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A STUDY TO DETERMINE THE OPTIMAL
LONG RANGE UTILIZATION OF THE MAIN
HOSPITAL BUILDING AT FITZSIMONS
ARMY MEDICAL CENTER

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A Graduate Research Project
Submitted to the Faculty of Baylor
University In Partial Fulfillment
of the Requirements for the Degree of
Master of Health Administration

By
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ADDENDUM

There have been editorial comments concerning my detailed use of space as a criteria in the evaluation of Alternatives Two and Three while the space criteria is not mentioned in Alternative One. The space discussion is a subset of the JCAH standards criteria and is addressed in Alternative One under that criteria as it is under the same criteria in Alternatives Two and Three. The author believes the discussion rightfully belongs under the JCAH criteria as the JCAH has addressed space in past surveys as adequate or inadequate rather than in specific size considerations. It should be recognized that we are forced to live with the space in Alternative One, the status quo. The size is discussed in a more detailed manner in Alternatives Two and Three because these are future proposals rather than existing facts.

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CHAPTER I

INTRODUCTION

General Information

The main hospital building (Building 500) of Fitzsimons Army Medical Center (FAMC) provides all the inpatient treatment capability, except for Building 609 which houses all of the inpatient psychiatric area. Building 500 was completed and dedicated on 3 December 1941. Since it was dedicated, it has not had one major renovation, the only Army Medical Center to have such a dubious distinction. Building 500 presently houses 508 operating beds which includes 15 newborn bassinets. The remaining 46 beds of FAMC's total of 554 operating beds are located in the aforementioned Building 609. The beds are distributed among 20 inpatient wards in Building 500. Building 500 also houses numerous clinics, ancillary support such as Pathology, Radiology and Pharmacy, the command suite, and other administrative support areas associated with inpatient and clinical missions.

Conditions Which Prompted the Study

The present facility does not conform to various standards and codes for existing buildings established by the Joint Commission on Accreditation of Hospitals (JCAH), National Fire

Protection Association (NFPA) and the Occupational Safety and Health Administration (OSHA). The wards within the facility are cramped and poorly laid out, and many clinics, offices, and administrative areas are located in areas that were originally designed and occupied for inpatient treatment. The clinics remaining in the main facility are overcrowded and woefully inadequate for delivering quality service to outpatients. These clinics create an additional burden on an already overworked elevator system and cause considerable congestion in and around inpatient care areas.

Smokestop partitions and deadend corridors need to be altered to meet JCAH standards. Noncompliance with such standards jeopardizes quality patient care capability and the approved status of Graduate Medical Education training programs conducted by FAMC. JCAH and other reviewing bodies have remarked about the inadequacy of space in such areas as the Main Laboratory, Cardiac Catheterization Laboratory, Neonatal Intensive Care Unit, and Physical Medicine and Rehabilitation Services to name just a few.

Many clinics are physically located in outlying buildings which were temporary buildings when they were constructed in the period 1918 to 1923. The clinics are primarily without the benefit of the ancillary support (Pharmacy, Laboratory, and X-ray) which is located in the main building. The above mentioned outlying clinics are in buildings which are outdated

and expensive to maintain and repair. They are widely scattered and in some cases a considerable distance from the main facility. This dispersion of outlying clinics causes considerable problems. It forces FAMC to duplicate services and functions, causes considerable inconvenience for patients and staff and increases the costs for the provision of health care.

The quality of patient care ramifications of this project are significant. Patients are subjected to cramped, old, and unsightly patient treatment areas. Some services are located in areas that require patients to pass by steam, sewer and water pipes and other electrical and mechanical areas to gain access to the entrance of the services. Travel from clinics to other clinics and ancillary services is confusing and cumbersome for outpatients because of the times and distances involved. In most cases pharmacy and laboratory facilities are not available to clinic patients without returning to the main hospital building. The list below sums up the quality of patient care problems presented by the existing facility:

--Excessive travel time and distances result from poor physical relationship between functional areas.

--Patient and visitor confusion and inconvenience is experienced.

--The staff is used ineffectively because of lost time and improper response time because of commuting distances between buildings.

--Administrative and logistical support is hampered because of spatial and physical distances between buildings.

The main reason for conducting this project is the concern that the proposed project to remedy the above deficiencies may not be the best solution for the problem. The present plan proposes an electrical/mechanical upgrade for the main building as Phase I. Phase II would be the new construction of a six story outpatient clinic addition to be sited on the northeast corner of Building 500. Phase III calls for the alteration of existing outpatient areas in Building 500 to return them to their originally intended inpatient usage after those clinics are relocated to the new outpatient wing. Is the plan the most feasible solution for the long range utilization and requirements of FAMC? Is it truly feasible to consider upgrading a 40 year old building for continued use as an inpatient facility? Other alternatives might be considered in order to provide a state-of-the-art facility, which will meet new building codes and standards established by various regulatory agencies. It is quite possible that Building 500 could be upgraded to the relatively less stringent outpatient facility codes and be used to consolidate all administrative and ambulatory areas presently housed in outlying temporary buildings. New construction possibly could be dedicated to a new inpatient facility or addition.

The reason for the project is clear. FAMC is a facility that is obsolete in comparison to facilities planned, designed, and constructed in accordance with modern medical practices and technology.

Statement of the Problem

The problem is: (1) To determine the optimal long range utilization of the main hospital building at Fitzsimons Army Medical Center; (2) To propose the use of the method utilized to determine the long range utilization of the main hospital building at Fitzsimons Army Medical Center as a model for evaluating facilities of similar design and construction facing similar problems.

Limitations Affecting the Project

The study is limited to the long range utilization of the gross main building. It is not within the scope of this project to determine the specific utilization or space requirements for each individual activity presently housed or housed in the future within the main building.

A full economic analysis, normally conducted by a health planning firm through a contract, will not be conducted because it is beyond the capability and scope of this project and its author. A preliminary economic analysis with gross cost estimates and comparisons will be accomplished.

Literature Review

Numerous facilities are presently encountering the same problems as FAMC. Many facilities were constructed 30 to 35 years ago as a result of the Hill-Burton Construction program. This program was primarily developed to correct the conditions which resulted from the neglect of hospitals during the World War II time period. During this period tremendous amounts of money were spent on the war effort at the expense of social programs as well as construction of adequate community facilities, not the least of which were hospitals. The large infusion of Hill-Burton funds at this time shortly after World War II caused the problem that many hospitals are facing an obsolescence problem in the decade of the seventies, which continues in the eighties. Numerous authors have written on this subject and have provided numerous alternatives to solve this obsolescence problem.

The costs of new construction versus the investment in the existing facility are critical. Boyar cites the figure that 30 to 35 percent of the cost of constructing new facilities is in the mechanical systems such as heating, ventilation, plumbing, with another 10 to 15 percent for the electrical system such as lighting, emergency power, communication systems.¹ These are sunk costs in older facilities and may be the deciding factor in whether to renovate or build new. An important consideration is the electrical and mechanical systems are precisely the reason many facilities are faced with their obsolescence problem. Is

it feasible to take 50 percent of the cost of a new building and spend that amount in renovating an older building which probably has other functional and code compliance problems?

Life cycle costing is especially critical when considering whether to renovate an existing facility. Life cycle costing is an estimate of the total cost to the owner of using the facility for a specified period. Douglass describes a facility that chose to renovate because the building was structurally sound. Closer examination showed the life cycle costs implications of such a project were unfavorable. This was due mainly to the fragmentation of operations imposed by the building's sprawl which caused substantial duplication of personnel.² He goes on further to state that the potential for cost reduction decreases with a building's age while the cost of implementing cost reducing measures increases.³

Estimates of costs for renovation versus new construction are very difficult to ascertain. In a 1978 study by Levitan, construction estimates for a medical/surgical general hospital in a non-urban setting amounted to \$77.44 per gross square foot for new renovation versus \$89.60 per gross square foot for new construction.⁴ He continues to note that architectural fees for renovation will most likely be 30 to 50 percent higher than fees for new construction. This higher cost represents the complexities and uncertainties of dealing with existing facilities.⁵

Far too many construction projects have been concerned with up front costs as the only economic consideration. As noted

before, life cycle costing is too seldom used in figuring the total costs of a construction project. Sprague and others have voiced concern over overly cost conscious programs which could seriously hamper future operations. A facility too pre-occupied with initial construction costs, which allows little flexibility in the building plan, often finds itself with the lack of flexibility which could seriously hamper the hospital's ability to function in the future.⁶ Between 1968 and 1973 the cost for modernizing a hospital was \$50,000 per bed.⁷

A particularly interesting article by Johnson compares historic and projected gross square feet (GSF) per bed for hospitals of 400 beds and over. In 1972 the figure was 796.17 GSF per bed. In 1980 the estimated figure was 987.11 GSF per bed. By 1985 it is estimated the number will be 1106.22 GSF per bed. The same article projects the costs for hospital construction. In 1981 the GSF per bed is 999.02. The 1981 project cost per GSF is \$120.00 with a median cost per bed of \$119,882. In 1985 the cost is expected to be \$157.63 per GSF with a median cost per bed of \$174,429.⁸ The same article states total replacement of hospital plants will no longer dominate the hospital construction scene. Such replacements will only take place under the sponsorship of the large hospital chains. What other construction does take place will be concentrated on adding beds cautiously, shifting as many services to ambulatory settings and responding to technological change.⁹

JCAH accreditation surveys have pointed out the need for renovation and upgrade projects. Boyar writes that inadequate building safety was a representative facility deficiency reflected in 35 percent of the hospitals receiving JCAH's one year accreditation. He believes many of our facilities are rapidly losing the battle in remaining code compliant.¹⁰

Confusing interpretations of various building codes is another problem to be considered in renovating an older facility. Csobaji describes a common problem with the various standards and with multiple regulatory agencies is a lack of common understanding of their intent and occasionally, a lack of uniform interpretation and conflicting application of criteria. His basic premise is you must anticipate future codes to allow for the later inevitable construction.¹¹

Design costs are significantly higher in a renovated building than a new one according to Edge. The total costs are significantly impacted by the requirement for the designer to spend a large portion of his time researching and questioning officials for interpretations to codes and regulations. It is far more difficult to renovate older buildings to meet the letter of the law than it is to ensure that new construction meets various codes.¹²

Wardrum maintains that it is smart use of limited dollars to change a building from inpatient to outpatient use

because it is conceivable the building would qualify for the less stringent business occupancy.¹³

With the ever increasing costs of new construction the reasons for facility reuse become more important. Parker describes three main reasons for considering reuse: (1) Changing methods of delivering health care which makes new demands on existing health facilities; (2) Facility obsolescence results in many services being delivered in inefficient and/or unsafe environments; (3) Rapidly increasing costs are restricting the flexibility to upgrade existing facilities.¹⁴

In a survey undertaken by the AHA in 1977, of all hospitals that were surveyed, 68.1 percent were using modernization projects, 51.9 percent were adding additions to existing buildings, while only 26.9 percent were building new buildings. The reporting hospitals were also using a combination of both thus the reason the percentages do not add up to 100.¹⁵ The trend is clear many hospitals are renovating or adding on rather than building new.

