Lyndhurst Fire Department Facility Needs Assessment

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CERTIFICATION STATEMENT

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ABSTRACT

The Lyndhurst Fire Department's fire station is over thirty years old. During the past thirty years, Lyndhurst has added additional staffing, hired its first female firefighter, increased its emergency call volume, begun housing regional technical rescue team equipment, and gotten involved in more public education programs. While the scope of the fire service as broadened over the years, the Lyndhurst fire station has not expanded to accommodate these additional responsibilities.

The purpose of this research was to identify what were the dimensional needs of line and staff personnel in terms of space and to identify what local and regional trends in the fire service could affect the Lyndhurst fire station. As well as literature review, evaluative research through the use of questionnaires and current facility dimensional analysis was completed to answer the following questions:

1. What are the current facility dimensions based on functionality?
2. What are the future local and regional fire service functions that could impact the Lyndhurst Fire Department facility size or needed functionality?
3. What are the needs of current administrative and line personnel in terms of space and function related to their specific functional assignments.
4. What course of action should the Lyndhurst Fire Department take in terms of major renovation or new facility?

Results from the research indicated that line and staff personnel felt the highest priority in terms design and needed space were the training room, EMS supply room and dorms. Regional fire chiefs indicated that fire stations for the future should take into

account regional trends including staffing, housing of equipment, funding, and a regional training center.

Recommendations included conducting more thorough research on facility design requirements based on functional assignment, obtaining feedback from elected city officials and broadening the research in terms of regional capabilities of a fire station facility.

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INTRODUCTION

Statement of the Problem

The Lyndhurst Fire Department Fire Station is in major need of well planned renovation or reconstruction. The fire department has added staffing, expanded emergency responsibilities, and equipment but the building has not grown with it. While some may say that our station is adequate, calls get handled, and the personnel have a place to eat and sleep; this is a great misunderstanding our actual needs!

The problem this study will address is the facility dimensional needs of the City of Lyndhurst Fire Department. The city has already spent excessive amounts of money to accommodate the first female firefighter but has lost space in the process which contributed to further inadequacies of the facility. The fire department will be competing with the police department and municipal court to increase their space to meet current standards and future needs.

Purpose of the Study

The purpose of this study is to identify what specific areas of a fire station design should be concentrated on based on current fire department personnel needs and regional fire service trends. While the space crunch at the fire department is obvious to the rank and file, city administration and the general public don't understand what is actually needed to operate an effective, efficient, and safe fire organization. It is expected that upon completion of this study the city administration and the general public will have a better understanding of the needs of the fire department and will support a new fire station or major renovation.

Research Questions

The research questions this study investigated were:

1. What is the current facility dimensions based on functionality?
2. What are the future local and regional fire service functions that could impact the Lyndhurst Fire Department facility size or needed functionality?
3. What are the needs of current administrative and line personnel in terms of space and function related to their specific functional assignments.
4. What course of action should the Lyndhurst Fire Department take in terms of major renovation or new facility?

BACKGROUND & SIGNIFICANCE

The Lyndhurst Fire Department started in 1926 as a volunteer organization and made the transition to a career department by the mid 60's. Lyndhurst responded to 2128 emergency calls in 2005, an increase of over 7% from 2004. Due to the large elderly population within the community, emergency medical responses account for over 80% of the responses. The department has twenty-six personnel. There are three shifts of six firefighters, one lieutenant & one captain with minimum on-duty manning of six. The Fire Chief and Fire Prevention Captain work forty-hour work weeks.

The community is predominately residential with light commercial. Per the 2000 census, there are approximately 15,279 residents with a median age of 44.7 years and 29.09% are over the age of 62. Lyndhurst is 4.7 square miles, Mayfield Road (Rt. 322) dissects the city North and South and a small section of Interstate 271 runs through the Southeast corner of the city. Since the 1990 census, Lyndhurst has lost some population but the average age has increased which has lead to some of the increase in emergency runs.

The Cleveland Clinic recently acquired the old TRW World Headquarters building and is in transition in making that facility their headquarters. There are seven buildings of six-stories, one nursing home, one high school, two private country clubs with 18-hole golf courses, and a new large upscale shopping complex.

There is one nursing home in the city which contains an assisted living section as well as the dependant care section. The facility's master plan calls for two more buildings but has not taken on that endeavor. There is also an urgent care facility in the

city as well as several medical and dental offices. One medical facility conducts out-patient surgeries and another specializes in radiological diagnosing.

There are small sections of land available for residential development and limited commercial development. There are currently two developments under construction which will contain high value single family homes, there will be approximately 45 homes added to the city when completed. Acacia Country Club has just completed building a new 33,000 square foot club house. There has been discussion of a luxury hotel being built at the Legacy Village Shopping Complex but it has yet to be realized.

The largest open land space is on the Cleveland Clinic property which is zoned for office and consists of 110 acres. The Cleveland Clinic has not given any official indication of development of the property at this point but unofficially there has been talk of a biomedical research facility or an additional medical office campus. There are no plans in place for any other major commercial development in the city, only the occasional one to two story office buildings has gone up in recent years.

The Lyndhurst Station houses one engine, one 100' platform truck, two ALS ambulances, one command car, and the Hillcrest Regional Tech Rescue Team - Collapse Truck with trailer. Two staff cars and a pick-up are housed outside because there is not enough bay space to house them inside. There is a small garage at the East end of the station which houses a golf cart that is used for hydrant maintenance. The garage is also used for maintenance of station power equipment & tools. Within the garage are some wooden storage cabinets for spare parts, gas cans, spare vehicle fluids, and other maintenance items (see Appendix A for a drawing of the current fire station).

There are three small dorms which are shared between all firefighters and officers. There are thirteen beds without partitions for twenty-four shift personnel. The dorms do not have fire detection or suppression equipment. There is one men's room and one lady's room. The men's room contains one shower, two sinks, two toilets, two urinals, as well as lockers for each firefighter. The lady's room consists of a single shower, lockers, a single toilet and sink. The lady's room is also use for general public use since there is not a public restroom within the fire station.

There is one office for the fire chief and one office for the fire prevention captain. The third office is shared between the six shift officers and is known as the "duty office". The duty office contains two desks with computer workstations, a conference table, several filing cabinets, training library, and storage closet. The duty office also houses the fire department server and the reverse 911 computer consoles.

The radio room has basic radio equipment including our Zetron System as well as two computer workstations for data entry by the firefighters. The room is also a back-up fire dispatch area but does not meet NFPA requirements for a dispatch area. There is also very limited storage in this room.

The day room and kitchen are combined into one room. The kitchen area has three refrigerators, one for each shift. There is not a hood system for the stove and no fire detection system in the room. Since there is not a formal training room in the fire department therefore, the kitchen/day room serves this function. However, the room lacks proper seating, lighting, or training equipment. Community education courses or fire department training larger than the shift requires the use of a community room in the basement of city hall or off-site on in the Community Center.

