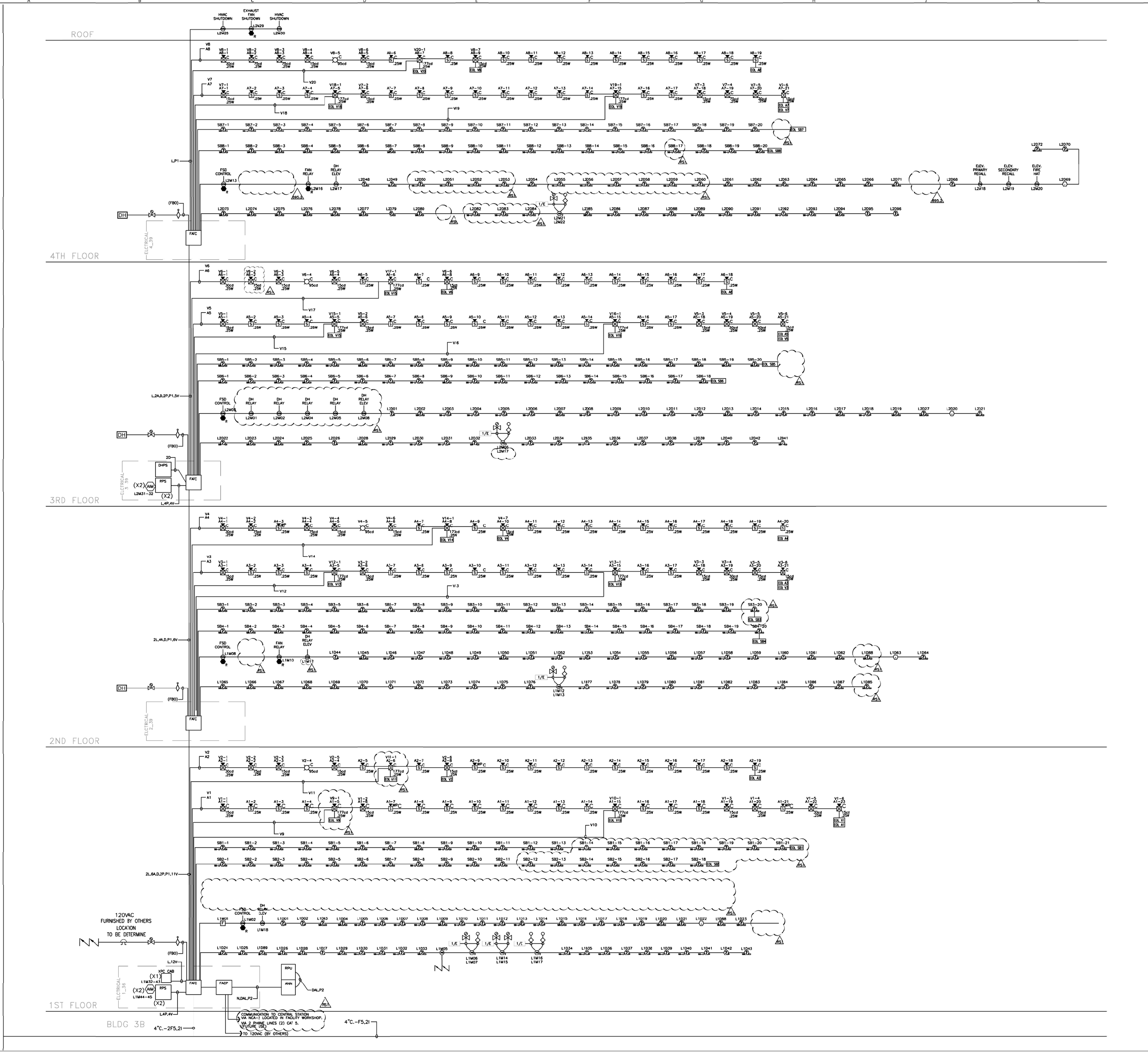
ROOF PLAN

BUILDING

3B

SHEET NUMBER

FA3-03



SYMBOL LEGEND

SYMBOL	DESCRIPTION
FACP	NFS2-3030 FIRE ALARM CONTROL PANEL
ONYX	INTEGRATED FACILITIES MONITORING NETWORK
RPU	DIGITAL VOICE COMMAND REMOTE PAGING UNIT
FXA	NETWORK CONTROL ANNUNCIATOR
LCD	160 CHARACTER LCD ANNUNCIATOR
RPS	REMOTE POWER SUPPLY
XPC	SIX-CIRCUIT SUPERVISED CONTROL MODULE
DHPS	DOOR HOLDER POWER SUPPLY
F	ADDRESSABLE MANUAL PULL STATION
	ADDRESSABLE PHOTO SMOKE DETECTOR
	ADDRESSABLE PHOTO SMOKE/CARBON DETECTOR W/ SOUNDER BASE
	ADDRESSABLE PHOTO SMOKE/CARBON DETECTOR W/ LOW FREQUENCY SOUNDER BASE
	ADDRESSABLE HEAT DETECTOR
	HEAT DETECTOR 194°F
AM	ADDRESSABLE MONITOR MODULE
AM2	ADDRESSABLE DUAL MONITOR MODULE
RM	ADDRESSABLE RELAY MODULE
	ADDRESSABLE CONTROL MODULE
	PAM RELAY
	MULTI-CANDELA STROBE (CEILING MOUNT)
	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT)
	MULTI-CANDELA SPEAKER STROBE (CEILING MOUNT) (SURFACE MOUNT FOR PARKING STRUCTURE)
	HIGH CANDELA SPEAKER STROBE (CEILING MOUNT) (SURFACE MOUNT FOR PARKING STRUCTURE)
S	SPEAKER W/ SA-WBB (WALL MOUNT) (WEATHERPROOF BACK BOX)
S	EXTERIOR SPEAKER W/ SA-WBB (WALL MOUNT) (WEATHERPROOF BACK BOX)
	FIRE ALARM TERMINAL CABINET (FBO)
J	JUNCTION BOX
DH	DOOR HOLDERS (FBO)
	DOUBLE DETECTOR CHECK VALVE (FBO)
	SPRINKLER BELL (FBO)
	TAMPER SWITCH (FBO)
	WATERFLOW SWITCH (FBO)

WIRE LEGEND

TYPE	USE
A	SPEAKER CIRCUIT
C	SYNCHRONIZATION CIRCUIT
D	DOOR HOLDER
DAL	DIGITAL AUDIO LOOP
E	MONITOR/CONTROL
F5	OUTDOOR FIBER OPTIC CABLE
I	INNERDUCT
L	INITIATING INTERIOR
LU	INITIATING UNDERGROUND
N	ANNUNCIATOR INTERIOR
NU	ANNUNCIATOR UNDERGROUND
P	24 VDC SOUNDER BASE POWER
P1	24 VDC RESETTABLE POWER
P2	24 VDC NON-RESETTABLE POWER
V	VISUAL CIRCUIT

PROJECT NAME

STUDENT HOUSING SOUTH

PROJECT ADDRESS

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LAUREN SHELTON
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JEROME HAMMAN
VICTORIA CHU

ARCHITECT STAMP

OFFICE OF THE STATE FIRE MARSHAL APPROVED FIRE AND PANIC ONLY
Reviewed by: ... Gibson, DSFM III
JUL 30 2018
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VDTA PROJECT NUMBER

14031.00

NAI Consulting Engineers
Mechanical . Electrical . Plumbing

CONSULTANT

TRI-SIGNAL INTEGRATION, INC.
15853 MONTE STREET
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818.566.8558
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CONSULTANT PROJECT NUMBER

15-002-55

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B13	OSFM BACK CHECK- FIRE ALARM	11.01.2016
A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017
	RFI I00394	03.15.2017
	RFI I00822	03.17.2017
B15	ADD-009/3B RESNET	03.24.2017
	RFI I00742	03.23.2017
	RFI I00915	05.01.2017
	RFI I00688.1	06.19.2017
	DOOR HOLDER PENDING	01.16.2018
	RFI I01415	01.19.2018
	RFI I01345.2	04.11.2018
RS1	FIRE ALARM PROGRAMING ADDRESSING	06.08.2018
RS2	MATCH MECHANICAL AS-BUILTS	06.08.2018
895.2	RFI I 00895.2	03.30.2018
1396.1	RFI I01396.1	01.15.2018
1345.2	RFI I001345.2	04.11.2018
523	RFI I0523	11.08.2016