Many older facilities were constructed for the primary purpose of inpatient facilities. Little if any planning was accomplished for expansion for the space required for modern technologies such as Intensive Care Units or new modes of care such as ambulatory care. These facilities have had to divert space from inpatient areas to meet the burgeoning requirement

for ambulatory care facilities. More space was diverted to accommodate the sophisticated, high technology ancillary support to include new methods of therapeutic and diagnostic procedures. These accommodations were all accomplished at the expense of inpatient treatment areas.

Bettencourt and Coffin question whether older facilities can be upgraded economically to meet current building code requirements. Major changes in code requirements, medical and technical requirements, and treatment programs make continuing building modifications a fact of life. Do existing buildings have the capability for continued technical upgrading, especially in the highly sophisticated areas such as the surgical suite, the radiology department and the clinical laboratory? Are floor to floor heights sufficient to allow the addition of new mechanical systems?¹⁶

Many facilities are faced with the fact that their building is obsolete for sophisticated inpatient use but perfectly suitable for use by less sophisticated inpatient areas such as maternity or long term care. Many single and double inpatient rooms can be very satisfactorily renovated into doctors offices with adjoining examining rooms. Expanding horizontally on existing facilities has proven to be a very economical method of building new inpatient facilities alongside obsolescent inpatient facilities which have been converted to administrative or outpatient use. Phased moves allow for the old inpatient

areas to be relocated to the new inpatient wing so the existing building can be renovated for administrative and outpatient occupancy.

Older facilities facing obsolescence problems have had to make innovative use of Life Safety Codes in order to properly update their facilities. Adams and Burgun describe a facility which used the sprinkler option in the 1973 Life Safety Code, which permits corridor walls to terminate at the hung ceiling rather than construction to the slab above. The height of the partitions required was reduced from 16 feet to 10 feet. This significantly reduced the cost for this project.¹⁷

Boyar has also discussed the importance of the electrical-mechanical systems renovation as perhaps the most critical factor in trying to decide whether to renovate or build new. This single element may be the decisive determinant influencing the final decision for or against reuse.¹⁸

Buckley writes that choices are very limited in redesigning an existing structure because the choices available are always limited by the load bearing columns and exterior walls. Existing floor plans can limit design options and they eliminate the possibility of completely customizing space.¹⁹

Remodeling may be very expensive if it does not solve the operational problems of a fragmented hospital complex. Douglass feels if the structure meets code requirements and has

adequate floor to floor heights, it can be preserved and gutted inside at a savings of 25 to 35 percent of the cost of a new building.²⁰

A major problem encountered with reuse projects arises from the design constraints imposed because of the size and functional relationships of older existing buildings. Parker describes the questions raised about the relationship between function and design in older facilities. There are more fixed variables in reuse projects, this is so because the basic space configuration and structural grid are often fixed constraints.²¹

Often unconsidered, says Sprague, is the time normally required to design, demolish and construct a renovation project rather than build a new building. This longer time can offset the costs saved by doing a renovation.²²

Because of the growth in new technology in health care many older buildings are experiencing significant functional problems. Weatherill discussed this most appropriately in an article about form and function. It has been often stated that buildings must not get in the way of organizations which they accommodate, and form must conform to function. Unfortunately, in most cases, buildings do get in the way and, more often than not, form dictates function. This is especially true in renovations of 30 to 40 year old buildings.²³

Boyar describes the difficulties older facilities encounter when the relocation of a medically intensive service requires the reordering of other supporting services. This is

especially true in older facilities where the facility may have experienced unplanned growth in activity over the years since it was constructed.²⁴

Douglass discusses the validity of the process of reprogramming existing facilities for extended life. The principle in reprogramming is that a less demanding function, such as outpatient clinics, can often use reassigned space as is, eliminating the need for expensive remodeling.²⁵

In another article Douglass states that it may be more cost effective to build a new facility than to remodel one that will have to be brought repeatedly into code compliance. He states that hospitals should seriously consider vacating portions of facilities that are too expensive to correct or turning them over to new uses such as outpatient, administrative or training use, which are subject to less stringent requirements.²⁶

Wardrum discusses the same possibility. He foresees a declining need for inpatient beds and an increasing need for outpatient and ambulatory facilities. Wardrum feels it is very conceivable that existing acute care nursing facilities could be remodeled into outpatient related clinical space and qualify for occupancy as a lesser type of construction. These same hospitals may need more critical care areas. In this situation it might be more practical to consider new facilities for the critical care unit while converting other inpatient nursing units into

outpatient facilities.²⁷

DeNyse puts forth a rather startling statistic that on the average, a hospital is expanded or renovated once every three to four years.²⁸ If one accepts the 40 year criterion as the average life span for a building then that means the facility will be remodeled or expanded ten times during its usable life time.

The most important disclosure of the literature review is that the decision to renovate or rebuild depends on the facility's own particular situation. There is no one best way. Sometimes renovation costs are significantly cheaper than building new, but the life cycle costs of such a facility may be significantly higher over the entire life cycle of the building. One key point which was present in almost all articles reviewed is that no matter how little or much is spent to renovate, if the end result is not an up-to-date facility, the money invested is wasted. Too many facilities let cost drive the entire decision. They make concessions and allow upgrades of existing facilities which result in poorly planned facilities that are unable to meet the changing demands of health care technology. These concessions were made because the decision makers allowed themselves to be constrained by the physical space and configuration of their existing building. They had to make less than desirable decisions because the alternatives available to them were limited by short

range goals and plans. Decisions were made based on the form of the building rather than on the function to be performed inside.

Research Methodology

The actual project research methodology to include objectives, criteria, assumptions and actual steps in the project are listed below.

Objectives

The objectives of this research project are:

1. To analyze current building deficiencies that cause the existing problems utilizing the following resources:
 - a. Subject matter experts.
 - b. Literature review.
 - c. Proposed plans and studies for FAMC.
 - d. Existing plans and studies for FAMC and other facilities.
 - e. JCAH standards and NFPA codes.
2. To develop alternatives that possibly could determine the best long range utilization of the main hospital building.
3. To analyze the alternatives against criteria to determine the relative costs and benefits and advantages and disadvantages of each alternative.
4. To determine the optimal long range utilization of the main hospital building at Fitzsimons Army Medical Center based on the analysis conducted above.

5. To propose the use of the methodology used to make this determination as a model to be used by similar facilities facing similar problems.

Criteria

The evaluation and decision will be based upon the following criteria. In order to determine the optimal solution the alternative must:

1. Correct JCAH standards deficiencies.
2. Correct NFPA Life Safety Code deficiencies.
3. Provide for a solution that can be supported in relationship to its costs.
4. Meet mission related criteria to:
 - a. Provide present level of care.
 - b. Support Graduate Medical Education Training Programs.
 - c. Utilize state-of-the-art systems.
 - d. Enhance relationships between organizations and functions.
5. Meet health planning criteria of:
 - a. Accessibility to care.
 - b. Availability of care.
 - c. Continuity of care.
 - d. Quality of care.

6. Meet operational criteria of:

- a. Ability to meet mobilization requirements.
- b. Ability to maintain flexibility in response to changing requirements.

Assumptions

The following assumptions are instrumental to the successful completion of the project and the resultant conclusions and recommendations:

1. Fitzsimons Army Medical Center will remain a viable facility within the organizational inventory of the US Army Health Care Delivery System.
2. Sufficient Military Construction Army Appropriations will be available to update FAMC to continue its operation as a tertiary care medical center.
3. Present workload will continue and no efforts will be made to recapture any of the workload presently being performed by CHAMPUS, nor will any of the existing workload be accomplished by increased use of CHAMPUS.
4. Present scattered treatment areas will continue to produce additional travel time between facilities and reduce staff effectiveness.

Research Process

The determination of the long range utilization of the main hospital building at FAMC will start with a thorough review of the literature to determine how other facilities faced with

similar problems have solved these problems. Subject matter experts at the American Hospital Association, Health Facility Planning Agency, Health Services Command and Veterans Administration will be consulted for possible thoughts and documents to assist in the determination of alternative solutions to the problem. Documents and other plans for FAMC and other facilities will be analyzed to provide information on which to develop viable alternatives that can be matched against the criteria mentioned above.

The outcome of this analysis will be displayed to show the costs, benefits, advantages and disadvantages of each. An alternative evaluation approach will be utilized to rank order the alternatives in order to determine the optimal solution for the research problem. The alternative evaluation will be in a narrative form in the text of the document.

The final product of the research project will be offered as a basis upon which a new Military Construction Project Data submission can be generated. This submission is the first step in the process of validating the project and making it a part of the Long Range Medical Military Construction Army Program. Further steps such as the project development brochure, utilization and requirements document, and detailed economic analysis will be completed by the responsible officials and agencies in the time frames established by appropriate regulations and guidance.

The completed research project will be offered as a methodology that other facilities, military and civilian, can use as a model to develop the information, requirements, criteria, alternatives, and analysis of alternatives to solve their particular facilities obsolescence problem.

Footnotes

¹Robert L. Boyar, "Renovation--A Feasible Alternative to Physical Obsolescence," Hospital Topics, September-October 1980; p. 4.

²H. Robert Douglas, "How to rein in the Costs of Capital Improvements," Trustee 30 (May 1977): p. 51.

³Ibid., p. 53.

⁴Mark S. Levitan, "To Reuse or Reconstruct: That is the Question," Hospitals 53 (February 16, 1979); p. 95.

⁵Ibid., p. 95.

⁶William J. Taylor, "Careful Planning Can Reduce Cost Problems in Hospital Construction," Hospitals 52 (February 16, 1978); p. 98.

⁷Paul S. Pierson, "An Examination of Obsolescence/Prime Generator for Need," Hospitals 48 (February 1, 1974); p. 52.

⁸Richard L. Johnson, "Construction Spending Will Be Shaped by Competition," Hospitals 56, (February 16, 1982); p. 92.

⁹Ibid.

¹⁰Boyar, p. 3.

¹¹Sandor B. Csobaji, "Anticipating Future Codes to Allow For Later Construction," Hospitals 51 (February 1, 1977); p. 135.

¹²Donald R. Edge, "A Hospital Must Study Cost, Codes, Alternatives to Decide on Reuse or New Building," Hospitals 53 (February 16, 1979); p. 114.

¹³Earl Roy Wardrum, "The Codification of Hospital Design," Hospitals 48 (February 1, 1974); p. 69.

¹⁴William T. Parker, "Facility Reuse - It Could Work for Your Hospital," Hospital Forum (September-October 1979); p. 12.