The basement of the fire department contains the work out room and storage room. The workout area is cramped and used by members of the police department, service department and the fire department. Due to the limited space in the main office area of the fire department, fire investigation files and the training supplies are stored in the basement.

The current station lacks a clean area for SCBA's or a SCBA fill-station. There is not an area to clean contaminated turn-out gear or EMS equipment. Currently, the fire department gear racks are located in the bays behind the ladder truck requiring members to suit up in an area with moving fire apparatus. The vehicle exhaust system is over seven years old and goes out of service regularly leading to exposure of exhaust fumes to fire department members. The department does not have hose washing and due to the lack of a hose dryer, the fire department hangs hose in the apparatus bays which have the potential of collapsing on personnel. Due to the lack of storage, the fire department must store items in various areas including the fire department basement and in the basement of city hall.

The current city hall complex (which included the city hall, court, police department and fire department) was built in 1973 and has had minor renovations throughout the years keeping the station in good condition. In addition to the fire department space needs, the Police Department and Court have also expressed a need for larger facilities. With the general down-turn of the economy over the past few years, the city is in a "belt tightening" mode and has decided not to address any major facility needs.

The impact this study will have is identifying specific needs of a modern fire station based on functionality and regional trends. This study will assist the fire department in building a facility that will not only meet the current needs of the fire department but will be able to adapt to the future.

The building of a new fire station or major renovation of an existing fire station should be based on national standards as well as departmental and regional needs. This is a significant issue to the department and the community because it affects the efficiency and safety of fulfilling our fire department's Mission Statement and Values. This project is even more imperative to the fire department because of the space needs of the other city departments and the limited funds to meet those requests. With the expected cost of a new fire station to be in the several million dollars of tax payer money, it is paramount that the fire department justifies such an expense through comprehensive research and analysis.

LITERATURE REVIEW

A literature review was conducted to develop established standards for fire stations, identify specific needs of fire stations and to ascertain how similar fire departments addressed their respective stations needs.

Ely (1989) identified various federal guidelines related to the safety aspect of fire station design including NFPA 1500 and OSHA. "Obviously, any fire station must be equipped with state-of safety materials and equipment, including fire walls, fire resistive building materials, an automatic detection and alarm system with smoke detectors, and a complete automatic sprinkler system" (Ely, 1989, p. 15). Even though this manual is eight-teen years old, it lays out guidelines that are still applicable today. In addition, Ely identified minimum apparatus space requirements based on functionality of the piece of apparatus.

While the fire and building codes have changed over the last 33 years, the current station has only had minimum upgrades to keep it in good repair. Architect David Acomb of Cole & Russell Architects (2001) stated "What more logical place to start than appraising the condition of your existing facility to meet your operational requirements. Itemizing the inadequacies of your facility and…". (Acomb, March 2001, p.1). While the current fire station at Lyndhurst was adequate when first built, progression within the fire service has made it somewhat antiquated. As to not get caught being short sighted, Cole + Russell stated, "…by determining not just your immediate needs, but anticipate 5, 10, even 20 years into the future", (Cole & Russell, 2001).

In *Fire Chiefs Handbook 5th Edition* an entire chapter is devoted to fire station and facility design. The text identifies space requirements for many areas including

training. "Classroom and conference room space should be planned at 16 sq. ft. person, designed to accommodate 15-24 people" (de Silva, 1995, p. 491). *NFPA 101 Life Safety Code* recommends an area of 20 sq. ft. for classrooms (NFPA 101, 2006, p. 66). While these are a few recommendations for a training area, the current Lyndhurst Fire Department lacks any formal training room or training grounds. This text also identifies the need for experts to assist in developing the plan and the implementation of the proposed new facility. The text stipulates the need for the department members, the community (elected officials and citizens), and outside experts to make up the team.

With the addition of our first female firefighter a literature review was done on gender related issues at fire stations. McElroy (2001) concluded that his department should "immediately move to provide partial height partitions in all open floor plan bunkrooms, regardless of whether or not they house mixed genders" (McElroy, 2001, p. 21). While gender is a consideration, McElroy concluded that privacy was important to their staff members. His study was limited to gender issues related to sleeping arrangements and restrooms; it brings to light the need to address these issues when building a new facility.

A survey was conducted of metropolitan fire departments by McGrath (2005) to ascertain what designs were implemented in recently built fire stations. The Lyndhurst Fire Station was built in 1973 and the fire service has evolved in equipment needs as well as service provided. One area surveyed was in relations to turnout storage. "Every department surveyed provides dedicated turnout storage rooms", (McGrath, November 2005, p. 47). At Lyndhurst, gear is currently stored on movable wire racks in the apparatus bay behind the ladder truck. In addition, the turnouts are below the hose racks

which are hoisted towards the ceiling above so hose can be dried. There could be catastrophic consequences if these hose racks were to collapse while loaded with fire hose onto the firefighters below donning their turnouts.

One of the major areas of concern is the apparatus room at the fire station. The current bays do not have adequate room for all vehicles and the bays lack an adequate area for cleaning contaminated equipment. In the November, 2005 issue of *Fire Chief Magazine*, Ross (2005) specified minimum bay requirements in terms of size and options. "Bay configuration should encompass current and future response, site layout, building size, and the ability to house all equipment in most or all bays", (Ross, November 2005, p. 116). Ross also stated "Double-deep bays should be at least 80 feet deep and may be more depending on specific apparatus", (Ross, November 2005, p. 116). In reference to decontamination facilities, Ross stated "Decontamination facilities such as sinks, showers, counter tops and hook-ups must be included", (Ross, November 2005, p. 117).

In the FEMA manual *Safety and Health Considerations for the Design of Fire and Emergency Medical Services Stations* it was concluded that the needs assessment "should begin with community expectations and operational needs which can be broken down into more specific requirements" (FA 168/May 1997, p. 11). The needs assessment should include a risk assessment as it relates to heath and safety. The manual also addresses the need for a station to be able to adapt to future expansion or future functional role assignments. The manual addressed needs not only for fire related functions but for EMS related functions and is very comprehensive in nature.

The City of Lyndhurst has had two master plan studies conducted to address the entire facility needs of the city. The study completed by Collins Gordon Bostwick

Architects concluded that “Other than for the Court and the Fire Department, there are no immediate critical personnel needs for departmental area expansion within the foreseeable future”, (CBGA, 2001). CBGA specifically identified various options for an addition to the current station but all options were very expensive and ill advised. The study conducted by Project and Construction Services, Inc. (2004) only submitted site plans depicted a new facility and not a renovation. The city is currently having another study completed to identify current the facility needs of the fire department, police department, and court. This study was not completed by submission of this research project.