SHEET TITLE

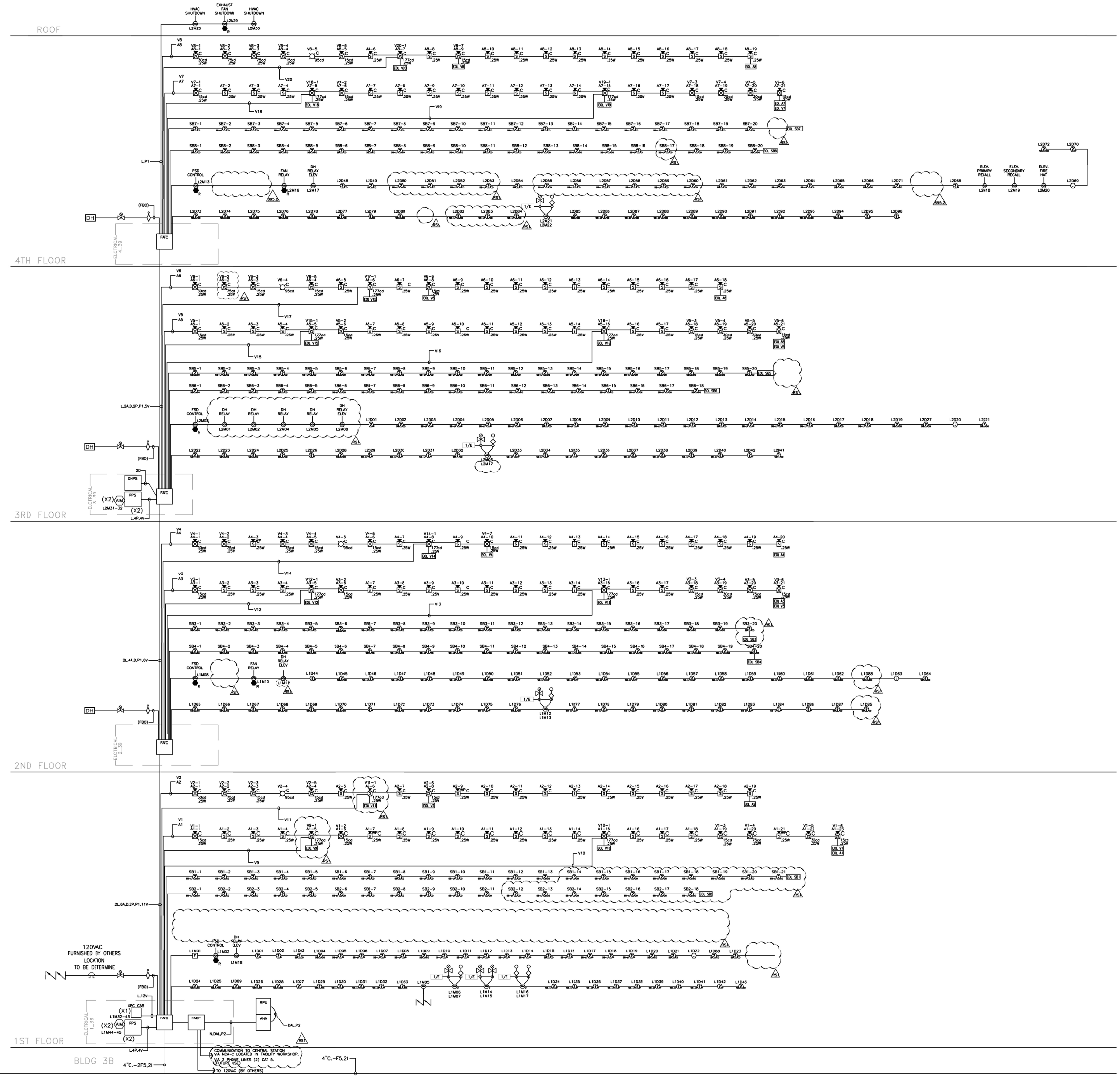
RISER DIAGRAM

BUILDING

3B

SHEET NUMBER

FA6-02B



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TYPE	USE
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I	INNERDUCT
L	INITIATING INTERIOR
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P	24 VDC SOUNDER BASE POWER
P1	24 VDC RESETTABLE POWER
P2	24 VDC NON-RESETTABLE POWER
V	VISUAL CIRCUIT

OFFICE OF THE STATE FIRE MARSHAL APPROVED FIRE AND PANIC ONLY
Reviewed by: Joshua Gibson, OSFM III
MAY 21 2018
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RFI 1557 RESPONSE - FA - 4E Drawings

PROJECT NAME
STUDENT HOUSING SOUTH

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LAUREN SHELTON
ELIZABETH UTLEY
JEROME HAMMAN
VICTORIA CHU

VDTA PROJECT NUMBER
14031.00

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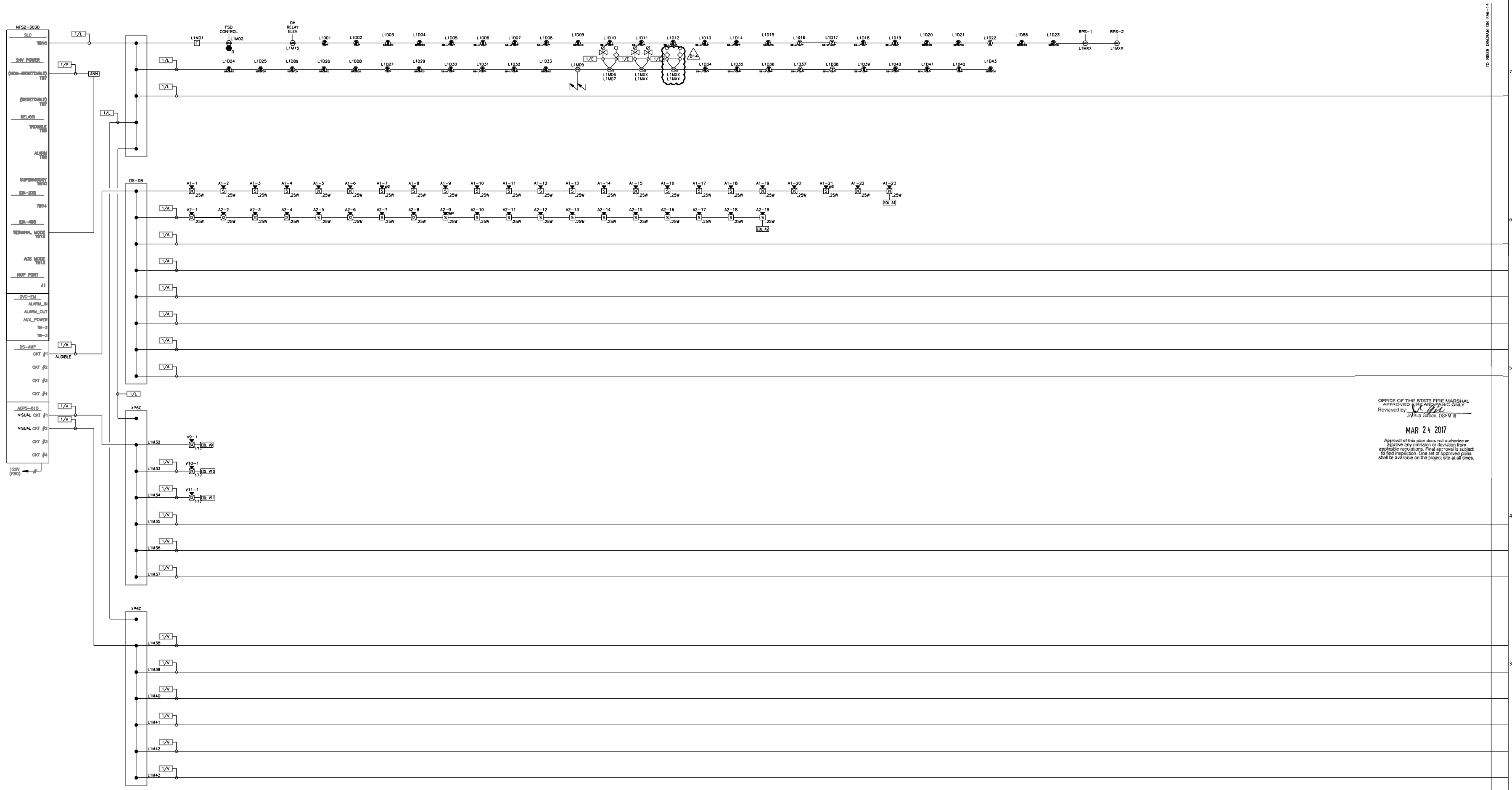
523	RFI I0523	11.08.2016
	RFI I01557	05/21/2018