¹⁵"Sources of Funding for Construction," AHA Research Capsule No. 29, Hospitals 53 (February 19, 1979); p. 63.

¹⁶Robert J. Bettencourt and Christie J. Coffin, "Suburban Hospitals Opt for Horizontal Growth/Old Structures Kept," Hospitals 48 (February 1, 1974); p. 105.

¹⁷George Adams and J. Armand Burgun, "Hospital Remains In Inner City By Moving to Recycled Factory!" Hospitals 52 (June 1, 1978); p. 63.

¹⁸Boyar, p. 6.

¹⁹David M. Buckley, "Two HMO's Retrofit Buildings in Historic and Commercial Downtown Areas," Hospitals 53 (February 16, 1979); p. 160.

²⁰Douglas, p. 52.

²¹William Parker, Jr., "Flexible Designs Are Key to Reuse Projects," Hospitals 53 (February 16, 1979); p. 130.

²²Joseph G. Sprague, "Is Recycling of Buildings a Healthy Alternative for the Hospital Industry?" Hospitals 53 (February 16, 1979); p. 83.

²³Jeffrey Weatherill, "A Strategy for Reutilizing Existing Buildings," Dimensions 54 (July 1977); p. 26.

²⁴Boyar, p. 4.

²⁵Douglas, p. 51.

²⁶Robert Douglass, "Forward Looking Architecture: Flexibility with Change In Mind," Hospitals 52 (February 16, 1978); p. 116.

²⁷Wardrum, p. 68.

²⁸Robert A. DeNyse, "Hospitals Meet Space and HSA Criteria Through Merger," Hospitals 53 (February 16, 1979); p. 137.

CHAPTER II

DISCUSSION

Description of Alternatives

As presented in Chapter 1, one of the main objectives of this study was to develop alternatives that possibly could determine the best long range utilization of the main hospital building. An assumption that should have been added to the research methodology phase is that Building 500 will continue to be utilized in some capacity, either for patients or administration. The building is structurally sound and in a relatively good state of repair. Because of the obvious equity and investment in the building it would be ludicrous to assume there is no viable alternative for its occupancy. Based on this assumption the alternative that Building 500 be destroyed to be replaced by a completely new facility is unthinkable and not even considered. Three obvious alternatives exist for Building 500's future use. Alternative One. This alternative is the status quo. In this alternative the use of Building 500 as an inpatient facility is continued. The relocation of some of the outpatient clinics in Building 500 to the outlying buildings can be expected to continue. This relocation is primarily forced by the expansion of ancillary support plus technological advances which require more space to be diverted from clinics that are less apt to see

inpatients.

Alternative Two. This alternative is the major Military Construction Army Project presently planned for FAMC. It proposes that a 120,000 gross square foot addition be added to the northeast section of Building 500. This addition will be used solely for outpatient care. It will be used to replace 124,021 gross square feet of existing substandard clinic space presently spread throughout the installation in outlying buildings. An electrical/mechanical upgrade of Building 500 is planned. This includes upgrade of air conditioning, electrical, oxygen, and vacuum systems to conform with Occupational Safety and Health Act (OSHA), Joint Commission on Accreditation of Hospitals (JCAH), and National Fire Protection Association (NFPA) standards. Following this upgrade the clinic addition will be built. After the clinics are relocated the existing clinic facilities in Building 500 will be converted back to their designed use as inpatient facilities. The structural system problems of Building 500 such as smokestop partitions and deadend corridors will also be corrected to meet the standards established by JCAH and NFPA.

Alternative Three. This alternative consists of the construction of an addition to the north side of Building 500. The addition would be almost totally all new bed space for inpatient use. With its location on the north side of the building, expansion of the existing laboratory on the second floor, radiology on the third floor and operating suite on the fourth floor could

be accomplished into the new wing. This would solve the deficiencies present in these three existing areas. The inpatient wards would be relocated to the new addition. The size of the new inpatient addition will be approximately 475,000 gross square feet. Following relocation of the inpatient wards, the wards in Building 500 will be renovated to standards for outpatient clinic occupancy on the lower floors and administrative and support use on the upper floors. Following the renovation all outlying clinics will be relocated to Building 500. Those administrative and support areas such as Resources Management, Personnel and Community Activities, Plans and Training, Patient Administration and others would be consolidated on the upper floors of Building 500. A complete two hour fire stop between Building 500 and the inpatient addition would be constructed to allow Building 500 to conform to the less stringent outpatient and business occupancy codes. As part of the inpatient wing construction the vertical transportation network will be upgraded to meet not only the needs of the inpatient wings, but also the increased traffic flow caused by the consolidation of all clinics and selected administrative areas in Building 500.

Comparison of Alternatives to Criteria

The three alternatives selected above need to be compared to the criteria described in Chapter I. This alternative analysis can then be utilized to determine the conclusions and ultimate recommendations for the long range utilization of Building 500.

It is important at this juncture to again reiterate that Building 500 is a structurally sound, fire resistive structure that has obvious major uses in the continued future of FAMC. It is totally beyond the realm of rational thinking to consider the total abandonment of Building 500. To construct a totally new facility to consolidate all the functions of FAMC would be prohibitively expensive. A comparison to the present project planned for Madigan Army Medical Center (MAMC) adequately compares the cost ramifications of such a project. The present MAMC project is estimated to cost \$310 million. It will provide a facility of 1,166,770 gross square feet with a result of 662,042 net square feet of occupied floor space.¹ By comparing this 478 bed facility to a required 600 bed new facility at FAMC provides the following estimates. FAMC would require 1,408,576 gross square feet, with a result of 799,246 net square feet. The estimated cost of such a facility would be \$375 million. An even more interesting comparison of construction costs of military versus civilian hospital construction costs can be found by using the construction costs estimates found in the Johnson article mentioned in Chapter I.² Assuming the above mentioned estimates are valid for MAMC and FAMC, by using Johnson's 1985 estimates of 1106.22 GSF per bed and construction project costs of \$157.68, the following figures are extrapolated. MAMC's 478 bed facility should cost \$86,691,098 and FAMC's 600 bed facility should cost \$104,660,000. By dividing Johnson's

GSF per bed estimate into the projected requirement for MAMC and FAMC the following figures result. MAMC should be able to get 1,054 beds multiplied by the \$174,429 construction cost per bed for a cost of \$183,850,000. FAMC should be able to get 1,273 beds multiplied by the \$174,429 construction cost per bed at a cost of \$222,050,000. The Johnson estimate of \$174,429 median cost per bed in 1985 contrasts with his actual of \$119,882 median cost per bed in 1981. His 1985 median project cost of \$157.68 per GSF compares to his actual 1981 median project cost of \$120.00 per GSF. What is even more interesting is the estimates for GSF provided by Army Regulation 415-17 which uses a cost estimate of \$103.75 per GSF.³ What the inconsistencies of these comparisons show is that it is extremely difficult to estimate the true costs of a medical facility and even more difficult to predict the costs of a military medical facility. Some of these higher costs can be significantly attributed to the military's much greater collocation of ambulatory and primary care facilities as an actual part of the inpatient facility. Most ambulatory care in the civilian sector is provided in the doctor's office away from the hospital, therefore, the cost of these facilities is borne by the physician and not the hospital. Another factor with military medical facilities is the size of ancillary clinical and support facilities. Many civilian facilities have contracts for many services while military facilities

perform most in-house. Warehouse space is usually included, medical maintenance facilities are provided, more training space is included, doctors office space is included, all contributing to significantly higher GSF per bed and construction costs. MAMC's size figures compute out to show their facility will have 2,348 GSF per bed, more than double the 1985 estimate of 1106.22 GSF per bed proffered by Johnson.⁴

This comparison of size and cost estimates demonstrates that the present 420,000 GSF in Building 500 of FAMC has considerable equity and potential for future use.

Analysis of Alternative One

As previously stated this alternative is the status quo. Building 500 will continue to be used as an inpatient facility. The relocation of the remaining clinics in Building 500 will occur whenever space demands of new technologies or more inpatient oriented clinics necessitates this action. Appendix A lists all the activities presently occupying Building 500. There are 16 clinics still present in the main building. Appendix B lists those clinics which are located in outlying buildings. Twenty-two clinics are presently occupying outlying buildings comprising approximately 169,537 gross square feet. Of the main hospital's 420,000 GSF approximately 59,321 GSF are occupied by clinics. Approximately 230,000 GSF of the entire FAMC complex is devoted to outpatient clinics.

Appendix C contains a map of FAMC depicting the locations and distances between the main hospital and outlying buildings.

In comparing Alternative One to the criteria the costs, benefits and problems are discussed as follows. In the life safety code criteria the problems are several. Most notable are the lack of fire rated door assemblies for the elevators, lack of smoke barriers, and lack of slab to slab construction of corridor walls. Attached as Appendix D is a list of all life safety code deficiencies recently compiled by an inspection team from the Army Environmental Hygiene Agency. The problems are considerable and question the advisability of the continued use of Building 500 as an inpatient facility.

JCAH standard deficiencies primarily revolve around the lack of approved exits on the sixth and seventh floors and deadend corridors. Comments have been received about the lack of space for drug preparation areas on certain wards. Space deficiencies have been noted in the Neonatal Intensive Care Unit, Medical Intensive Care Unit, Main Laboratory and waiting area in Physical Medicine. Major pathology labs are located in outlying buildings. Radiology utilizes space originally designed for inpatient rooms.

The cost criteria is critical. Major renovation, especially to correct smoke partitions and lack of slab to slab construction, must be undertaken in order to upgrade Building 500 to continue operation as an inpatient facility. The most serious cost factor is also the most difficult cost factor to determine. The cost of operating a facility with such physically

separate operations is extensive. Much time is lost by staff members commuting from building to building. Transportation time of supplies and other goods is increased. Facilities such as laboratories, pharmacy, and radiology must be duplicated with the associated facilities and personnel costs. Housekeeping support must be fragmented obviating any economies of scale. Linen must be delivered across a far ranging area. Storage of supplies on the wards is especially poor with supplies being stored in every possible location because of the critical space shortage on the wards. Every square foot of the main building is in high demand and as soon as another clinic or function is moved outside the building the requests to fill that space are many. The present system of piecemeal renovation is also quite expensive with decisions being based on available space and limited by the configuration of the particular area to be renovated. These are patchwork jobs which make the best of a bad situation.

In the mission related criteria the present level of care can continue to be accommodated and no one can question the quality of care as far as the personnel factor is concerned. At times it is impossible to find a medical bed for an incoming air evac patient. This necessitates placing the patient on a surgical ward until the next available medical bed is free. The lack of time for various services in the operating room creates large

backlogs which creates long waits to have certain surgical procedures performed. This problem is exacerbated by the lack of sufficient operating room nurses. The operating room time problem is primarily due to the lack of sufficient operating rooms in relationship to the demand on them.