PROCEDURES

The procedure that was used in this study was evaluative research. The current Lyndhurst Fire Station was evaluated to ascertain specific current facility dimensions based on functional use. All rooms and apparatus were measured and the facility was diagramed (see Appendix A – The Current Lyndhurst Fire Station) using a computer program. The dimensions were used to identify what areas of the fire station need additional space based on current fire department personnel needs. Industry standards were also taken into consideration however; they were not used as the main focus of this paper because this author wanted to investigate more closely the preferences of the current personnel's preferences in terms of prioritizing space based on specific functional use. In addition, industry standards will be used more specifically when designing a new facility or preparing for a major renovation. While the intent of this study was to address current facility deficiencies, it would have been short-sighted not to address future changes in the region or fire service that could affect the Lyndhurst Fire Department Facility.

In addition, a survey was submitted to fire department personnel (see Appendix B – Fire Department Functional Assignment Questionnaire) based on functional assignment within the department and their individual specific needs. The survey was done in the form of a questionnaire and was distributed to six shift officers, fire prevention captain, fire chief, and eight-teen firefighters. A total of seventeen surveys were returned of the twenty-six distributed for a 65% response.

A survey was also distributed to the Hillcrest Regional Fire Chiefs (see Appendix C – Hillcrest Regional Fire Chief's Questionnaire) to identify possible future roles the Lyndhurst Fire Department or region may need to take on. A total of eight fire chiefs were sent the survey and seven surveys were returned for an 87.5% response. The survey was limited to the Hillcrest Region because it is within this region that the Lyndhurst Fire Department is currently involved in regional programs such as the Hillcrest Technical Rescue Team and the Hillcrest Fire Investigation Strike Force. This survey was used to help better plan out how a new facility should accommodate future expansion or function.

A final questionnaire was submitted to the elected officials of the City Of Lyndhurst (see Appendix D – City of Lyndhurst Elected Officials Questionnaire) to ascertain their understanding of the roles the fire department plays in public safety. The ultimate goal of the survey was to understand what the elected officials expect from the fire department in terms of emergency and non-emergency services. It is expected that this survey will allow the fire department to develop a plan of action to gain support from the elected officials in the building of a new station. Only two surveys were returned of the eight distributed for a 25% response.

Defintions

ADA. American with Disabilities Act

NFPA. National Fire Protection Association

EOC. Emergency Operations Center

Down Time: time in which firefighters are not engaged in handling emergency runs, conducting fire prevention activities, attending trainings, or conducting routine daily maintenance to the apparatus or facility. Generally "down time" is

when an individual can perform personal activities such as reading, watching television, or working on personal projects.

EMS: Emergency Medical Services

SCBA: Self-contained Breathing Apparatus

Day Room: The room in the fire station where firefighters can watch television, read, & relax.

Radio Room: the room in the fire station where firefighters complete reports and can function as a backup dispatching center.

Limitations of the Study

The research for this study was limited to the twenty-six personnel currently employed at the Lyndhurst Fire Department. Of the twenty-six surveys distributed, only seventeen were returned or 65%. Of those returned questionnaires, eleven were firefighters; four were shift officers, one from the fire prevention officer and one from the fire chief. It was felt that current personnel had the best information on the fire station and how the short-comings of the facility affect them in their daily responsibilities.

Hillcrest Regional Fire Departments were also only used in this study which encompasses a total of eight fire departments. A total of seven fire departments responded to the study of the eight surveys submitted for a 87.5% response. The Hillcrest Regional Fire Departments that responded to the survey were Beachwood Fire Department, Richmond Heights Fire Department, Highland Heights Fire Department, Mayfield Heights Fire Department, Pepper Pike Fire Department, Gates Mills Fire Department, and the Lyndhurst Fire Department. Lyndhurst works cooperative with the above mentioned fire departments routinely. The Hillcrest Region has developed many

area wide programs such as Technical Rescue, Fire Investigation, and Rapid Intervention to name a few.

This study was greatly limited by the low response from the elected officials of the community. All city council members were given a survey and only two responded of the seven distributed for a 25% response. City council members were emailed several times in an attempt to get them to response to the survey. The data that was to be collected for this research project by city council was not used because of the low response.

RESULTS

The results for this research project were compiled from the literature review, the data collected from the completed questionnaires, and a review of our current facility.

Research Question 1

What is the current facility dimensions based on functionality?

The current fire station facility was broken down room by room and measured to ascertain what the overall dimensions were.

Table 1

Total square footage of fire station rooms based on functionality

Room	Square Foot	Comments
Chief's office	238	
Fire Prevention office	133	
Duty office	264	Shared by six officers, two workstations
Radio room	112	EMS report entry, two workstations
West dorm	364	Six beds
East dorm		Five beds
Small dorm	71	Bunk bed, small desk,
Men's locker room	189	One shower, one urinal, two toilets, three sinks, 72 metal lockers
Woman's locker room	46	One shower, one toilet, three lockers
Kitchen	494	
Day room	167	Same room as kitchen (measured separately)
Apparatus room	3843	Four bays, 60 foot deep
SCBA room	77	No fill station or sinks, just storage
Laundry room	157	
Shop	304	Golf cart is parked in shop during summer
Training room	0	Currently use kitchen as training room

The current fire station does not contain a sprinkler system or adequate fire alarm system which was identified by Ely as an important aspect in meeting current federal and OSHA standards. In addition there is no fire suppression system in the kitchen hood

system which is required by the fire code. The current turnout gear storage area is in the bays requiring firefighters to put on the gear in the area of moving apparatus. McGrath (2005) stated most departments surveyed have a specific room for turnout gear out of the way of moving apparatus.

Since there is not a current formal training room at Lyndhurst, the kitchen table is used as the training room. de Silva (1995) recommended a minimum of sixteen square feet per person for a classroom and the classroom should hold from 15 – 20 personnel. The training room should also have the capability for modern audiovisual equipment, storage for training materials, and be able to have space enough to conduct a department wide training. Using de Silva's recommendation, the current facility would need a training room that would hold twenty-six personnel and be a minimum of 416 square feet.

The fire department currently houses three fire department vehicles outside due to the lack of bay space, the fire department utility pick-up truck, the fire chief's SUV, and the fire prevention officer's car. Table 2 gives the overall length of Lyndhurst fire apparatus that are currently parked inside the fire station.

Table 2

Overall fire apparatus length parked inside fire station

Vehicle	Total length in feet	Comments
Squad 442	27	Front line ambulance
Squad 441	24	Second line ambulance
Car 458	17	SUV ambulance chase vehicle
Engine 411	36	Sole engine, first out fire truck
Truck 421	49	Sole ladder tower, second out fire truck
Rescue 578	23	Regional collapse truck
Trailer 578	24	Regional collapse trailer, pulled by Rescue 578

The bay length is only 60 feet which limits the vehicles that can be housed inside. Ross (2005) recommended bay drive through bays of at least 80 feet long that would have the ability to house all of the current vehicles at Lyndhurst.