SHEET TITLE
RISER DIAGRAM

BUILDING
3B

SHEET NUMBER
FA6-02B



OFFICE OF THE STATE FIRE MARSHAL
APPROVED SITE AND OHIC ONLY
Reviewed by

MAR 24 2017

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RISER DIAGRAM — BUILDING 3B LEVEL 1

SCALE: NTS

PROJECT NAME

STUDENT HOUSING SOUTH

PROJECT ADDRESS

1 GRAND AVENUE,
SAN LUIS OBISPO, CA 93407

ARCHITECT

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VICTORIA CHU

VDTA PROJECT NUMBER

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A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

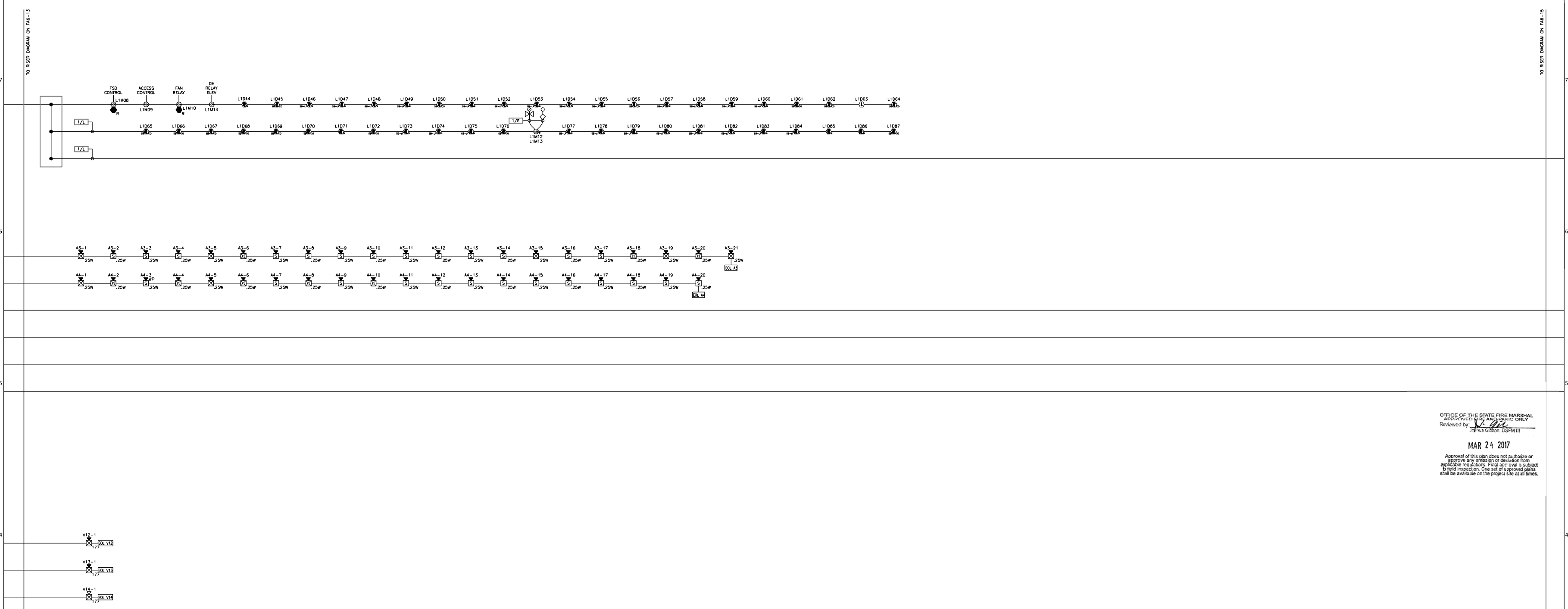
POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-13



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Reviewed by: Joshua Gibson, DSFM III

MAR 24 2017

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RISER DIAGRAM — BUILDING 3B LEVEL 2

SCALE: NTS

PROJECT NAME

STUDENT HOUSING SOUTH

PROJECT ADDRESS

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SAN LUIS OBISPO, CA 93407

ARCHITECT

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A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

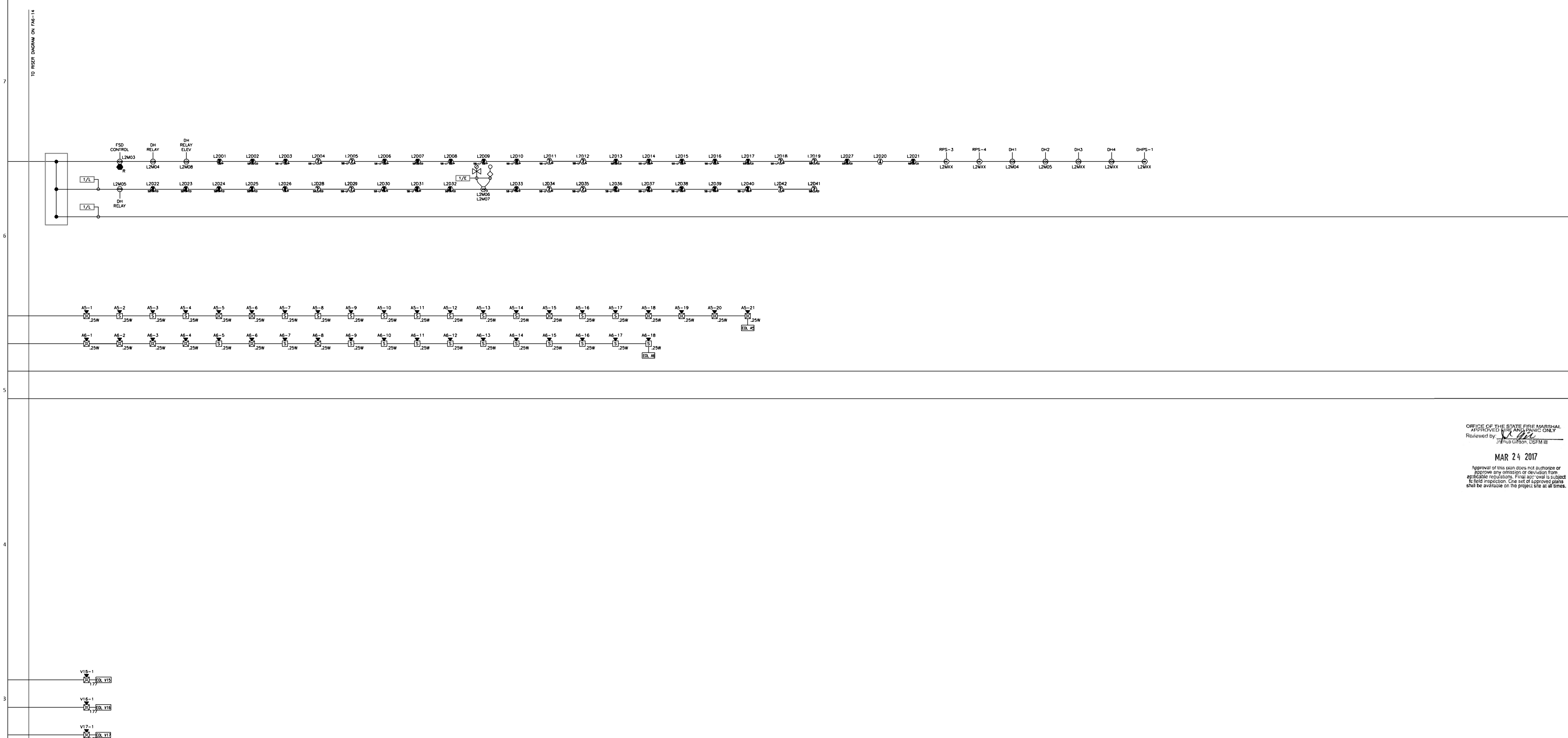
POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-14