This lack of operating room time impacts on the Graduate Medical Education Training Programs. FAMC has 107 full-time medical staff and 183 interns, residents, and fellows. The present facility cannot adequately support a teaching program of this size. The size of the house staff also causes a significant demand for space for offices.

Applications of state-of-the-art systems are being accomplished but any that require new space rather than replacement of existing equipment must divert space away from other users or be located in the outlying buildings.

The status quo system definitely does not enhance relationship between organizations and functions. Much staff time is lost walking between buildings. Outpatient records are filed in a building 400 yards from the main building. Patients who must pick up their records have to go to this building first if their appointment is in Building 500. The files building for the Department of Radiology is several hundred yards away from the department. The previously mentioned far flung nature of the clinics away from their departments increases communication problems and causes duplication of staffing. The resupply of these clinics requires more time. The psychiatric

patients must be bussed from their separate building for all their meals.

The accessibility to care is very difficult especially for the patient who may have more than one appointment. Parking is limited around most buildings so the need to ambulate between buildings is required. In a climate such as Denver has in the winter, this causes obvious disadvantages. The availability of care is not markedly decreased by the status quo except for the time inefficiencies caused by the lack of operating room time and commuting time. This time could be better used to decrease backlog and increase availability. Continuity of care is satisfactory with all levels of care being available except for the time to receive it.

The quality of care criteria cannot be questioned from a personnel viewpoint. FAMC's personnel have increased the quality of care provided in spite of the physical plant deficiencies. From a facility viewpoint the quality of care criteria has many ramifications. Slow elevators cause dissatisfied patients. Any ward with a southern exposure has a continuous porch outside the single patient rooms. This porch is used for inpatients so patients on the porch must pass through the adjoining patient room to get to the corridor. This is highly undesirable as far as patient privacy is concerned. Radiation Therapy patients must go to the basement and pass by unsightly electro-mechanical areas to get to the clinic. The

distances the patients must travel to get to their clinics impacts on the perception of the quality of care by creating a disgruntled patient.

The mobilization requirements criteria is adequately met except that almost all of the buildings that the clinics occupy are scheduled to be standby wards during mobilization. Should mobilization occur there is no suitable place to relocate the displaced clinics.

The ability to maintain flexibility in response to changing requirements criteria can only be met by displacing activities from Building 500 to the outlying buildings compounding the present problems. There is no space in Building 500 and any new technology to be employed must be done at the expense of another area or by squeezing in the requirement in an already cramped area.

All in all the status quo analysis against the criteria indicates a negative factor or disadvantage for most criteria. It is quite evident that care at FAMC is being provided in a facility that is sorely lacking when compared to facilities planned, designed and constructed in accordance with contemporary hospital design.

Analysis of Alternative Two

This alternative is the major Military Construction Army project presently planned for FAMC. An electrical/mechanical upgrade of Building 500 is planned. The upgrade includes the air conditioning, electrical, oxygen and vacuum systems to be

brought up to conform with applicable standards. Following the upgrade a 120,000 gross square foot addition will be added to consolidate outlying clinics. Following clinic relocation from Building 500, the existing clinic facilities will be renovated to their original designed usage as inpatient wards. The structural problems of Building 500 such as the fire stop partitions and deadend corridors will be corrected in accordance with JCAH and NFPA standards.

In comparing Alternative Two to the criteria the costs, benefits, and problems are discussed as follows. The JCAH deficiencies already discussed under Alternative One are purported to be corrected. This will be accomplished by the upgrades in Phase I and Phase III of the project. The biggest question concerning the upgrades and the new clinic construction is, will there be enough space to accommodate all the outlying clinics? The proposal calls for a 120,000 GSF outpatient wing to be built. This wing will supposedly consolidate all clinic functions into one building. Present 59,321 GSF in Building 500 is devoted to clinic space. Appendix B shows all the clinics in outlying buildings. These buildings make up 169,537 GSF. By adding the two together the sum of 228,858 GSF details FAMC's present outpatient utilization. It is conceded that some of the outlying clinics have more space than they need but it is questionable whether the clinic addition would meet FAMC's needs. How does one consolidate 228,858 GSF of clinic utilization into a

120,000 GSF addition? Obviously the space problems present in the main laboratory and radiology will still continue to exist. Some, if not half, of the existing clinics will have to remain in outlying buildings which continues FAMC's physical separation problem.

The Life Safety Code deficiencies will be solved by both phases of the electrical/mechanical upgrade but the disarray and congestion caused by completing smoke stop partitions in an active inpatient facility will be very time consuming and take considerable planning and coordination. Referring again to Appendix D, the Life Safety Code deficiencies are considerable and it is questionable whether a 40 year old building can be brought up to contemporary life safety code standards at a reasonable cost.

The cost criteria are favorable as far as current costs are concerned. The Phase I, Electrical/Mechanical Upgrade, is estimated to cost \$15,000,000. The Phase II clinic addition is estimated to cost \$18,437,100 (120,000 GSF at \$153.64 per GSF). The Phase III alteration to the hospital is estimated to cost \$15,000,000. Supporting facilities such as utilities, roads, and medical equipment are estimated to cost \$3,121,800. This adds up to a total of \$51,588,900.⁵ If the planned outpatient facility would accommodate all of FAMC's outpatient services, the costs would be acceptable for the clinic addition. Using the total 228,858 GSF outpatient requirement times the

\$153.64 GSF factor provides a new addition cost of \$35,161,743. This is the estimated cost to truly consolidate all of FAMC's outpatient services. The biggest cost concern is expending \$30,000,000 for Phase I and Phase III. Present minor exigent renovations of FAMC's intensive care units show only too well the problems of trying to update FAMC's inpatient care areas to contemporary standards. Load bearing columns obstruct the view of critical care patients. Existing space and building configurations limit the options available in any renovation. There are many hidden costs in any renovation program which make it extremely difficult to estimate the true costs of the renovation. The biggest concern with the costs of this alternative are those unanswered by a preliminary economic analysis such as this. A fully detailed economic analysis needs to be completed to fully ascertain all the costs of this alternative. In addition, a Life Cycle Costing approach would fully detail the costs over the life of the facility. How much longer can a 40 year old building be upgraded and still satisfactorily meet inpatient standards? The recent \$10 million electrical/mechanical upgrade of Brooke Army Medical Center (BAMC) in San Antonio, Texas, adequately supports this problem thesis. This project provided improved facilities for the Medical Center but a new facility costing \$230 million is programmed in the FY 1986 Health Services Command major construction program. The problems faced by BAMC and FAMC are very similar. The buildings are

configured the same. The buildings were constructed in the same era. Outpatient activities are widely dispersed. The size of the facilities is very similar. A possible better solution for FAMC involves the recent request for \$4 million to correct FAMC's JCAH and NFPA deficiencies as an interim measure before the major addition is completed.⁶ This solution has provided an interim solution to BAMC's problems but they recognize the futility of upgrading an obsolete, old, inpatient facility.

The alternative provides the present level of care and would increase bed availability as clinics are moved to the new addition. Sufficient bed space would be recovered to allow the expansion of medical ward beds where the need is the greatest. Some surgical specialties could be consolidated to free a ward for the psychiatric inpatients presently housed in Building 609. The problem of the lack of operating room time would still exist as no provision for the increase of operating rooms is planned with this alternative.

The support of Graduate Medical Education Training Programs would improve dramatically as all outpatient (save those not able to move) and inpatient facilities are consolidated. House and teaching staff would spend less time commuting between buildings.

The application of state-of-the-art systems would be improved in the outpatient area because of the new building. Possible new space in Building 500 could be used to upgrade

the systems of the hard services such as Radiology and Pathology.

The relationships between organizations and functions would be significantly enhanced. The departments and their clinics would be much closer enhancing the time physicians can devote to actual patient care. Duplication of pharmacy, laboratory, and radiology services could be eliminated with probable cost savings of economics of scale. Outpatient records would be readily available in one location near all clinics. The proximity of the clinics to the inpatient building should significantly reduce resupply time. A much more positive advantage could have been obtained had a materiel distribution system been planned for the lower floor of the outpatient clinic addition. This would have helped solve some of the major problems FAMC has with supply storage in the main inpatient building.

Since all clinics would be in one location, the accessibility to care would be dramatically improved. The emerging question revolves around the problem of whether or not there is sufficient gross square footage in the new outpatient clinic addition to accommodate all outpatient clinics. From the gross square footage requirements presented earlier this does not appear to be the case. If all the clinics are not accommodated, the accessibility of care problem still appears to be unsolved totally. It would be extremely unfortunate if the new project does not solve this problem because it would just

obviate the total solution and its requisite advantages.

Availability of care would be basically unchanged. Less time commuting would mean more time for the provider to provide care. Continuity of care would remain the same or increase as more services could be efficiently operated. This would provide for more effective coordination of services provided to the individual consumers.

The quality of care should increase markedly. Providers and other FAMC personnel should be more motivated and positive because of the new facility. This positive attitude and pride would obviously carry over into the quality of care rendered by them. A new outpatient facility would also visibly contribute to the quality of care. Patients would be seen in spacious clinics with pleasing decor. Increased vertical transportation would move patients to their desired location, hopefully generating a calm, more relaxed patient more receptive to the care they are receiving. Waits at clinics would be more readily accepted. Patient porches would still be present so the quality of care for inpatients would remain appreciably unchanged. Radiation Therapy patients would no longer have to traverse the basement of Building 500. Their therapy would be received in the new clinic provided for that purpose.

Mobilization requirements would improve as clinics occupying standby wards are moved to the new wing. The problem of where to locate the clinics if mobilization should occur

would no longer be present.

The ability to maintain flexibility in response to changing environments would increase. More space would be available in Building 500 to set up additional beds as space is freed by clinics that move. It might be possible to curtail the use of the porches as active inpatient areas. This would allow space in some patient rooms, used for other purposes, to be returned to patient use while the porches could be used for storage or administrative uses. Nothing is done, however, to improve the flexibility to meet changing life safety code requirements. Building 500 remains a fixed size and configuration. The changes in codes and advances in treatment practices have caused FAMC's present problem. Future changes in codes and treatment regimens and procedures can be expected to compound the problems as long as Building 500 continues to be used as an inpatient facility.

The analysis of Alternative II against the criteria indicates an improvement in some of the factors over the status quo (Alternative I). A much better facility results with the consolidation of clinics in a building adjoining the inpatient facility. Deficiencies in size and spatial distance are partially solved. An aesthetically pleasing building is provided for outpatient care.