Research Question 2

What are the future local and regional fire service functions that could impact the Lyndhurst Fire Department facility size or needed functionality?

A questionnaire was submitted to the regional fire chief's and to Lyndhurst City Council members to identify what local and regional trends may impact a modern fire station facility. Due to the limited response from the council their information is not included in this paper.

Cole & Russell (2001) recommended anticipating up to 20 years into the future when planning a fire station. The number one trend identified by the regional fire chiefs was addressing facilities to accommodate female firefighters. The FEMA manual (1997) referenced the need for fire stations to be designed in such a fashion to be able to adapt to future expansion or functional assignment.

Four different issues tied for the next highest score. They were designing a facility for a greater than thirty year use, meeting ADA & NFPA standards, EOC capabilities, and interestingly the staffing of regional manpower for regional equipment. The area that the chief's indicated should be the least considered in the design of a new fire station was the ability to use it as an emergency shelter.

Research Question 3

What are the needs of current administrative and line personnel in terms of space and function related to their specific functional assignments.

A questionnaire was given out to line and staff personnel asking them various questions about the current fire station and how it meets each individuals need based on functional assignment. The first objective was to measure how much time a member spent doing a specific activity and what impact that had on which room within the fire station the member felt needed the highest priority in terms of space based on function. Figure 1 identifies what rooms current line and staff personnel spend the majority of their time.

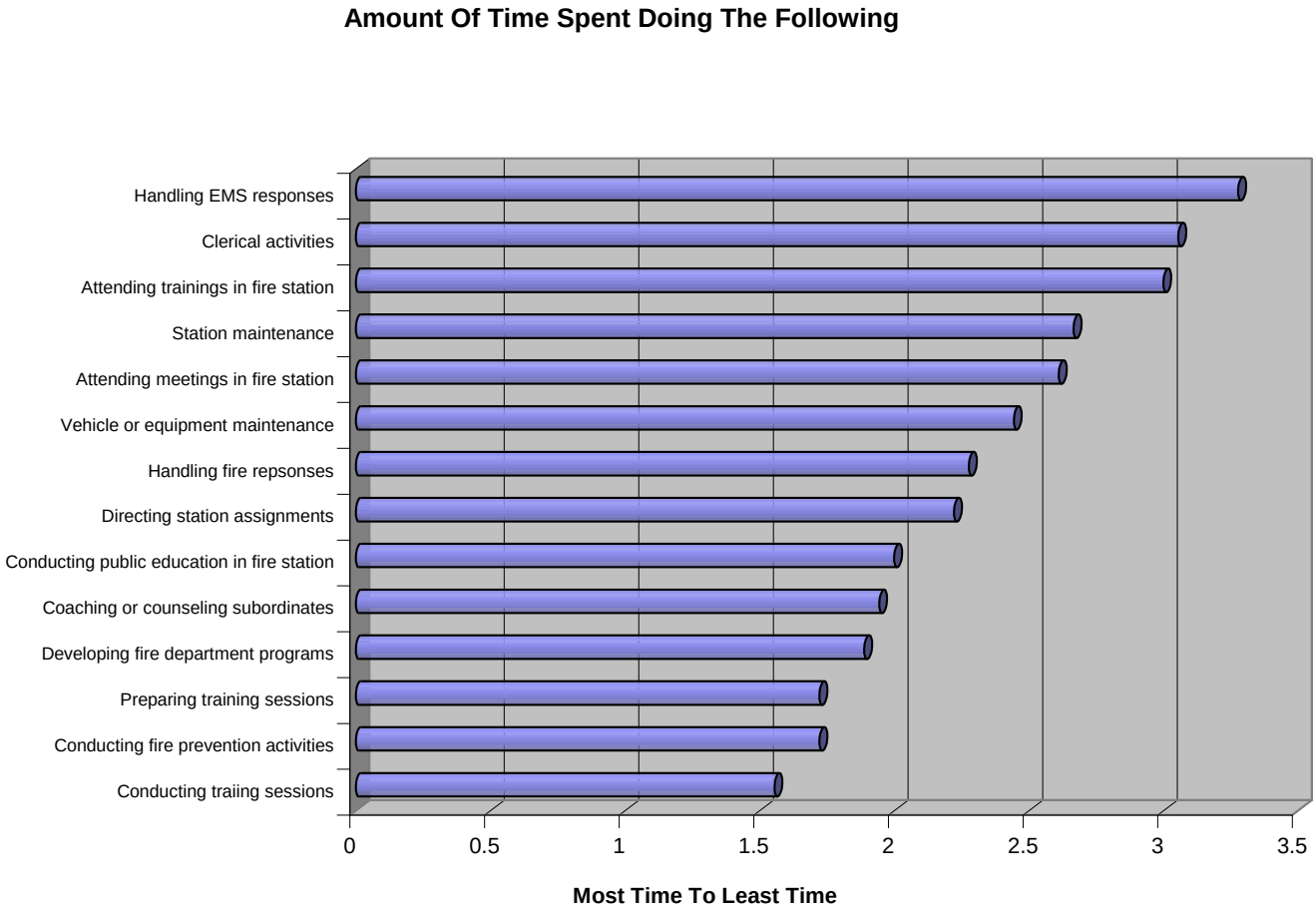

Figure 1

Amount of time spent completing various activities while on duty at fire station

Per Acomb's (2001) recommendation, the amount of time that line and staff personnel spend completing various functions was evaluated. The firefighters spent the most time handling EMS responses while the officers spent most of their time with clerical activities. Attending training sessions had a high response by participants, probably due to the fact some type of training is conducted on most every shift. Completing station maintenance also received a high response but this was probably due

to the fact participates counted daily equipment checks as part of the maintenance routine. Lyndhurst generally sends out vehicles for repairs and preventative maintenance instead of completing it in house.

The least time spent on an activity was actually conducting a training session. The training officer and shift officers actually conduct the training sessions as well as prepare the programs. The fire prevention officer is the primary person that conducts fire prevention activities but occasionally receives assistance from line officers which in turn lead to a lower rating.

The participants were also asked how much time the participant spends in the each room used in the survey. The number one room was the day room followed by a tie between the kitchen and dorms. The duty office was specified by all of the participating shift officers and the radio room was specified by the line firefighters.

The participants were also asked what room they felt had the highest priority need in terms of size or function to help complete their specific functional need. The rooms that were asked about in the survey are the rooms that are used most often by line and staff personnel.

The training room, EMS supply room and dorms received the highest priority need while the fire chief's office, shop/maintenance area, and fire prevention office received the lowest rating in priority. It should be noted that the fire prevention officer rated his space as a high priority which is not surprising because he uses the room daily and has the best understanding of the room's limitations. Figure 3 gives a graphical presentation of priority need identified by current personnel.