RISER DIAGRAM – BUILDING 3B LEVEL 3

SCALE: NTS

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
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MAR 24 2017

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PROJECT NAME

STUDENT HOUSING SOUTH

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ARCHITECT

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PROJECT TEAM | **ARCHITECT STAMP**

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JEROME HAMMAN
VICTORIA CHU

REGISTERED PROFESSIONAL ENGINEER — SAMEH S. NAKHLA — No. E 16631 — EXP. 6-30-18 — ELECTRICAL — STATE OF CALIFORNIA

VDTA PROJECT NUMBER

14031.00

CONSULTANT

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LICENSED ELECTRICAL CONTRACTOR — TRI SIGNAL INTEGRATION INC — C-10 — LICENSE NO. 758792 — 02/28/2019 — STATE OF CALIFORNIA

CONSULTANT PROJECT NUMBER

15-002-55

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B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

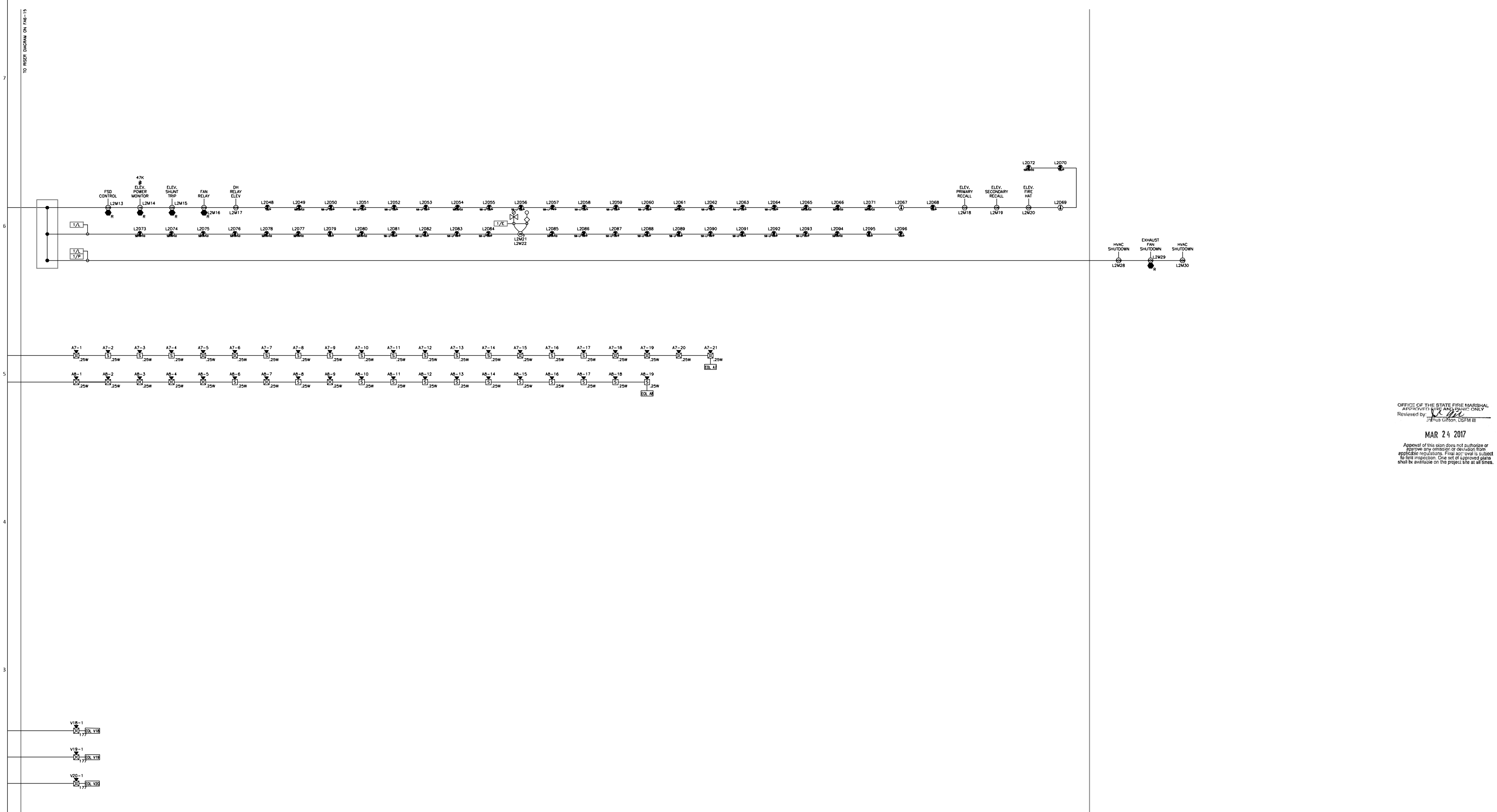
POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-15



RISER DIAGRAM — BUILDING 3B LEVEL 4 AND ROOF

SCALE: NTS

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: Joshua Gibson, DSFM III

MAR 24 2017

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PROJECT NAME

STUDENT HOUSING SOUTH

PROJECT ADDRESS

1 GRAND AVENUE, SAN LUIS OBISPO, CA 93407

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ARCHITECT STAMP

VDTA PROJECT NUMBER

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SHEET TITLE

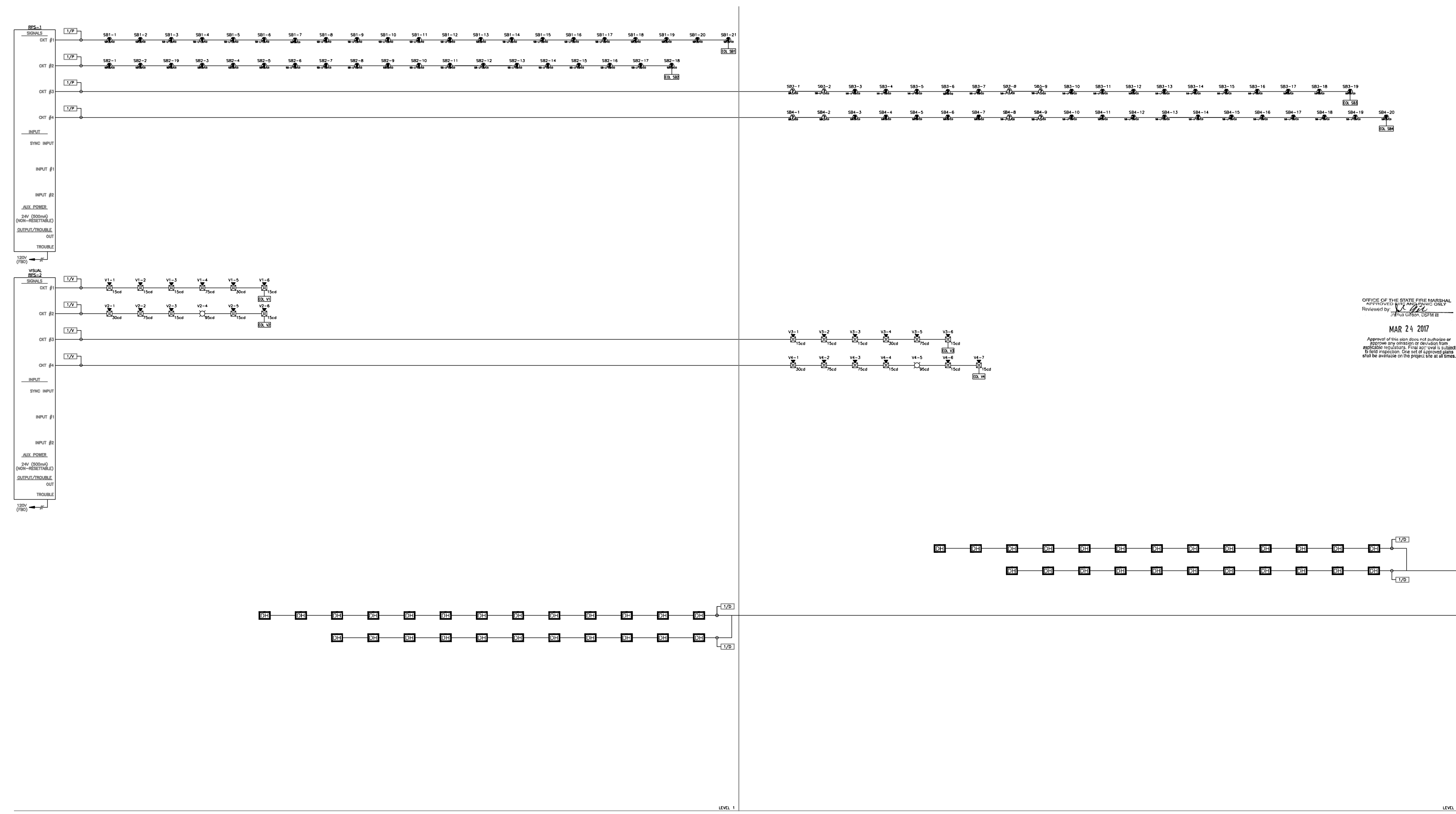
POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-16