Two main problems exist that weigh heavily in the consideration of this alternative. First, the present plan

appears inadequate in size and scope. There appears to be a shortage of approximately 110,000 GSF in the outpatient wing. Even if the size of the outpatient wing were increased to adequately consolidate all outpatient clinics, the second problem might be all the more critical. This problem is, can Building 500 be satisfactorily upgraded to render care in accordance with the present advances of medicine? Forty years is considered to be the average lifetime of a medical facility.⁷ Building 500 has exceeded that mark already. Even if it was cost effective in the short run to renovate the building, the life cycle costs are presumed to be a very disqualifying factor. A full economic analysis should be performed to provide further information. The literature seems to indicate that similar facilities facing the same problem have converted their buildings to other occupancies than inpatient such as outpatient or administrative. The main determination causing this decision is the problems of keeping such buildings in conformance with standards and codes, especially when considering the costs involved. The other decisive determinant was the inability to apply and integrate new technology and systems because of space and configuration constraints.

Analysis of Alternative Three

This alternative consists of the addition of an inpatient addition to the north side of Building 500. The addition would

consist of almost entirely inpatient wards. Expansion of the existing laboratory on the second floor, radiology on the third floor and operating room suite on the fourth floor into the new wing would solve the existing space deficiencies in these areas. All existing inpatient wards, to include Psychiatry in Building 609, would be relocated to this addition.

Since an adequate utilization and requirements study does not exist for FAMC, an extrapolation from the Utilization and Requirements of the MAMC project was used to estimate the size of the addition. All of MAMC's 478 beds and associated inpatient administrative areas take up 210,079 net square feet. The GSF equals 370,239.⁸ By performing a ratio analysis FAMC's 600 bed facility would require 263,697 net square feet. By using the standard conversion factors this equates to 464,735 GSF rounded to 475,000 GSF.⁹ The above figures are for the nursing units only and do not include clinic space, administrative support areas, or materiel and logistical areas supporting the entire facility. Following the relocation of the inpatient wards to the new wing, Building 500 will be renovated to standards for outpatient clinic occupancy on the lower floors and administrative and support use on the upper floors. Following the renovation all outlying clinics will be relocated to Building 500. A complete two-hour fire separation would be constructed between Building 500 and the inpatient addition. This construction will allow Building 500 to conform to the less

stringent life safety codes for outpatient and business occupancy codes. The vertical transportation system in the new addition will be planned to meet the increased needs of both structures.

It should be noted Building 500 has 420,000 gross square feet of space, the existing 59,321 GSF of Building 500 clinics and 169,537 GSF of outlying clinics could be easily accommodated in Building 500. Additional space left in Building 500 would be used for Patient Administration, Personnel and Resources Management. All additional administrative activities would remain in their existing buildings or be moved to closer buildings once the clinics have been relocated to Building 500.

In comparing Alternative III to the criteria the costs, benefits and problems are discussed as follows. Obviously, in a new inpatient facility all JCAH standards will be planned for in the design process. The facility will be state-of-the-art encompassing all new current systems meeting the latest in health facility design criteria. The existing deficiencies in Building 500 will be greatly reduced since it will no longer be used as an inpatient facility. Sufficient space will be available for all outpatient activities. The major benefit of this alternative is in the life safety area. A structurally sound, fire resistive building will be used for outpatient and business occupancy. Many of the present deficiencies such as absence of smoke stop partitions and deadend corridors

will be negated by the less stringent life safety code requirements of outpatient and business occupancy. The renovation costs will be significantly less because there will be no need for major structural alterations. The possibilities for using a 40 year old building as an outpatient facility are infinitely more manageable than proposing its continued use for inpatients.

The cost estimates are of a very elementary nature. Again a full scale economic analysis is needed to more fully capture the life cycle costs of this alternative. The costs for the conversion of Building 500 to outpatient use compared to the costs already discussed in Alternative II should be significantly less. The total of \$30 million for Phases I and III of Alternative Two would probably be halved for the outpatient renovation. Most of the systems needing upgrading in Building 500 would no longer need upgrading if Building 500 was no longer used for inpatients. The major structural changes; i.e., smoke stops and approved exits to eliminate deadend corridors, would no longer be necessary. Partitions on the south facing porches could provide doctors offices, adjoining the present bed areas which would be used as examining/treatment areas at a fraction of the cost. Outpatient care areas are much less affected by constraints imposed by the configuration of the building its located in. The present ward individual rooms lend themselves very well to clinic offices.

Since the new addition would be mostly ward space, the construction costs would be very close to that of a civilian facility. The costs would not have to include the clinics and ancillary service costs which drive up the cost of military medical facilities because these activities would be housed in Building 500 for the clinics and other buildings for the ancillary support (Logistics, Medical Maintenance, etc.). Using Johnson's 1985 cost estimate of \$157.68 per GSF, which incidentally compares very closely to that derived from Army Regulation 415-17, provides a good estimate for the costs of the inpatient addition.¹⁰ Army Regulation 415-17 provides the following GSF cost estimate:¹¹

Basic Cost		\$103.75
Location Adjustment	x	.98
Cost Growth	x	1.25
Technological Updating	x	1.02
Cost Reliability	x	1.015
Contingency Factor	x	1.05
Supervision and Administration Factor	x	1.05

Cost in 1983 Dollars = \$145.07 per GSF

Obviously the above would appreciate by 1985 to at least the figure computed by Johnson. Multiplying the Army Regulation 415-17 cost data and Johnson's cost data by the 475,000 GSF for the new wing provides the following cost estimates:

AR 415-17 = \$68,908,250 (1983 dollars)

Johnson = \$74,898,000 (1985 dollars)

Adding to this the \$15 million for renovation of Building 500, the costs should be below \$100 million. The biggest benefits with this alternative are the fact that FAMC would have a brand new inpatient building with a projected full 40 year life ahead of it plus Building 500 is used more wisely as an outpatient facility. Savings associated with consolidated operations should be significant as duplicated services are eliminated, extra personnel are used more wisely, and economies of scale take affect.

The present level of care is improved because of additional beds provided by the new wing could be mostly medical which would negate the shortage present on medevac days. Psychiatric inpatients would be moved to the new addition which would eliminate bussing for meals, and provide a more pleasant milieu for their treatment. Operating room time problems should be lessened as new OR's can be provided to allow more time for the operations needed to support the Graduate Medical Education Training Program. Less time would be spent commuting by providers so more time could be used for improving the Graduate Medical Education Training Programs. A new inpatient wing will solve the threat of non-accreditation by JCAH which could affect our Graduate Medical Education accreditation.

The use of state-of-the-art systems in the inpatient wing would obviously be planned for in the design process.

The design would be in accordance with present concepts of delivering inpatient care without the constraints if the wards remained in the 40 year old Building 500. These state-of-the-art systems could expect to cause economies of scale and cost savings in other areas.

The relationship between organizations and functions would be greatly enhanced as clinics and inpatient wards would be physically close, decreasing response time and increasing the time providers spend in actual patient care. The supply and storage problems of the hospital complex would be alleviated if a new materiel distribution area were built in the new inpatient wing.

Accessibility to care should be improved because of the consolidation of inpatient and clinic areas. Sufficient space is available in Building 500 to accommodate all clinics in one location.

Availability of care should improve as more OR's decrease the backlog in necessary elective surgery. The present supply and mix of health care providers would be used more effectively, therefore increasing the availability of care.

The perception of the quality of care should increase markedly. Inpatients, who deserve the more aesthetic surroundings, would have a pleasant new facility. Shorter waits and commuting time to get to the clinic would mean less time the patient has to wait to receive care, and less time away from their job.

The application of new design techniques in the building would maximize the efforts of the staff. These structural improvements should have positive influences on the delivery process which should ultimately improve the outcome of the care.

Mobilization requirements should improve as clinics in outlying buildings would relocate to Building 500. These clinics could then revert to their mobilization standby ward mission. In the event of a worst case, during mobilization, Building 500 could revert to inpatient care since the alterations to convert it to clinic use are relatively minimal. Standby wards could then be used as clinics or extra ward space since the obvious need during mobilization would be for inpatient space. Since the new wing would be planned under new construction criteria, more space per bed would be provided with the possibility of placing a third bed in two-bed rooms and an extra two beds in four-bed rooms. The inpatient wing should significantly increase FAMC's ability to meet mobilization mission requirements.

The ability to maintain flexibility in response to changing requirements should improve. This would be more true for the new inpatient wing because it would be of more current design, anticipating more accurately future advances in technology and treatment procedures. Changing requirements should be more easily accommodated. Additional space for the clinics in Building 500 should allow them more flexibility as well. Most

importantly the new wing will be able to meet changing codes and standards by various inspecting and accrediting bodies. By anticipating these future codes FAMC's new inpatient wing will insure FAMC's future in the Army Medical Department Health Care Facility Inventory.

The analysis of Alternative III against the criteria indicates an improvement or advantage in all factors except for cost. A much better facility results with an entirely new inpatient wing with increased clinic space in Building 500. Deficiencies in size and distances between activities are solved. Inpatient care would be provided in a configuration consistent with current practice of health care facility design. The only real problem with this alternative is the inability to provide a more detailed cost analysis and estimate. Life cycle costing would have to prove this is the most viable alternative. The literature is replete with projects where old facilities have converted their existing inpatient structures into outpatient and administrative use. The ever changing codes, standards and advances in medicine make it almost impossible to update a 40 year old facility to bring it into the realm of the modern practice of inpatient medicine. The cost conscious era of today demands that a building with the equity of Building 500 be re-used wisely either for outpatient or administrative use.

Footnotes

¹"Utilization and Requirements Study for Madigan Army Medical Center," Health Facility Planning Agency, Washington, D. C. (6 September 1981); p. 194.

²Richard L. Johnson, "Construction Spending Will Be Shaped by Competition," Hospitals 56 (February 16, 1982); p. 92.

³Army Regulation 415-17, "Cost Estimating for Military Programming," Washington, D. C. (15 February 1980); p. 7.

⁴Johnson, p. 92.

⁵DD Form 1391, "Military Construction Project Data, Additions and Alterations to Building 500," Fitzsimons Army Medical Center, Aurora, Colorado (16 May 1980); p. 1.

⁶Letter, "Preliminary Input, Annual MCA Documentation Requirement," Fitzsimons Army Medical Center, Aurora, Colorado (4 March 1982); p. 3.

⁷Owen B. Hardy and Lawrence P. Lammers, Hospitals - the Planning and Design Process (Germantown, MD: Aspen Systems Corporation, 1977); p. 215.

⁸"Utilization and Requirements Study," p. 2.

⁹Ibid., Net to Gross Conversion Page.

¹⁰Johnson, p. 92.

¹¹AR 415-17, p. A-1.

CHAPTER III

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the analysis of the alternatives it is clear that Alternative III, the construction of a new wing for inpatient use with the conversion of Building 500 to outpatient and administrative use, provides the optimal long range utilization of the main hospital building at Fitzsimons Army Medical Center. The decision is based on Alternative III providing the most advantageous and beneficial results from the alternative analysis against the pre-established criteria. The advisability of continuing the use of Building 500 as an inpatient facility must be severely questioned. In its early years it served Fitzsimons well as an inpatient facility. It has grown obsolete over the years as standards, codes and advances in medicine and technology have increased the sophistication of inpatient health care delivery. It might be conjectured that the life cycle costs of operating such a facility would most probably support its conversion to another occupancy.