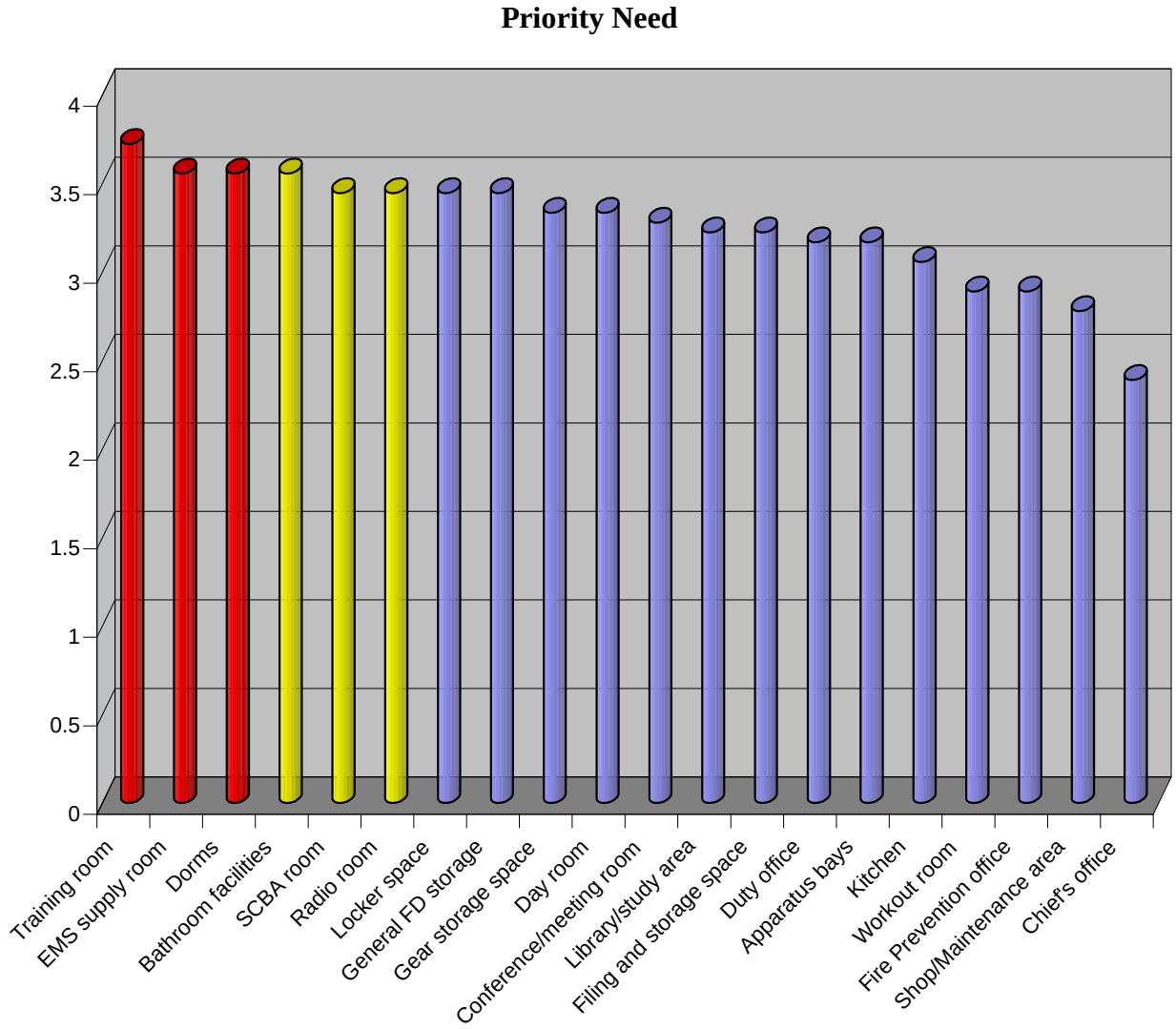

Figure 3

Priority of need in terms of size based on function

Not surprising, the training room was the number one identified priority followed by the station dorms. Tied for the third highest rating were the apparatus bays and storage areas of the fire station.

Research Question 4

What course of action should the Lyndhurst Fire Department take in terms of major renovation or new facility?

De Silva (1995) noted that experts would be needed to assist in developing a plan for a new station or major renovation. In addition, community and department involvement would be needed to further ensure a well planned facility able to address the future needs. Unfortunately, due to the lack of response from the elected officials there in not adequate information on what role they would want or need to play in a new facility.

The regional fire chiefs have identified other area fire station design strengths that should be examined. The fire chiefs were asked if they were to build a new fire station, what local or regional fire stations would they model the station after and what specific room they would model. Table 3 lists the top three fire stations as well as the specific rooms.

Table 3

Top three fire stations and rooms to model

Fire Station	Room(s)	Votes
Beachwood Fire Station 1		3
	General Offices	2
	Apparatus Bays	1
Mayfield Heights Fire Station		2
	Training Room	1
	Apparatus Bays	1
Mayfield Village Fire Station		2
	Training Room	1
	Watch Office/Radio Room	1

Two master plan studies completed by the city have identified the fire department in the need of a major renovation or new facility because of lack of space and adequate design. CBGA (2001) identified multiple renovation options but due to cost and limitations of a renovation, renovation was ill advised. In addition, a study completed by PCS (2004) only depicted a new facility in their drawings and recommendations to the city.

DISCUSSION

The results of the research conducted were somewhat ambiguous and narrow focused; however, the research still provided valuable information. As recommended by Cole & Russell Architects, the research began by examining the current facility dimensions and shortcomings identified by the current department personnel. Line and staff personnel have identified inadequacies of various offices and rooms which could be attributed to the lack of space within those rooms. By examining the length of the current fire apparatus and comparing that length to the length of the apparatus bay space, one can tell that space is at a premium in the bays.

There are currently four bays which are sixty feet long and have fourteen foot wide garage doors. Retired Fire Chief Patrick Murphy proposed in his 2003 Five Year Plan, "…increase the present size of the apparatus room from four drive-thru bays which are approximately 60' deep with 14' doors to five drive-thru bays with dimensions of 80' deep with 18' doors" (Murphy, 2003, p.4). In addition, a master plan study completed by PCS, only depicts five bays for a fire department renovation or addition (PCS, 2004, pp. 4 – 6). Five bays for the fire department would allow for all fire department apparatus to be parked inside the fire station and allow for adequate room for personnel to conduct basic maintenance on apparatus as needed. Ross (2005) specified "Bay configuration should encompass current and future responses, site layout, building size, and the ability to house all equipment in most or all bays", (Ross, November 2005, p. 116). While the apparatus bay area was not indicated by current personnel as a high priority, the regional fire chiefs indicated the area should be an area to concentrate on when building a new fire station.