RISER DIAGRAM — BUILDING 3B LEVEL 1 & 2

SCALE: NTS

PROJECT NAME

STUDENT HOUSING SOUTH

PROJECT ADDRESS

1 GRAND AVENUE,
SAN LUIS OBISPO, CA 93407

ARCHITECT

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A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

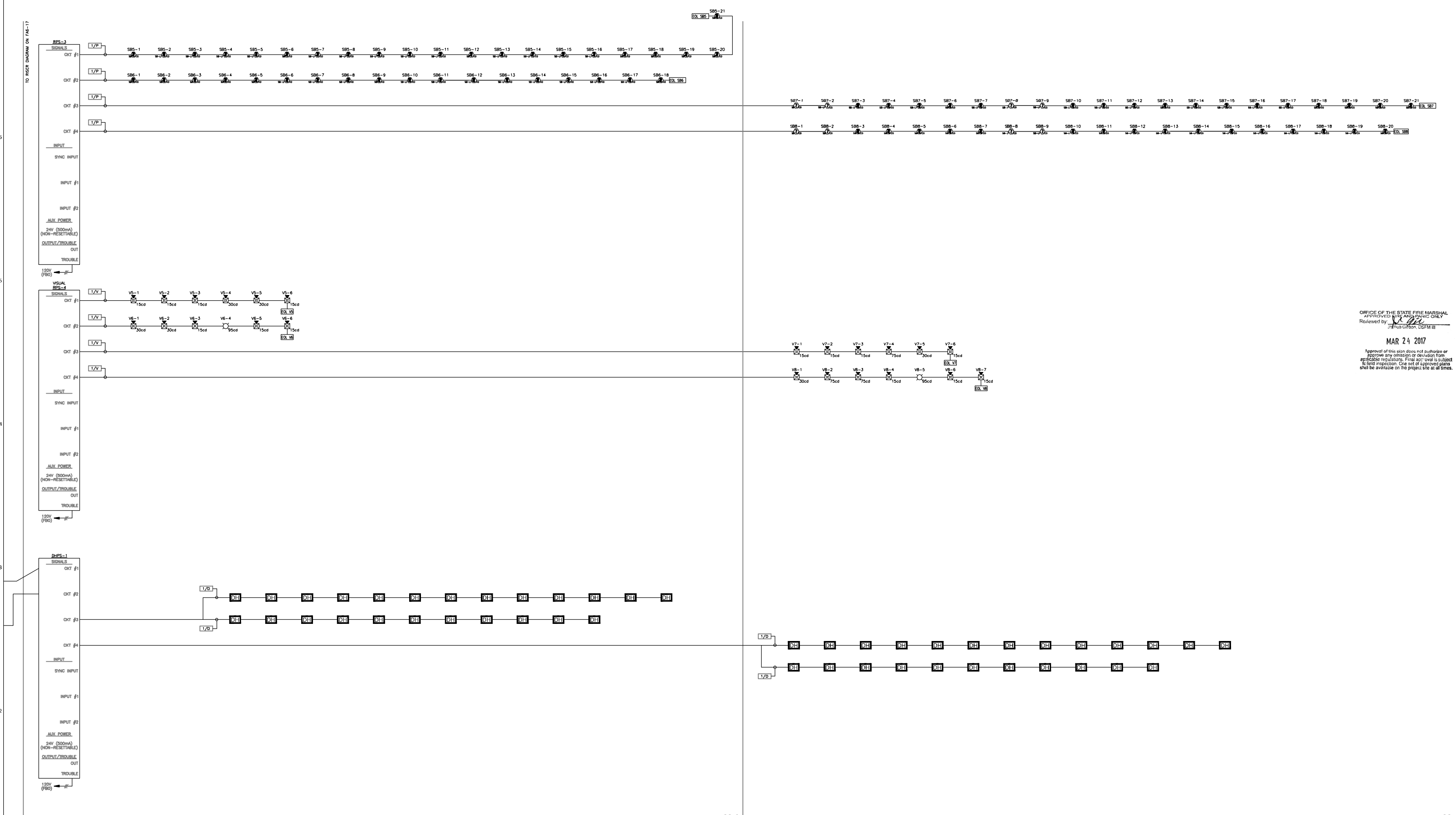
POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-17



RISER DIAGRAM — BUILDING 3B LEVEL 3 & 4

SCALE: NTS

PROJECT NAME

STUDENT HOUSING SOUTH

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CONSULTANT PROJECT NUMBER

15-002-55

ISSUE		
NO.	REVISION DESCRIPTION	DATE
1	PACKAGE 2, 50% PD	03.02.2015
2	PACKAGE 2, 100% PD	05.11.2015
3	PACKAGE 2, 50% CD	07.22.2015
5	PACKAGE 2, 95% CD	10.15.2015
B1	P2: PLAN CHECK CORRECTIONS	12.10.2015
B2	P2: PLAN CHECK CORRECTIONS	01.20.2016
6	DSA PERMIT ISSUANCE	01.28.2016
B5	P2: PLAN CHECK CORRECTIONS	04.08.2016
B6	DSA BACK CHECK	04.14.2016
B7	P2: PLAN CHECK CORRECTIONS	05.10.2016
B8	DSA BACKCHECK V2	06.03.2016
B9	P2: PLAN CHECK CORRECTIONS	07.01.2016
7	OSFM ISSUANCE - FA, LV & SEC	07.26.2016
B10	P2: PLAN CHECK CORRECTIONS	07.29.2016
B13	OSFM BACK CHECK- FIRE ALARM	11.01.2016
A6	2A CSD APARTMENT	11.07.2016
A7	ADD-007/TELECOM REVISIONS	12.15.2016
B14	100% FOR CONSTRUCTION DOCUMENTS	02.21.2017

SHEET TITLE

POINT-TO-POINT

BUILDING

3B

SHEET NUMBER

FA6-18

FST-851(A) Series

Intelligent Thermal (Heat) Detectors with FlashScan®

NOTIFIER® by Honeywell

Intelligent / Addressable Devices

General

Notifier FST-851(A) 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 rotary, decimal address switches, providing exact detector locations. FST-851(A) Series thermal detectors use an innovative thermistor sensing circuit to produce 135°F/57°C fixed-temperature (FST-851/A) and rate-of-rise thermal detection (FST-851R/A) in a low-profile package. FST-851H(A) provides fixed high-temperature detection at 190°F/88°C. These thermal detectors provide effective, intelligent property protection in a variety of applications. FST-851(A) Series detectors are compatible with Notifier Onyx and CLIP series Fire Alarm Control Panels (FACPs).

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by Notifier Engineering that greatly enhances the speed of communication between analog intelligent devices and certain NOTIFIER systems. 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.