Obviously, a major construction project of the scope needed to create a new Fitzsimons is many years in the future. In order to assure Fitzsimons meets its JCAH accreditation interim short range construction measures must be initiated. The proposal to spend approximately \$4 million to bring FAMC closer to code compliance should be pursued. The command has

been recently informed that the construction project proposed in Alternative II has been placed in the Health Services Command Fiscal Year 1989 Major Construction Program. Immediate action must be taken by the command to submit a new Military Construction Project Data submission based upon the conclusion that Alternative III is the optimal long utilization of the main hospital building at Fitzsimons Army Medical Center.

Recommendations

Based upon the preceding discussion and conclusions, the following recommendations are made:

1. That a full economic analysis be completed to support the conclusions and recommendations of this study.
2. That Alternative III, building a new inpatient wing and conversion of Building 500 to outpatient and administrative use, be determined as the optimal long range utilization of the main hospital building at Fitzsimons Army Medical Center.
3. That a new Military Construction Project Data submission be generated with the proposal established in Alternative III as its basis.
4. That the methodology used in this study be used as a model by other facilities to develop the information, requirements, criteria, alternatives, and analysis of alternatives to solve their own facilities obsolescence problem.

APPENDIX A
ACTIVITIES LOCATED IN BUILDING 500

APPENDIX B
CLINICS LOCATED IN OUTLYING BUILDINGS

Clinics Located in Outlying Buildings

<u>Bldg Number</u>	<u>Clinic</u>	<u>Gross Square Feet</u>
T-403	Hematology/Oncology	11,000
T-404	Rheumatology	7,200
T-405	Surgery	11,876
T-408	Outpatient	5,436
T-409	Outpatient	14,902
T-410	Social Work	8,000
T-417	Internal Medicine	12,191
	OB/GYN	
T-418	Dermatology	7,200
T-502	Orthopedic	16,585
T-505	ENT	11,725
T-506	Pediatric Well Baby	5,740
T-507	Pediatric Clinic	15,901
	Adolescent Medicine	
T-511	Nuclear Medicine	6,200
	Thyroid	
T-514	Dental Clinic	6,606
T-515	Optometry	2,100
T-516	Occupational Therapy	4,276
T-517	Orthopedic Brace Shop	7,374
T-606	Occupational Therapy	15,225
	Psychiatry	
	Psychology	

Total Clinics = 22

Total GSF = 169,537

APPENDIX C

**MAP OF FITZSIMONS
ARMY MEDICAL CENTER**

APPENDIX D

LIFE SAFETY CODE DEFICIENCIES

THROUGHOUT FINDINGS

1 - Lack of appropriate adaptor to standardize screw threads on hose outlet valve on standpipe system. RAC 2

Reference: 29CFR1910.158(c)(2)(ii)

Recommendation: Refit hose valves with national standard thread fittings or provide adaptor.

2 - Lack of fire rated door assemblies for elevator shaft doors. RAC 2

Reference: NFPA 101, Sec 13-3.1.1 & 6-2.2.3.1

Recommendation: Provide 1½ hour (B-rated) fire door assemblies.

3 - Lack of fire rated enclosure for stairwells (stairwells goes from 7th floor to penthouse area). RAC 2

Reference: NFPA 101, Sec 13-3.1.1 & 6-2.2.3.1

Recommendation: Provide a fire rated enclosure around stairwell doors on 7th & 8th floors.

4 - Lack of smoke barriers. RAC 2

Reference: NFPA 101, Sec 13-3.7.1

Recommendation: Provide smoke barriers to divide every story into at least two separate compartments. Exception - 8th floor does not require smoke barrier.

5 - Lack of manual fire alarm box near exit. RAC 2

Reference: NFPA 101, Sec 7-6.2.3

Recommendation: Install a manual fire alarm box near exits.

*6 - Lack of slab to slab construction of corridor walls. RAC 2

Reference: NFPA 101, Sec 13-3.6.1

Recommendation: Extend the corridor wall to the floor or roof slab above.

7 - Lack of 1 hour fire resistive construction and automatic fire extinguishing system for high hazardous area. (Soiled linen rooms). RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Separate the area with 1 hour fire resistive construction and C-labeled doors. Install approved automatic extinguishment system.

8 - Lack of approved nurse call buttons for oxygen enriched atmospheres. RAC 2

Reference: NFPA 56B, Sec 6-1.5

Recommendation: Replace nurse call units with approved type for oxygen enriched atmospheres where required.

9 - Lack of rated door frames in stairways. RAC 2

Reference: NFPA 101, Sec 6-2.2.3.1 & NFPA 80, Sec 1-5 & 2-5

Recommendations: Replace existing frames in stairway enclosure with frames rated for use in 1½ hour "B" locations.

10 - Lack of positive latching means to hold room door in the closed position against the pressure of expanding fire gases. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendations: Install or repair present positive latching means on room doors.

FINDINGS

Penthouse - Mechanical Room

1 - Lack of labeled fire door and frame in stairway enclosure. RAC 2

Reference: NFPA 101, Sec 6-2.2.3.1 and NFPA 80, Sec 1-6, 1-7 & 2-5.

Recommendation: Replace existing door and frame in stairway enclosure with fire door and frame rated for use in 1½ hour (B) locations. Doors should be constructed so that the maximum temperature end point should not exceed 450 ZF above ambient temperature at the end of the standard fire test.

8th Floor - Bushnell Auditorium

1 - Lack of two (2) remote exits for auditorium with capacity greater than 50 persons. RAC 2

Reference: NFPA 101, Sec 8-2.4.3

Recommendations: Provide a second exit remote from present exit.

2 - Lack of 2 hour fire separation RAC 2

Reference: NFPA 101, Sec 13-1.2.3

Recommendation: Replace present door assembly with a 2 hour fire rated assembly.

*3 - Unknown flame spread rating of carpet. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

8th Floor - Remaining Areas

1 - Lack of two (2) remote exits for gross floor area. RAC 2

Reference: NFPA 101, Sec 12-1.7 & Sec 13-2.3

Recommendation: Provide additional exits in accordance with references.

2 - Defective lamp in internally illuminated exit sign. Located over door

*3 - Lack of wired glass and steel frames in transoms over doors No. 8007 and 8006. RAC 3

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing plain glass with wired glass in a steel frame or use another material with a fire rating not less than 20 minutes.

4 - Lack of noncombustible or limited combustible construction of interior wall or partition (walls for chaplains office and tumor registry). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls with ones constructed of noncombustible or limited combustible materials.

5 - Lack of rated enclosure for elevator machine room located to the rear of Rm 8011 (Bushnell Auditorium). RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Provide fire rated enclosure for elevator machine room.

6 - Lack of noncombustible or limited combustible construction of ceiling located in elevator mechanical room to the rear of rm 8011 (Bushnell Auditorium). RAC 2

Reference: NFPA 101. Sec 13-1.6.5

Recommendation: Replace construction of ceiling with one constructed of noncombustible or limited combustible materials.

7th Floor (North)

*1 - Lack of wired glass and steel frames for vision panels in corridor walls. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing glass and frame with wired glass in steel frames.

Limit size of glass vision panel to 1296 sq. inches.

* 2 - Lack of wired glass in steel frames in transoms over doors No. 7079 and 7076 (Cardiovascular & thoracic services). RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendations: Replace existing plain glass with wired glass in a steel frame or use another material with a fire rating not less than 20 minutes.

7th Floor - Lobby Area

1 - Lack of non-combustible or limited combustible construction of interior wall or partition (wall for urology service secretary). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls with one constructed of non-combustible or limited combustible materials.

2 - Lack of required room door. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace door in accordance with cited reference.

7th Floor - South

1 - Dead-End Corridor (exceeds 30 feet) Urology Section. RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (See exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor and install a manual fire alarm near the new exit.

2 - Lack of non-combustible or limited combustible construction of interior wall or partition (wall leading into urology section). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls with one ^{constructed} of non-combustible or limited combustible materials.

3 - Lack of exit passage way between stairways on 7th floor. RAC 2

Reference: NFPA 101, Sec 5-2.7.1 & 5-2.7.2

Recommendation: Enclose 7th floor lobby area with 2 hour fire resistive construction.

7th Floor - Ward 7 West

1 - Lack of required room door (door required for oxygen storage area). RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace room door in accordance with cited references.

2 - Dead-end corridor (exceeds 30 feet). RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (See exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor and install a manual fire alarm near the new exit.

7th Floor - Ward 7 East

1 - Dead-end corridor (exceeds 30 feet). RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (See exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor and install a manual fire alarm near the new exit.

2 - Lack of required room door located next to rm 7029. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace room door in accordance with cited reference.

* 3 - Lack of wired glass in room door, Rm 7019. RAC 3

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace existing glass with wired glass in approved steel fram.

* 4 - Lack of 1 hour fire resistive separation for hazardous area, Rm 7017. RAC 2

Reference: NFPA 101, Sec 13-3.2.1

Recommendation: Separate the area with 1 hour fire resistive construction and C-labeled doors.

6th Floor - South

* 1 - Lack of wired glass in steel frames for vision panels in corridor walls, Rms 6143, 6144, 6000, 6001 & 6002. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing glass and frame with wired glass in steel frame. Limit size of glass vision panel to 1296 sq. inches.

2 - Lack of smoke tight window shutters for 3 service windows in OB-GYN clinic area in corridor wall. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Sec 11-1, 11-2, 11-3 & 11-4.

Recommendation: Install smoke actuated closing shutters on service windows.

6th Floor - West

1 - Defective lamp in internally illuminated exit sign (2 locations - one inside and 1 outside entrance door to west ward). RAC 4

Reference: NFPA 101, Sec 5-10.3

Recommendation: Replace bulbs.

*2 - Unknown flame spread rating of carpeting in Rm 6113 area. RAC 2

Reference: NFPA 101, Sec 13-3.3

Recommendation: Determine flame spread rating of carpeting. Replace carpeting not having an interior finish rating of class A or class B.

3 - Lack of astragal and single point latch on upper leaf of dutch door. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point ^{latch} leaf on upper portion of door.

4 - Lack of room door on storage room next to room 6116. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install door in accordance with cited reference.

5 - Lack of non-combustible or limited combustible construction of interior wall or partition (OB service section). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall with one constructed of non-combustible or limited combustible materials.

6th Floor - East

1 - Dead-end corridor (exceeds 30 feet). RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (See exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor and install a manual fire alarm near the new exit.

* 2 - Unknown flame spread rating of carpet in Rm 6032 and adjacent conference room. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

3 - Lack of non-combustible or limited combustible construction of interior wall Rm 6032. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall with one constructed of non-combustible or limited combustible materials.