The regional fire chiefs also indicated that fire stations of the future should consider more regional concepts. The Hillcrest region has already embraced regional concepts; therefore, it would be short-sighted not to further consider this when considering bay space. Architect David J. Acomb of Cole+Russell Architects stated "Fire suppression is no longer the primary mission of fire departments. Nowadays, EMS, Technical Rescue, Hazardous Materials, and Fire Prevention represent a large portion of the changing nature of fire services. All of these services have a direct impact on the design and function of your station", (Acomb, 2001, p.1). He continued and stated "Manpower shortages, gender issues, disaster preparedness, and training requirements place additional operational demands on your facility and administration". This reinforces the importance of planning for future growth and responsibilities for the fire department when renovating or building a new facility. All of the fire stations that the regional fire chief's recognized with specific desirable designs or rooms were less than eight years old.

The current fire department personnel had various points of view towards different areas of the current fire station. It is this researcher's opinion that current line and staff personnel in any organization have a personal perspective towards the facility that they work in. It is important to consider these opinions towards rooms based on functional assignment because it affects their ability to function day to day. As stated by McElroy (2001) "…seek input on the types of sleeping facilities to be provide from representatives of both male and female employees whenever panning remodeling of existing facilities and construction of new facilities", (McElroy, 2001, p.22). Dorms were the second most important area that should be addressed according to line and staff

personnel. Whether partial partition walls are added or separate dorm rooms for each on duty person, it is imperative that the fire department administration seek input from the current male and female personnel on what they prefer in a dorm for fire department staff.

It was interesting that the fire department training room was of high importance to line and staff personnel. The fire department kitchen is currently used for classroom training sessions and when a larger training is done, the training is moved over to the community center. Training is completed every shift in some fashion or another at the fire station. While shift training general consists of six to ten personnel, the training room should be designed to accommodate the department as a whole. In addition, the training officer has to keep reference material, videos, and props throughout the fire station because there is not a central training office to store the material. NFPA 1402 is the standard on fire department training facilities and needs to be referenced when designing a fire station with a designated training room, building, or grounds. NFPA 101 Life Safety Code establishes minimum square footage based on occupancy with 20 square feet the recommended size per person for a classroom. Further more, the lack of a formal training room in the fire station may affect the city's Insurance Services Organization (ISO) rating. Further research needs to be completed to completely understand what affect the training area or lack of training area has on the fire department as well as the city.

The research also revealed that line personnel spend most of their down time in the kitchen, day room, or dorm. With the cramped quarters in the fire station, especially the kitchen and day room, it is difficult for members to find a quiet area to read or relax.

Members must go to the dorm to find a quiet area in the current fire station. This is not an ideal situation because it may give the perception that members are sleeping during business hours. Using the dorm as a quiet area is also a hindrance during the evening when other personnel may want to go to bed. A new fire station or renovation should include a separate quiet room other than the dorms (such as a library or study) for individuals to read or work on special projects. While a library or study did not get the highest marks in terms of priority, it is evident that members desire a quiet area to go to when needed.

One final area to mention that the research revealed was the importance building a fire station to local and national standards. The regional fire chief's indicated that ADA and NFPA standards should be used when addressing a new fire station facility. The Ohio Basic Building Code and any Lyndhurst specific building standards would obviously be used. Table 4 lists the additional standards that would have to be referenced in building a modern fire station facility.

Table 4

Local and national codes related to fire station design and construction

Code	Description	Comments
Ohio Fire Code	Ohio fire code	Fire protection systems
NFPA 101	Life Safety Code	Minimum room sizes, fire protection, ect.
NFPA 1500	Standard on fire department Occupational Safety & Health Programs	Building issues, vehicle exhaust
NFPA 1402	Guide to building fire service training centers	Guidelines for training facilities
NFPA 1581	Standard on fire department infection control programs	Infection control, living quarters, kitchens, storage, ect.
NFPA 1221	Standard on installation, maintenance, & use of emergency services communication systems	Dispatching requirements
OSHA	Occupational Safety & Health	Occupational safety standards

ADA	Americans with disabilities act	Elevators, accessible common areas, ect.

This list is not all inclusive of pertinent standards but the ones listed are specific to fire station design or construction.

RECOMMENDATIONS

While the research completed was informative, it became apparent to this researcher that some elements of the research process should be reconsidered. Based on the literature review and the results of my research, I have the following specific dimensional design recommendations for the following areas of a future fire station facility.

Training Room: Highest ranked priority need by current personnel. The training room should be designed for a minimum of 32 personnel. This would allow for all members of the fire department to attend the training as well as two or three instructors. The training room should have a teaching station where all the necessary audio/visual equipment would be located. In addition, there should be easy access to a public restroom facility as well as counter area in the room for refreshments. The room should have large and small cabinets to store teaching aids and reference material. Finally, the room should have a large closet to store tables and chairs when they are not needed for a particular training. The total open area square footage for this room should be a minimum of 640 square feet.

Apparatus Bays: Highest ranked priority by regional fire chiefs. The apparatus bays should be 80 feet in length with 14 foot wide bay doors. There should be a total of five bays to accommodate all apparatus in the station. The bays should have the ability to have electrical line drops and air line drops at each vehicle. In addition, there should be garden hoses or water drops dispersed in the bays for ease of washing apparatus and refilling water tanks on the apparatus. There

should also be four feet between bay doors to allow adequate room between the apparatus for vehicle checks, routine maintenance, and storage of miscellaneous small equipment. Total square footage for the apparatus bays would be approximately 5920 square feet.

Facility Design Longevity: With the fire service being an ever evolving safety force, it is imperative that a renovation or new facility is built with the ability to expand. The expansion could be either facility size or facility use. While it is difficult to see well beyond five years it would be short sighted to design a facility without leaving room for expansion. The site of the facility should allow for future expansion of the building and the building should be built with possible expansion ten or twenty years later. In addition, it should be expected that the fire department will become increasingly diverse between genders. Therefore, it is recommended that the sleeping quarters be broken down into individual rooms. This would allow each firefighter a private area to read, relax, study, and sleep without creating an undue hardship on others. Additional research is still needed in this area to better understand how the facility could be designed to accommodate the future in terms of staff, equipment, and services provided.

The following general recommendations should be undertaken by the fire department to further investigate and prepare a modern and flexible fire station design.

1. A committee should be put together for further exploring fire station design and options. The committee should be made up of line and staff

personnel on the fire department. Preferably, the committee members should be familiar with various specific functional assignments of rooms. An example of this would be having the fire prevention officer have input on the fire prevention office since he would have the best understanding of the needs for the office. All three shifts on the fire department should be represented on the committee so that information is shared equally department wide.