B210-2251.jpg

FST-851(A) in B210LP(A) Base

Features

- Sleek, low-profile, stylish design.
- State-of-the-art thermistor technology for fast response.
- Rate-of-rise model (FST-851R/A), 15°F (8.3°C) per minute.
- Factory preset fixed temperature at 135°F (57°C); high-temperature model fixed at 190°F (88°C).
- Addressable by device.
- Compatible with FlashScan® and CLIP protocol systems.
- Rotary, decimal addressing (1-99 on CLIP systems, 1-159 on FlashScan systems).
- Two-wire SLC connection.
- Visible LEDs "blink" every time the unit is addressed.
- 360°-field viewing angle of the visual alarm indicators (two bi-color LEDs). LEDs blink green in Normal condition and turn on steady red in Alarm.
- Integral communications and built-in device-type identification.
- Remote test feature from the panel.
- Built-in functional test switch activated by external magnet.
- Walk test with address display (an address of 121 will blink the detector LED 12-(pause)-1).
- Low standby current.
- Backward-compatible.
- Built-in tamper-resistant feature.
- Designed for direct-surface or electrical-box mounting.
- Sealed against back pressure.
- Plugs into separate base for ease of installation and maintenance. Separate base allows interchange of photoelectric, ionization and thermal sensors.
- SEMS screws for wiring of the separate base.
- Constructed of off-white fire-resistant plastic, designed to commercial standards, and offers an attractive appearance.
- 94-5V plastic flammability rating.
- Remote LED output connection to optional RA100Z(A) remote LED annunciator.
- Optional sounder, relay, and isolator bases.
- Optional flanced surface mounting kit.

Specifications

Size: 2.1" (5.3 cm) high; base determines diameter.

– **B210LP(A):** 6.1" (15.5 cm) diameter.
– **B501(A):** 4.1" (10.4 cm) diameter.
– **B200S(A):** 6.875" (17.46 cm) diameter.
– **B200SR(A):** 6.875" (17.46 cm) diameter.
– **B224RB(A):** 6.2" (15.748 cm) diameter.
– **B224BI(A):** 6.2" (15.748 cm) diameter.

Shipping weight: 4.8 oz. (137 g).

Operating temperature range: FST-851(A) Series, FST-851R(A): –20°C to 38°C (–4°F to 100°F); FST-851H(A): –20°C to 66°C (–4°F to 150°F).

Detector spacing: UL approved for 50 ft. (15.24 m) center to center. FM approved for 25 x 25 ft. (7.62 x 7.62 m) spacing.

Relative humidity: 10% – 93% noncondensing.

Thermal ratings: fixed-temperature setpoint 135°F (57°C), rate-of-rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C).

ELECTRICAL SPECIFICATIONS

Voltage range: 15 - 32 volts DC peak.

Standby current (max. avg.): 300 μA @ 24 VDC (one communication every 5 seconds with LED enabled).

LED current (max.): 6.5 mA @ 24 VDC ("ON").

Applications

Use thermal detectors for protection of property. For further information, go to systemsensor.com for manual I56-407-00, Applications Manual for System Smoke Detectors, which provides detailed information on detector spacing, placement, zoning, wiring, and special applications.

Installation

The FST Series plug-in intelligent thermal detectors use a separate base to simplify installation, service, and maintenance. Installation instructions are shipped with each detector. A special tool allows maintenance personnel to plug in and remove detectors without using a ladder

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see *DN-60054*.

NOTE: 1) *Because of the inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.* ***2)*** *When using relay or sounder bases, consult the ISO-X(A) installation sheet I56-1380 for device limitations between isolator modules and isolator bases.*

Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document.In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. *Consult factory for latest listing status.*

- **UL Listed:** S747.
- **ULC Listed:** S6978.
- **MEA Listed:** 383-02-E.
- **FM Approved.**
- **CSFM:** 7270-0028:0196.
- **BSMI:** CI313066760025.
- **CCCF:** Certif. # 2004081801000018.
- **U.S. Coast Guard:** 161.002/42/1 (NFS-640); 161.002/50/0 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).
- **Lloyd's Register:** 11/600013 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).

Product Line Information

NOTE: *"A" suffix indicates ULC Listed model.*

FST-851: Intelligent thermal detector. Must be mounted to one of the bases listed below.

FST-851A: Same as FST-851 but with ULC Listing.

FST-851R: Intelligent thermal detector with rate-of-rise feature.

FST-851RA: Same as FST-851R but with ULC Listing.

FST-851H: Intelligent high-temperature thermal detector.

FST-851HA: Same as FST-851H but with ULC Listing.

INTELLIGENT BASES

NOTE: *"A" suffix indicates ULC Listed model.*

NOTE: *For details about intelligent bases and their mounting, see DN-60054.*

B210LP(A): Standard U.S. flanged low-profile mounting base.

B210LPBP: Bulk pack of B210LP; package contains 10.

B501(A): Standard European flangeless mounting base.

B501BP: Bulk pack of B501; package contains 10.

B200S(A): Addressable Intelligent, programmable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone.

B200SR(A): Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Replaces B501BH series bases in retrofit applications.

B224RB(A): Intelligent relay base. Screw terminals: up to 14 AWG (2.0 mm^2). Relay type: Form-C. Rating: 2.0 A @ 30 VDC resistive; 0.3 A @ 110 VDC inductive; 1.0 A @ 30 VDC inductive.

B224BI(A): Intelligent isolator base. Isolates SLC from loop shorts. Maximum: 25 devices between isolator bases; see Note 2 under Installation.

ACCESSORIES

F110: Retrofit flange to convert B210LP(A) to match the B710LP(A) profile, or to convert older high-profile bases to low-profile.

F110BP: Bulk pack of F110; package contains 15.

F210: Replacement flange for B210LP(A) base.

RA100Z(A): Remote LED annunciator. 3 – 32 VDC. Fits U.S. single-gang electrical box. Supported by B210LP(A) and B501(A) bases only.

SMB600: Surface mounting kit, flanged.

M02-04-00: Test magnet.

M02-09-00: Test magnet with telescoping handle.

XR2B: Detector removal tool. Allows installation and/or removal of FlashScan® Series detector heads from base in high ceiling installations. Includes T55-127-010.

T55-127-010: Detector removal tool without pole.

XP-4: Extension pole for XR2B. Comes in three 5-foot (1.524 m) sections.

ISO 9001 CERTIFIED
ENGINEERING & MANUFACTURING QUALITY SYSTEMS

This document is not intended to be used for installation purposes.
We try to keep our product information up-to-date and accurate.
We cannot cover all specific applications or anticipate all requirements.
All specifications are subject to change without notice.

Made in the U.S. A.

For more information, contact Notifier. Phone: (203) 484-7161, FAX: (203) 484-7118.
www.notifier.com

SYSTEM SENSOR®

Indoor Selectable-Output Speaker Strobes and Dual Voltage Evacuation Speakers for Ceiling Applications

System Sensor L-Series selectable-output speaker strobes and dual-voltage evacuation speakers can reduce ground faults and enable faster installation with lower current draw and modern aesthetics.

Features

- Plug-in design and protective cover reduce ground faults
- Universal mounting plate with an onboard shorting spring tests wiring continuity before installation
- No extension ring required
- Field selectable candela settings on ceiling units: 15, 30, 75, 95, 115, 150, and 177
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Rotary switch simplifies field selection of speaker voltage (25 and 70.7 Vrms) and power settings (¼, ½, 1 and 2 watts)
- Speakers offer high fidelity and high volume sound output
- 520 Hz +/- 10% square wave tone capable with compatible FACP
- Compatible with System Sensor synchronization protocol
- Electrical compatibility with existing SpectrAlert and SpectrAlert Advance products
- Tamper-resistant construction
- Updated modern aesthetics

Agency Listings

SIGNALING UL LISTED S4048

FM APPROVED — FM approved except for ALERT models 3057493

7320-1653:0505

System Sensor L-Series of speakers and speaker strobes reduce costly ground faults using a plug-in design and universal mounting plate that allow the installer to pre-wire mounting plates, dress the wires, and confirm wiring continuity before plugging in the speakers. In addition, a protective plastic cover prevents nicked wires by covering exposed speaker components.

These devices also enable faster installations by providing instant feedback to ensure that wiring is properly connected, rotary switches to select voltage and power settings, and 7 field-selectable candela settings for both wall and ceiling speaker strobes.

The low total harmonic distortion of the SP speaker offers high fidelity sound output while still offering high volume sound output for use in high ambient noise applications.