6th Floor - North

1 - Lack of non-combustible or limited combustible construction of interior wall. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall with one constructed of non-combustible or limited combustible material.

2 - Improper use of transfer grill in room door (doors 6060 & 6090). RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

3 - Dead end corridor OB-GYN delivery suite (exceeds 30 ft.) RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (see exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor and install a manual fire alarm near the new exit.

4 - Defective lamp in internally illuminated exit sign. Located at entrance to delivery suite. RAC 4

Reference: NFPA 101, Sec 5-10.3

Recommendation: Replace bulb.

6th Floor - Lobby

1 - Lack of noncombustible or limited combustible construction of interior wall or partition (adjacent to Rm 6001). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls, with one constructed of non-combustible or limited combustible materials.

5th Floor - Lobby

1 - Improper use of transfer grill in room^{AI} door. Door Nos. 5002, 5005, 5006. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood^{OR} equivalent.

2 - Lack of astragal and single point latch on upper leaf of dutch door, Rm 5005. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point ^{LATCH} leaf on upper portion of door.

3 - Lack of non-combustible or limited combustible construction of interior wall or partition, (wall divides cast room from respiratory therapy and also partitions in Rm 5154). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partition with one constructed of non-combustible or limited combustible materials.

4 - Lack of smoke detector in waiting areas . RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install required smoke detectors in waiting areas.

5th Floor - South

1 - Improper use of transfer grill in room doors, (door Nos 5091, 5068, 5069 5089, 5070, 5087 & clean linen room). RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

* 2 - Unknown flame spread rating of carpet (throughout 5th floor - south). RAC 2

Reference: NFPA 101, SEC 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

3 - Dead-end corridor (exceed 30 ft). RAC 2

Reference: NFPA 101, Sec 13-2.5.5 (see exception 1)

Recommendation: Install an additional exit to eliminate the dead-end corridor

and install a manual fire alarm near new exit.

5th Floor - East

* 1 - Unknown flame spread rating of carpet throughout 5th floor - east. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

2 - Unknown combustibility of cubicle curtains. RAC 2

Reference: NFPA 101, Sec 31-4.5 & NFPA 701

Recommendation: render and maintain cubicle curtains flame resistant as per NFPA 701 or purchase non-combustible cubicle curtains.

3 - Lack of exit sign (word plate missing on sign frame) located rear of suite. RAC 2

Reference: NFPA 101, Sec 5-10.1.1 and 5-10.1.2

Recommendation: Replace missing sign.

4 - Travel distance to exit exceeds 100 feet. RAC 2

Reference: NFPA 101, Sec 13-6.2.6.2

Recommendation: Provide an additional exit (see exception to cited ref.).

5th Floor - West

1 - Unknown combustibility of cubicle curtains. RAC 2

Reference: NFPA 101, Sec 31-4.5 & NFPA 701

Recommendation: Render and maintain cubicle curtains flame resistant as per NFPA 701 or purchase non-combustible cubicle curtains.

2 - Unknown combustibility of draperies. RAC 2

Reference: NFPA 101, Sec 31-4.1 & NFPA 701

Recommendation: Render and maintain draperies flame resistant as per NFPA 701 or purchase non-combustible draperies.

3 - Lack of non-combustible or limited combustible construction of wall or partition (CMS & equipment storage area). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace partition with one constructed of non-combustible or limited combustible materials.

4 - Improper use of transfer grill (wardmaster office). RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

* 5 - Unknown flame spread rating of carpet, Rm 5097. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

6 - Lack of room door, located behind nurses station. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install door in accordance with cited reference.

4th Floor - Lobby

* 1 - Unknown flame spread rating of carpet (lobby waiting areas and Dept of Surgery offices). RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

2 - Lack of non-combustible or limited combustible wall or partition (xerox rm). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partition with one constructed of non-combustible or limited combustible materials.

3 - Lack of smoke detector in waiting areas. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 3)

Recommendation: Install smoke detectors in waiting areas.

4 - Improper opening in corridor wall (exhaust fan located in xerox rm projects thru wall to corridor). RAC 2

Reference: NFPA 101, Sec 13-3.6.4 & NFPA 90A, Sec 2-2.2

Recommendation: Remove fan and seal opening. Install exhaust fan in compliance with NFPA 90A.

4th Floor - West

1 - Lack of smoke detectors in waiting area. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install smoke detectors in waiting room areas.

* 2 - Unknown flame spread rating of carpet, throughout the 4th floor - west. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

3 - Improper use of transfer grill, located in room door No. 4170. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

4 - Lack of required room door, located to the rear of nurses station. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace room door in accordance with cited reference.

* 5 - Lack of 1 hour fire resistive enclosure for storage room No. 4189. RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Provide a fire barrier of 1 hour fire resistive rating or provide an automatic fire extinguishing system.

4th Floor - East

1 - Stand pipe station not located conspicuously within the immediate area and where not likely to be obstructed, located within new intensive care section. RAC 2

Reference: NFPA 14, Sec 4-1.1

Recommendation: Relocate stand pipe hose cabinet into corridor.

3rd Floor - Lobby

1 - Lack of non-combustible or limited combustible construction of interior wall or partition (plastic surgery clinic office). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls or partition with one constructed of non-combustible or limited combustible materials.

2 - Lack of astragal and single point latch on upper leaf of dutch door Rm 3006. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper leaf of door.

* 3 - Unknown flame spread rating of carpet (office area). RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

4 - Lack of room doors - 2 doors missing (clinic office & appt distribution). RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install doors in accordance with cited reference.

5 - Improper use of transfer grill in room door (Doors 3006, 3209, 3003, 3007) RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill & seal hole with 1 3/4 solid wood or equivalent

3rd Floor - East

1 - Lack of room door, located to the rear of pediatrics nurses station. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install doors in accordance with cited reference.

2 - Lack of non-combustible or limited combustible construction of wall or partition (admissions room). RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partition with one constructed of non-combustible or limited combustible materials.

3rd Floor - North

1 - Lack of non-combustible or limited combustible construction of interior walls or partition, location X-ray & radiology, rad. files and film library area) RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partitions with one constructed of non-combustible or limited combustible materials.

2 - Lack of astragal and single point latch on upper leaf of dutch door - Appointment office. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper portion of door.

3 - Lack of room door - throughout radiology section, exposure Rm 293, and film library. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install door in accordance with cited reference.

*4 - Lack of wired glass in steel frame for vision panel. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing glass and frame with wired glass and steel frame.

Limit glass size to 1296 sq inches.

3rd Floor - West

1 - Lack of room doors - kitchen area, rear of nurses station and wardmaster office. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install doors in accordance with cited reference.

2 - Lack of astragal and single point latch on upper leaf of dutch door, Rm 3138, ultra sound. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper portion of door.

3 - Lack of smoke detector in waiting area. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install required smoke detectors in waiting areas.

4 - Unknown combustibility of cubical curtains and draperies. RAC 2

Reference: NFPA 101, Sec 31-4.5, 31-4.1 & NFPA 701

Recommendation: Render and maintain cubicle curtains and draperies flame resistant as per NFPA 701 or purchase non-cumbustible cubicle curtains & draperies.

2nd Floor - Lobby & Dept. of Medicine

1 - Lack of smoke detectors in waiting areas - 2 locations. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install required smoke detectors in waiting areas.

* 2 - Unknown flame spread rating of carpet - throughout area. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet have a flame rating in excess of 75.

3 - Defective lamp in internally illuminated exit sign. (near waiting room). RAC 4

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace room door in accordance with cited reference.

5 - Lack of non-combustible or limited combustible construction of interior wall or partition - typing pool area. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace walls or partition with one of non-combustible or limited combustible materials.

* 6 - Lack of wired glass in steel frames for vision panels in corridor walls. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing glass & ^{frame}feam with wired glass in steel frames.

Limit size of glass panels to 1296 sq inches.

2nd Floor - East

* 1 - Unknown flame spread rating of carpet - Rms 2005 & 2007. RAC 2

Reference: NFPA 101, Sec 13-3.3

Recommendation: Determine flame spread rating of carpet. Replace carpeting ~~not~~ having a flame spread rating in excess of 75.

2 - Lack of smoke detectors in waiting area. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install required smoke detectors in waiting areas.

3 - Defective lamp in internally illuminated exit sign (near waiting areas.

Reference: NFPA 101, Sec 5-10.3

Recommendation: Replace bulb.

4 - Lack of required room doors - Location, kitchen locker rooms combination area and behind nurse station. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace doors in accordance with cited reference.

2nd Floor - North (Dept of Pathology)

1 - Lack of astragal and single point latch on upper leaf of dutch door, Rm 2094. RAC 2

Reference: NFPA 80 (see fig. 1-26)

Recommendation: Install astragal and single point latch on upper portion of door.

* 2 - Unknown flame spread rating of carpet - throughout 2nd floor north. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Replace carpet having a flame spread rating in excess of 75.

3 - Lack of smoke tight window shutters for service window, records office and administrative services. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Sec 11-1, 11-2, 11-3 & 11-4.

Recommendation: Install smoke actuated closing shutters on service windows.

4 - Lack of non-combustible or limited combustible construction of interior walls or partitions - administrative & NCOIC offices) RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partitions with one constructed of non-combustible or limited combustible materials.

* 5 - Lack of wired glass in room door, RM 2109. RAC 3

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace existing glass with wired glass in approved steel frames.

6 - Lack of astragal and single point latch on upper leaf of dutch door #2115. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal & single point latch on upper portion of door.

7 - Lack of room door - next to room 2111. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install room door in accordance with cited reference.

2nd Floor - North (Hematology)

9 - Lack of room doors - doors are missing throughout the entire section of hematology. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install room doors in accordance with cited reference.

10 - Lack of astragal and single point latch on upper leaf of dutch door- residents office. RAC 2

Reference: NFPA 80 (see fig. A-06)

Recommendation: Install astragal and single point latch on upper portion of door.

11 - Improper use of transfer grill in room doors #2117 & 2103. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

2nd Floor - West

1 - Lack of required room door. Two doors - one to the rear of nurses station and one at kitchen area\$. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Replace door in accordance with cited reference.

2 - Lack of smoke detector in waiting area. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 (see exception 1)

Recommendation: Install required smoke detectors in waiting area.

1st Floor - Lobby Area

1 - Improper use of transfer grill in room door #1100. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grill and seal hole in door with 1 3/4 inch solid wood or equivalent.

*2 - Lack of wired glass and steel frames in transoms over doors, #1089, 1106, & entrance to dining room. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing plain glass with wired glass in steel frame or use another material with a fire rating not less than 20 minutes.