2. The fire station committee should go out and see the fire stations recognized by the regional fire chiefs. The specific rooms mentioned by the fire chiefs should also be seen and used as models when designing a new station.
3. More detail is needed by line and staff personnel to ascertain what specific elements they would require in offices or rooms to better fulfill their specific functional assignment. Items such as filing cabinets, desks, storage cabinets, computer workstations, etcetera, need to be considered when figuring out how much space is needed.
4. More regional research needs to be done by the fire department. By limiting the research to the Hillcrest Region, the information gained had limited value. It would be more beneficial to broaden the research to include all the communities on the eastside of Cleveland. The entire Region 2 area (Lake, Geauga, Cuyahoga, Lorain, & Ashtabula counties) should be surveyed because state level regional programs could impact the Lyndhurst fire station.

The following recommendations should be completed by anyone looking to do a similar research project.

1. Instead of surveying city officials with a questionnaire, it would be better to conduct in-person interviews of the officials. I only received two questionnaires of the eight given out which greatly limited the information I wanted from the city officials. It is this researcher's opinion that the city officials need to understand all of the services and programs the fire department offers if the fire department expects to get support from the officials.
2. Surveys related to regional concepts and programs should be obtained by a greater area than conducted in this research project. Again, the limited scope of surveying the region narrowed the type and amount of information obtained.
3. When collecting data, make sure it makes sense before inputting the data in a program for tabulation and graphing. Some data collected was useless for the purpose of this paper. This was not realized until the data was tabulated and examined for insight into addressing the problem. However, some of the useless data did give ideas on other issues the department faces.

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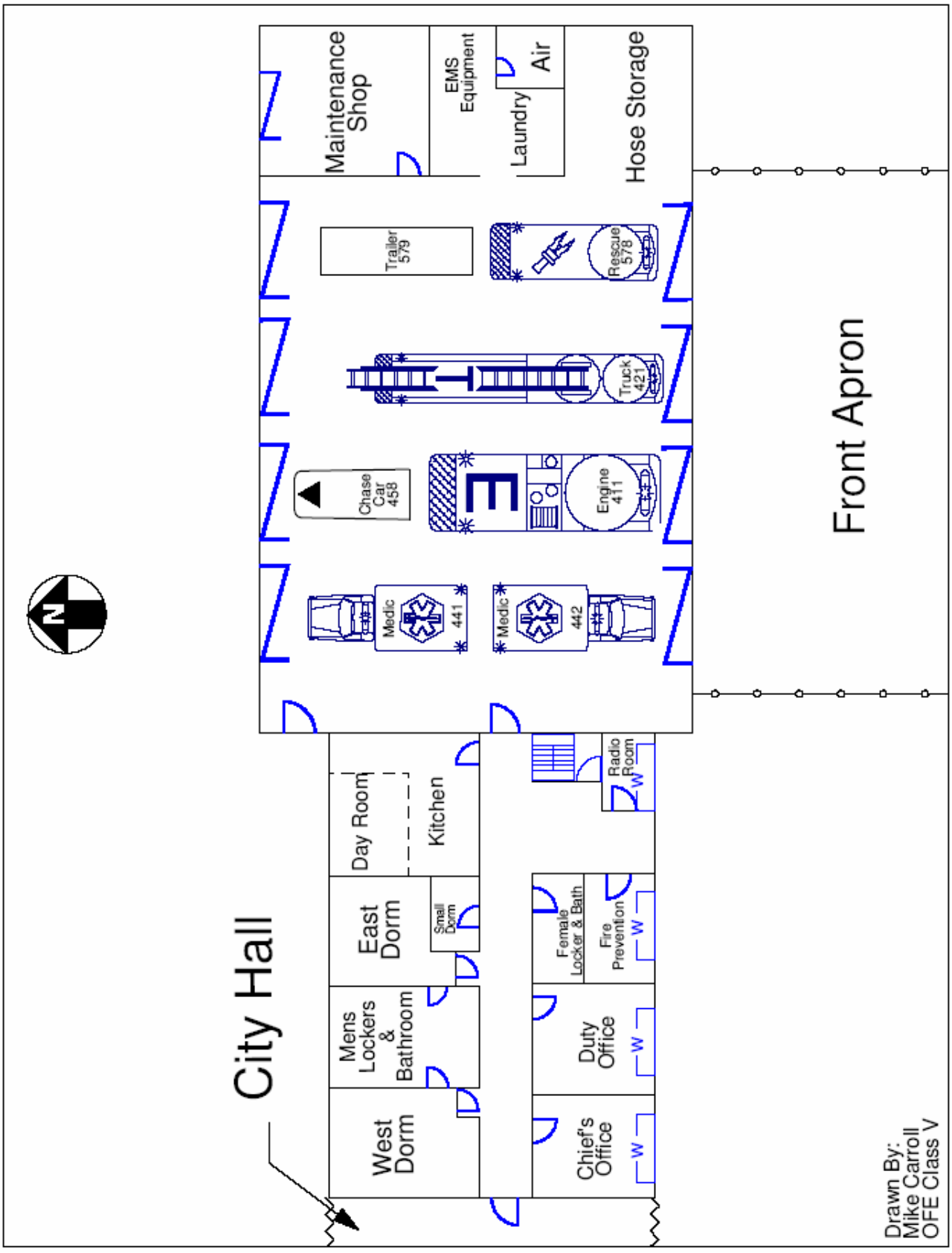
APPENDIX A

The Current Lyndhurst Fire Station. Drawing is not to scale.



APPENDIX B

Fire Department Functional Assignment Questionnaire

Below is a list of questions related to your functional assignment within the fire department. Answer the questions as completely as possible as they relate to your specific role within the fire department.

1. **Functional assignment within fire department:** Chief □ Fire Prevention □

   Shift Officer □ Firefighter/Paramedic □

2. **Rate the amount of time you spend conducting the following items. Use the key below:**

   1 = a lot of time 2 = sometime 3 = little time 4 = no time

   a. Clerical activities (including computer data entry): _____

   b. Directing station assignments: _____

   c. Preparing training sessions: _____

   d. Conducting training sessions: _____

   e. Coaching or counseling of subordinates: _____

   f. Handling fire responses: _____

   g. Handling EMS responses: _____

   h. Conducting public education in fire station: _____

   i. Conducting fire prevention activities: _____

   j. Vehicle or equipment maintenance: _____

   k. Station maintenance: _____

   l. Attending trainings in fire station: _____

   m. Attending meetings in fire station: _____

   n. Developing fire department programs: _____

3. How would you personally rate the current fire station in terms of full-filling your functional assignment. If it does not fall under your primary functional assignment, answer the question based on your opinion of the functionality of the space. You should answer this question based on the ease of completing your assignment.

1 = Very Good 2 = Good 3 = Fair 4 = Poor

a. Chief's office: _____
b. Fire prevention office: _____
c. Duty office: _____
d. Radio (report entry) room: _____
e. Training room: _____
f. SCBA room: _____
g. EMS supply room: _____
h. Shop: _____
i. Apparatus bays: _____
j. Filing/storage space: _____
k. General FD storage: _____

4. Rate the following based on priority the areas of the fire station that need to be addressed in terms of size or functionality.