L-Series makes installation easy

- Attach a universal mounting plate to a 4 × 4 × $2\frac{1}{8}$ inch back box . Flush-mount applications do not require an extension ring.
- Connect the notification appliance circuit or speaker wiring to the terminals on the mounting plate.
- Attach the speaker or speaker strobe to the mounting plate by inserting the product tabs into the mounting plate grooves. Hinge the device into position to lock the product pins into the mounting plate terminals. The device will temporarily hold in place with a catch until it is secured with a captured mounting screw.

L-Series Speaker and Speaker Strobe Specifications

Architectural/Engineering Specifications

General

L-Series speaker and speaker strobes shall mount to a 4 × 4 × 2$^{1}/_{8}$-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, L-Series speaker strobes, when used with the Sync•Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync•Circuit Module, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 and 33 volts. Indoor L-Series products shall operate between 32°F and 120°F from a regulated DC, or full-wave rectified, unfiltered power supply. Speaker strobes shall have field-selectable candela settings including 15, 30, 75, 95, 115, 150, 177.

Speaker

The speaker shall be a System Sensor L-Series model _______ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. It should be listed to UL 1480 and shall be approved for fire protective service. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. The speaker shall have power taps and voltage that are selected by rotary switches.

Speaker Strobe combination

The speaker strobe shall be a System Sensor L-Series model _________ listed to UL1480 and UL 1971 and be approved for fire protective signaling systems. The speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms selected via rotary switch, and shall have a frequency range of 400 to 4,000 Hz. The speaker shall have power taps that are selected by rotary switch. The strobe shall comply with the NFPA 72 requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Synchronization Module

The module shall be a System Sensor Sync•Circuit model MDL3 listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectrAlert strobes at 1 Hz. The module shall mount to a 4$^{11}/_{16}$ × 4$^{11}/_{16}$ × 2$^{1}/_{8}$-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical Specifications		
Operating Temperature	32°F to 120°F (0°C to 49°C)	
Humidity Range	10 to 93% non-condensing	
Dimensions, Ceiling-Mount	**Diameter**	**Depth**
SPC Speaker	6.8 in, 173 mm	1.0 in, 25 mm
With Surface Mount Back Box	6.9 in, 176 mm	3.5 in, 89 mm
SPSC Speaker Strobe	6.8 in, 173 mm	2.8 in, 73 mm
With Surface Mount Back Box	6.9 in, 176 mm	5.37 in, 136 mm

*When using 12AWG, 14 AWG, or adding extra wires in the box, a deeper box or extension ring is recommended.

Electrical/Operating Specifications	
Nominal Voltage (speakers)	25 Volts or 70.7 Volts (nominal)
Maximum Supervisory Voltage (speakers)	50 VDC
Strobe Flash Rate	1 flash per second
Nominal Voltage (strobes)	Regulated 12 VDC or regulated 24 VDC/FWR [1,2]
Operating Voltage Range (includes fire alarm panels with built in sync)	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Operating Voltage with MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Frequency Range	400 to 4,000 Hz[3]
Power	¼, ½, 1, 2 watts

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. Strobe products will operate at 12 V nominal only for 15 and 30 cd.
3. 520 Hz +/- 10% square wave tone capable with compatible FACP.

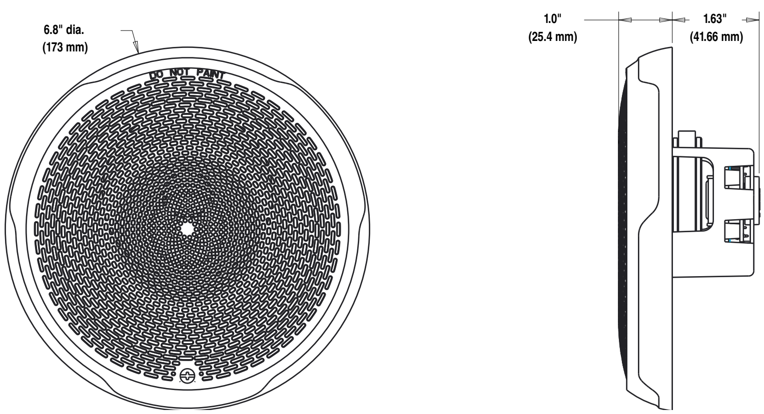
UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)			
	8 to 17.5 Volts	16 to 33 Volts	
Candela	DC	DC	FWR
15	87	41	60
30	153	63	86
75	NA	111	142
95	NA	134	164
115	NA	158	191
150	NA	189	228
177	NA	226	264

Ceiling-Mount Speaker Sound Output		
Setting	UL Reverberant (dBA @10 ft)	UL Anechoic (dBA @10 ft)
1/4 W	79	79
1/2 W	82	82
1 W	85	85
2 W	88	88

Ceiling-Mount Speaker Strobe Sound Output		
Setting	UL Reverberant (dBA @10 ft)	UL Anechoic (dBA @10 ft)
1/4 W	77	77
1/2 W	80	80
1 W	83	83
2 W	86	86

L-Series Dimensions



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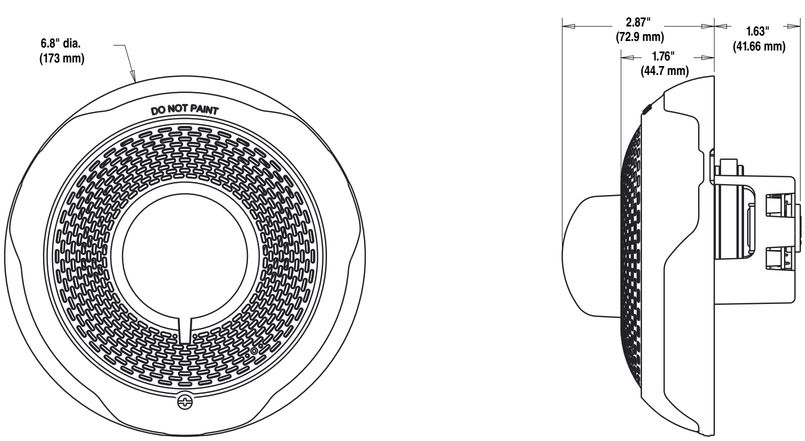
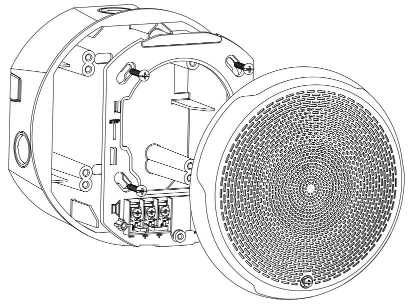
Ceiling Speaker



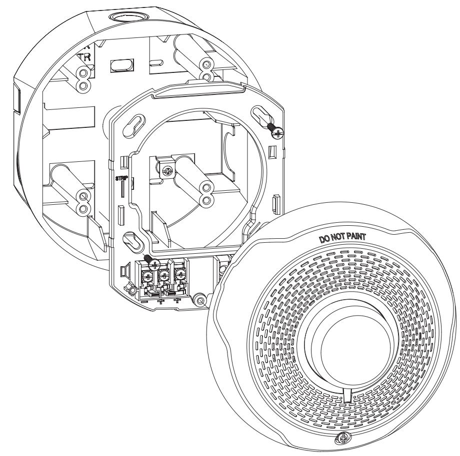
A0544-00

Ceiling Speaker Strobe

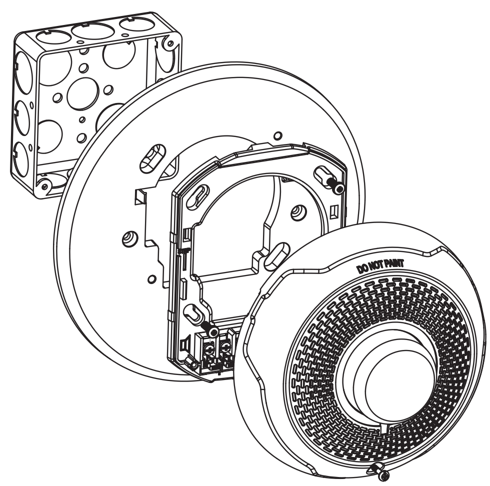
Surface Mounting



Ceiling Speaker with Surface Mount Back Box



Ceiling Speaker Strobe with Surface Mount Back Box



Ceiling Speaker Strobe with Trim Ring and 4" Square Electrical Box

L-Series Ordering Information

Ceiling Mount		
White	**Red**	**Description**
SPCWL	SPCRL	Speaker only
SPSCWL	SPSCRL	Speaker Strobe
SPSCWL-P	—	Plain, Speaker Strobe
SPSCWL-SP	—	Fuego, Speaker Strobe
SPSCWL-CLR-ALERT	—	Alert, Speaker Strobe, Clear Lens