H = High Priority M = Moderate Priority L = Low Priority

a. Chief's office: _____
b. Fire prevention office: _____
c. Duty office: _____
d. Radio/computer room: _____
e. Training room: _____
f. SCBA room: _____
g. EMS Supply/Decon room: _____
h. Shop/Maintenance Area: _____
i. Apparatus bays: _____
j. Filing and storage space: _____
k. General FD storage: _____
l. Kitchen: _____
m. Day room: _____
n. Dorms: _____
o. Gear storage space: _____
p. Bathroom facilities: _____
q. Locker space: _____
r. Workout room: _____
s. Library/study area: _____
t. Conference/meeting room: _____

u. Other: _____

5. List the top 5 things that need to be addressed in the current fire station in your opinion based on your answers to question 4.

a. _____

b. _____

c. _____

d. _____

e. _____

6. What 3 rooms identified in question 3 do you spend most of your time?

a. _____

b. _____

c. _____

APPENDIX C

Regional Fire Chiefs Questionnaire

Please answer the following questions to the best of your ability. These questions are based on presumptions or trends you see within the fire service that may impact a fire stations overall design and use by emergency workers or the general public.

Your answers do not reflect your personnel opinions on the issues, just the impact you feel the answers would have on a fire station. Answer the questions as if you were to be building or renovating a fire station within your community.

1. **What do you feel is the weakest area(s) of most fire stations in terms of design or functionality? Check all that apply**

Shift Officer Space □ Maintenance Space □

General Office Space □ Training Room □

Apparatus Bay Space □ Day Room □

Dorm Space □ Radio Room □

Kitchen Space □ Workout Room □

Storage Space □

Other: _____

2. **If you were to build a fire station today, what three areas would you pay particular attention to its design or functionality?**

    a. _____

    b. _____

    c. _____

3. **List three new fire stations that you have seen that you would model your future station after because of the stations overall design and functionality. List the one room below the station that was the most impressive to you.**

    a. City/Station #: _____

        i. Room: _____

b. City/Station #: _____

i. Room: _____

c. City/Station #: _____

i. Room: _____

4. **Check the trends or issues in the fire service today that should be considered when designing a fire station for the future:**

Female Firefighters □ EOC capabilities □

Regional dispatching □ Evacuation Center □

Regional teams (Tech Rescue, FIU, ect.)□ Community Education Capabilities □

Housing of regional equipment □ ADA/NFPA Compliancy □

Regional manning of equipment □ > 30 year use (without add/renovation) □

C.E.R.T. Programs □ Regional training center (burn building) □

Other: _____

5. **List any specific programs, functions, or capabilities you see the region be able to provide as it relates to the fire service in the next 20 years. Use the back of this page if more room is needed.**

_____

_____

_____

_____

_____

_____

_____

APPENDIX D

City Of Lyndhurst Elected Officials Questionnaire

Please answer the below listed questions to the best of your knowledge. Your answers will remain anonymous. Your answers should be based on your opinion or personally knowledge of the fire department.

1. **Using the key below, answer the following question: "I am _____ the fire department provides…"**

S = You are sure P = You are pretty sure U = You are unsure

Ambulance Service _____

Basic Life Support _____

Advanced Life Support _____

Fire Suppression _____

Fire Inspections _____

Residential Fire Inspections _____

Public Fire Education _____

Elderly Fire Education _____

Learn Not To Burn Program _____

Car Seat Inspection _____

Community CPR Training _____

Residential Knox Box Program _____

Fire Investigation _____

Water Rescue _____

Rope Rescue _____

Ice Rescue _____

Collapse Rescue _____

Trench Rescue _____

Confined Space Rescue _____

Community AED Program _____

Community Emerg. Response Team _____

Fire Station Tours _____

Smoke Detector Program _____

CO Detector Program _____

Squad stand-by at football games _____

Auto extrication _____

Hazardous Material Mitigation _____

Fire Hydrant Maintenance _____

Other _____

2. **Have you ever had a detailed tour of the fire station? Yes □ No □**

3. **Have you had the fire department respond to your house? Yes □ No □**

    a. If yes, for what type of emergency?

    Medical Emergency □ Fire Emergency □ Non-Emergency Service □

4. **Check the items you think the fire department should provide. These are the services you feel as an elected official should be important to provide to the community.**

Ambulance Service □

Fire Suppression □

Fire Inspections □

Residential Fire Inspections □

Public Fire Education □

Elderly Fire Education □

Learn Not To Burn Program □

Car Seat Inspection □

Community CPR Training □

Residential Knox Box Program □

Fire Investigation □

Water/Ice Rescue □

Rope Rescue □

Collapse Rescue □

Trench Rescue □

Confined Space Rescue □

Community AED Program □

Community Emergency Response Team □

Fire Station Tours □

Smoke Detector Program □

CO Detector Program □

Squad stand-by at football games □

Auto extrication □

Hazardous Material Mitigation □

In-house vehicle maintenance □

Fire station maintenance □

Swat Medic Capabilities □

Fire Hydrant Maintenance □

Emergency Operations Center □

Emergency Shelter □

Other _____

5. **How many firefighters are on duty with full staffing? _____**
6. **How many firefighters are on duty with minimum staffing? _____**
7. **What is the city's ISO rating? _____**
8. **How many personnel do you think respond on an ambulance call? _____**
9. **How many personnel do you think sleep at the station? _____**
10. **How many emergency runs do you think the fire department responds to in the city? _____**
11. **Please check the items listed below that you feel should be explored regionally for the fire department.**

Technical Rescue Team □ Manning of specialized equipment □

Fire Investigation Team □ Station manning □

FD Training Building □ Fire Dispatch Center □

Fire Prevention Bureau □ FD Training Officer □

Area Disaster Plan □ Hazmat Team □

Other: _____

12. **Do you know what the leading cause of firefighter deaths is in the country?**

Yes □, explain: _____ No □

13. **Do you know what is the leading contributing factor to firefighter injures?**

Yes □, explain: _____ No □

14. **How long is the shift for firefighters? 8 hr □ 12 hr □ 24 hr □**

15. Check all items you think are performed at the fire station by the firefighters or shift officers.

Vehicle Checks □	Decontaminate Equipment □
Vehicle Maintenance □	Breathing Apparatus Maintenance □
Clerical Activities □	Employee Coaching/Counseling □
Fire Training □	Community Education □
EMS Training □	Fire Dispatching □
Prepare Meals □	Study (Professional Development) □
Sleep □	Develop Fire Pre-plans □
Station Tours □	Reverse 911 Dispatching □
Fitness Activities □	Report Data Entry □

Other: _____