Accessories		
White	**Red**	**Description**
SBBCWL	SBBCRL	Universal Ceiling Surface Mount Back Box
TRC-2W	TRC-2	Universal Ceiling Trim Ring

SYSTEM SENSOR®

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www.systemsensor.com

AVDS866-03 • 03/23/2018

FSP-851(A) Series

Intelligent Plug-In Photoelectric Smoke Detectors with FlashScan®

NOTIFIER® by Honeywell

Intelligent/Addressable Devices

General

Notifier FSP-851(A) Series intelligent plug-in smoke detectors with integral communication provide features that surpass conventional detectors. Detector sensitivity can be programmed in the control panel software. Sensitivity is continuously monitored and reported to the panel. Point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for selective maintenance when chamber contamination reaches an unacceptable level. The FSP-851(A) photoelectric detector's unique optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources. Dual electronic thermistors add 135°F (57°C) fixed-temperature thermal sensing on the FSP-851T(A). The FSP-851R(A) is a remote test capable detector for use with DNR(A)/DNRW duct detector housings. FSP-851(A) series detectors are compatible with Notifier Onyx and CLIP series Fire Alarm Control Panels (FACPs).

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by Notifier that greatly increases the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices in 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.

Features

- Sleek, low-profile design.
- Addressable-analog communication.
- Stable communication technique with noise immunity.
- Low standby current.
- Two-wire SLC connection.
- Compatible with FlashScan® and CLIP protocol systems.
- Rotary, decimal addressing (1-99 on CLIP systems, 1-159 on FlashScan systems).
- Optional remote, single-gang LED accessory.
- Dual LED design provides 360° viewing angle.
- Visible bi-color LEDs blink green every time the detector is addressed, and illuminate steady red on alarm *(FlashScan systems only)*.
- Remote test feature from the panel.
- Walk test with address display (an address on 121 will blink the detector LED: 12-[pause]-1*(FlashScan systems only)*.
- Built-in functional test switch activated by external magnet.
- Built-in tamper-resistant feature.
- Sealed against back pressure.
- Constructed of off-white fire-resistant plastic, designed to commercial standards, and offers an attractive appearance.
- 94-5V plastic flammability rating.
- SEMS screws for wiring of the separate base.
- Optional relay, isolator, and sounder bases.

FSP-851(A) in B210LP(A) Base

B210-2951.jpg

Specifications

Sensitivity: 0.5% to 2.35% per foot obscuration

Size: 2.1" (5.3 cm) high; base determines diameter.

- **B210LP(A):** 6.1" (15.5 cm) diameter.
- **B501(A):** 4.1" (10.4 cm) diameter.
- **B200S(A):** 6.875" (17.46 cm) diameter.
- **B200SR(A):** 6.875" (17.46 cm) diameter.
- **B224RB(A):** 6.2" (15.748 cm) diameter.
- **B224BI(A):** 6.2" (15.748 cm) diameter.

Shipping Weight: 5.2oz. (147g).

Operating Temperature range: FSP-851(A), 0°C to 49°C (32°F to 120°F). FSP-851T(A), 0°C to 38°C (32°F to 100°F). Low temperature signal for FSP-851T(A) at 45°F +/- 10°F (7.22°C +/- 5.54°C). FSP-851R(A) installed in a DNR(A)/DNRW, -20°C to 70°C (-4°F to 158°F).

UL/ULC Listed Velocity Range: 0-4000 ft/min. (1219.2 m/min.), suitable for installation in ducts.

Relative Humidity: 10%-93% noncondensing.

Thermal Ratings: Fixed-temperature setpoint 135°F (57°C).

Detector Spacing and Applications

Notifier recommends spacing detectors in compliance with NFPA 72. In low airflow applications with smooth ceiling, space detectors 30 feet (9.144m) for ceiling heights 10 feet (3.148m) and higher. For specific information regarding detector spacing, placement, and special applications refer to NFPA 72. *System Smoke Detector Application Guide*, document A05-1003, is available at **systemsensor.com**

Electrical Specifications

Voltage Range: 15-32 volts DC peak.

Standby Current (max. avg.): 300µA @ 24VDC (one communication every five seconds with LED enabled).

LED Current (max.): 6.5mA @ 24 VDC ("ON").

Installation

FSP-851(A) plug-in detectors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug in and remove detectors without using a ladder.

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see *DN-60054.*

NOTE: *1) Because of inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring. 2) When using relay or sounder bases, consult the ISO-X(A) installation sheet I56-1380 for device limitations between isolator modules and isolator bases.*

Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. *Consult factory for latest listing status.*

- **UL Listed:** S1115.
- **ULC Listed:** S1115 (FSP-851A, FSP-851RA, FSP-851TA).
- **MEA Listed:** 225-02-E .
- **FM Approved.**
- **CSFM:** 7272-0028:0206 .
- **Maryland State Fire Marshal:** Permit # 2122 **.**
- **BSMI:** CI313066760036.
- **CCCF:** Certif. # 2004081801000017 (FSP-851T)
  Certif. # 2004081801000016 (FSP-851).
- **U.S. Coast Guard:** 161.002/42/1 (NFS-640); 161.002/50/0 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).
- **Lloyd's Register:** 11/600013 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).

Product Line Information

NOTE: *"A" suffix indicates ULC Listed model.*

FSP-851: Low-profile intelligent photoelectric sensor. Must be mounted to one of the bases listed below.

FSP-851A: Same as FSP-851 but with ULC listing.

FSP-851T: Same as FSP-851 but includes a built-in 135°F (57°C) fixed-temperature thermal device.

FSP-851TA: Same as FSP-851T but with ULC listing.

FSP-851R: Low-profile intelligent photoelectric sensor, remote test capable. For use with DNRA/DNRW.

FSP-851RA: Same as FSP-851R but with ULC listing. For use with DNRA.

Intelligent Bases

NOTE: *"A" suffix indicates ULC Listed model.*

NOTE: *For details on intelligent bases, see DN-60054.*

B210LP(A): Standard U.S. flanged low-profile mounting base.

B210LPBP: Bulk pack of B210LP; package contains 10.

B501(A): Standard European flangeless mounting base.

B501BP: Bulk pack of B501; package contains 10.

B200S(A): Intelligent, programmable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone.

B200SR(A): Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Replaces B501BH series bases in retrofit applications.

B224RB(A): Plug-in System Sensor **relay** base. Screw terminals: up to 14 AWG (2.0 mm²). Relay type: Form-C. Rating: 2.0 A @ 30 VDC resistive; 0.3 A @ 110 VDC inductive; 1.0 A @ 30 VDC inductive.

B224BI(A): Plug-in System Sensor ***isolator*** detector base. Maximum 25 devices between isolator bases.

Accessories

F110: Retrofit flange to convert B210LP(A) to match the B710LP(A) profile, or to convert older high-profile bases to low-profile.

F110BP: Bulk pack of F110; package contains 15.

F210: Replacement flange for B210LP(A) base.

RA100Z(A): Remote LED annunciator. 3 – 32 VDC. Mounts to a U.S. single-gang electrical box. For use with B501(A) and B210LP(A) bases only.

SMB600: Surface mounting kit

M02-04-00: Test magnet.

M02-09-00: Test magnet with telescoping handle.

XR2B: Detector removal tool. Allows installation and/or removal of detector heads from bases in high ceiling applications.

XP-4: Extension pole for XR2B. Comes in three 5-foot (1.524 m) sections.

T55-127-010: Detector removal tool without pole.

BCK-200B: Black detector covers for use with FSP-851(A) only; box of 10.

WCK-200B: White detector covers for use with FSP-851(A) only; box of 10.

ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

This document is not intended to be used for installation purposes.
We try to keep our product information up-to-date and accurate.
We cannot cover all specific applications or anticipate all requirements.
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