*3 - Unknown flame spread rating of carpet, Rm 1109. RAC 2

Reference: NFPA 101, Sec 13-3.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

4 - Unknown combustibility of draperies, Rm 1109. RAC 2

Reference: NFPA 101, Sec 31-4.1 & NFPA 701

Recommendation: Render and maintain draperies flame resistant as per NFPA 701 or purchase non-combustible drapes.

5 - Unknown flame spread rating of paneling, Rm 1109. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of paneling. Replace paneling having a flame spread rating in excess of 75.

6 - Lack of enclosure of vertical opening (stairway - main lobby between 1st & 2nd floor). RAC 2

Reference: NFPA 101, Sec 13-3.1.1

Recommendation: Enclose stairway at 2nd floor. (see exception 1 to cited ref.)

1st Floor - East (Medical Clinic)

* 1 - Unknown flame spread rating of carpet - throughout 1st floor east. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

2 - Improper protection of records. Records are not enclosed with 1 hr fire resistive construction and automatic fire extinguishment system - Rm 105 & cardiology records storage. RAC 2

Reference: NFPA 101, Sec 13-3.2.1 & NFPA 232, Sec 3511

Recommendation: Install approved C-labeled automatic closing fire door and automatic fire extinguishing system. Prohibit smoking in immediate vicinity of records.

1st Floor - Conference Room (Bruns)

* 1 - Unknown flame spread rating of carpet. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

* 2 - Unknown flame spread rating of wood paneling. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3.3

Recommendation: Determine flame spread rating of paneling. Replace paneling having a flame spread rating in excess of 75.

3 - Unknown combustibility of draperies. RAC 2

Reference: NFPA 101, Sec 31-4.1 & NFPA 701

Recommendation: Render and maintain draperies flame resistant as per NFPA 701 or purchase non-combustible draperies.

4 - Lack of exit signs. RAC 2

Reference: NFPA 101, Sec 5-10.1.1 & 5-10.1.2

Recommendation: Install required exit signs.

5 - Failure of exit doors to swing in direction of exit travel. RAC 2

Reference: NFPA 101, 9-2.2.1 & 5-2.1.1.4.1

Recommendation: *Ensure doors meet requirements of cited references*

1st Floor - North

1 - Improper use of transfer grill, Rm 1106. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove the transfer grill and seal hole in door with 1 3/4 inch solid wood ^{or} equivalent.

2 - Unknown flame spread rating of panaling, dining facility. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of panaling. Replace panaling having a flame spread rating in excess of 75.

3 - Lack of separation of hazardous area - kitchen area from dining area. RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Either separate by 1 hour fire resistive construction or a fully ^{installed} automatic sprinkler system.

4 - Lack of required exit signs, to show direction to exit from patient tray pickup area. RAC 3

Reference: NFPA 101, Sec 5-10.1.1 & 5-10.1.2

Recommendation: Install required exit signs.

1st Floor - West Wing

1 - Improper protection of records - pulmonary function lab. RAC 2

Reference: NFPA 101, Sec 13-3.2.1 & NFPA 232, Sec ³⁵¹¹~~3511~~

Recommendation: Install approved C-labeled automatic closing fire door and automatic fire extinguishing system.

2 - Lack of smoke tight window shutters for service window - patient trust fund. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Sec 11-1, 11-2, 11-3 & 11-4

Recommendation: Install smoke actuated closing shutters on service windows.

* 3 - Lack of wired glass and steel frames in vision panels in corridor walls, entrance to ophthalmology clinic. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing plain glass and frame with wired glass in steel frames. Limit size of glass panels to 1296 sq inches.

* 4 - Unknown flame spread rating of wood paneling, X-ray & oral clinic. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of paneling. Replace paneling having a flame spread rating in excess of 75.

* 5 - Lack of wired glass and steel frames in transoms over room doors - throughout section. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing plain glass with wired glass in steel frames or use another material with a fire rating not less than 20 minutes.

6 - Lack of required exit signs throughout the area. RAC 3

Reference: NFPA 101, Sec 5-10.1.1 & 5-10.1.2

Recommendation: Install required exit signs.

Ground Floor - Lobby Area

1 - Lack of 2 hour fire resistive separation. RAC 2

Reference: NFPA 101, Sec 5-7.2

Recommendation: Provide a 2 hour separation and automatic sprinkler system.

2 - Improper ^{OPENING} opening in corridor wall, 2 heater vents, wall mounted. RAC 2

Reference: NFPA 101, Sec 13-3.6.4 & NFPA 90A, Sec 2-2.2

Recommendation: Remove vents and seal openings. Install heaters in accordance with cited reference.

3 - Lack of smoke tight window shutters for service windows, message ^{CENTER} center & pharmacy. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Sec's 11-1, 11-2, 11-3 & 11-4.

Recommendation: Install smoke actuated closing shutters on service windows.

4 - Lack of astragal and single point latch on upper leaf of dutch door #94 in pharmacy. RAC 2

Reference: NFPA 80 (see fig. A26)

Recommendation: Install astragal and single point latch on upper portion of door.

* 5 - Unknown flame spread rating of wood paneling, pharmacy. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.2

Recommendation: Determine flame spread rating of paneling. Replace paneling having a flame spread rating in excess of 75.

Ground Floor - Snack Bar

* 1 - Unknown flame spread rating of wood paneling. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.2

Recommendation: Determine flame spread rating of paneling. Replace paneling having a flame spread rating in excess of 75.

2 - Lack of non-combustible or limited combustible construction of interior wall or partition. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partitions with one constructed of non-combustible or limited combustible materials.

3 - Lack of required exit sign. RAC 3

Reference: NFPA 101, Sec 5-10.1.1 & 5-10.1.2

Recommendation: Install required exit signs.

Ground Floor - PX

*1 - Lack of 1 hour fire resistive enclosure for storage area. RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Provide a fire barrier of 1 hour fire resistive rating or provide an automatic fire extinguishing system.

Ground Floor - East

1 - Lack of astragal and single point latch on upper leaf of dutch door - 2 doors in the in-patient pharmacy area. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper portion of door.

*2 - Lack of 1 hr fire resistive enclosure for storage area - in-patient pharmacy. RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Provide a fire barrier of 1 hr fire resistive rating or an automatic fire extinguishing system.

Ground Floor - East (Physical Therapy)

1 - Improper use of transfer grills, Rm doors 14, 22 & 25. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grills & seal hole in door with 1 3/4 inch solid wood or equivalent.

2 - Lack of smoke tight window shutters for service window, reception desk area. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Secs 11-1, 11-2, 11-3 & 11-4

Recommendation: Install smoke actuated closing shutters on service windows.

3 - Improper opening in corridor wall, exhaust fan in Rm 27A. RAC 2

Reference: NFPA 101, Sec 13-3.6.4 & NFPA 90A, Sec 2-2.2

Recommendation: Remove fan and seal opening. Install exhaust fan in compliance with NFPA 90A.

X 4 - Unknown flame spread rating of carpet throughout physical therapy. RAC 2

Reference: NFPA 101, Sec 803.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

5 - Lack of non-combustible or limited combustible wall or partition, office for Asst Ch, Physical Therapy. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partition with one constructed with non-combustible or limited combustible materials.

Ground Floor - East (Medical Illustration Section)

1 - Lack of astragal and single point latch on upper leaf of dutch door. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper portion of door.

2 - Lack of non-combustible or limited combustible wall or partition, throughout area. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall with one constructed of non-combustible or limited combustible materials.

* 3 - Lack of wired glass in steel frames in transoms over room doors, throughout section. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing plain glass with wired glass in steel frames or use another material with a fire rating not less than 20 minutes.

Ground Floor - East

* 1 - Unknown flame spread rating of wood panaling - Emergency room waiting area. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of panaling. Replace panaling having a flame spread rating in excess of 75.

2 - Lack of smoke detectors in waiting room area - emerg. room. RAC 2

Reference: NFPA 101, Sec 13-3.6.2 (see exception 1)

Recommendation: Install required smoke detectors in waiting areas.

* 3 - Unknown flame spread rating of carpet, throughout pulmonary disease service. RAC 2

Reference: NFPA 101, Sec 13-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet having a flame spread rating in excess of 75.

Ground Floor - East (CMS)

1 - Lack of astragal and single point latch on upper leaf of dutch door - entrance to CMS area. RAC 2

Reference: NFPA 80 (see fig. A-26)

Recommendation: Install astragal and single point latch on upper portion of door.

* 2 - Lack of wired glass in steel frames for vision panels in corridor wall. RAC 2

Reference: NFPA 101, Sec 13-3.6.2

Recommendation: Replace existing glass and frame with wired glass in steel frame.

Limit size of glass vision panel to 1296 sq inches.

* 3 - Unknown flame spread rating of carpet, throughout office CMS. RAC 2

Reference: NFPA 101, Sec 13-3.2

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

4 - Lack of room door - to prep area. RAC 2

Reference: NFPA 101, Sec 13-3.6.3

Recommendation: Install door in accordance with cited reference.

5 - Lack of smoke tight window shutters for service window - sterile supplies. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Sec 11-1, 11-2, 11-3 & 11-4.

Recommendation: Install smoke actuated shutters on service windows.

* 6 - Lack of 1 hour fire resistive enclosure for storage area - bulk storage. RAC 2

Reference: NFPA 101, Sec 12-3.2.1

Recommendation: Provide a fire barrier of 1 hr fire resistive rating or provide an automatic fire extinguishing system.

Ground Floor - East

* 1 - Unknown flame spread rating of carpet, patient assistance off & rm 99. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

* 2 - Unknown flame spread rating of panaling - Pat. Asst Off & Rm 99. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of panaling. Replace panaling having a flame spread rating in excess of 75.

3 - Lack of non-combustible or limited combustibile wall or partition - Admissions & disposition room. RAC 2

Reference: NFPA 101, Sec 13-1.6.5

Recommendation: Replace wall or partition with one constructed of non-combustible or limited combustibile materials.

Ground Floor - Food Service Section

1 - Improper openings in corridor walls - missing tile blocks and metal grates. RAC 2

Reference: NFPA 101, Sec 13-3.6.4 & NFPA 90A, Sec 2-2.2

Recommendation: Remove grates and seal openings in accordance with cited reference.

2 - Lack of smoke tight window shutters for service windows to food service contractor office. RAC 2

Reference: NFPA 101, Sec 13-3.6.1 & NFPA 80, Secs 11-1, 11-2, 11-3 & 11-4

Recommendation: Install smoke actuated closing shutters on service window.

3 - Improper use of transfer grill in room doors - throughout section. RAC 2

Reference: NFPA 101, Sec 13-3.6.4

Recommendation: Remove transfer grills and seal holes in door with 1 3/4 inch solid wood or equivalent.

* 4 - Unknown flame spread rating of carpet - food service classroom & office. RAC 2

Reference: NFPA 101, Sec 8-3.2.3

Recommendation: Determine flame spread rating of carpet. Replace carpet with a flame spread rating in excess of 75.

Basement - Radiation Therapy

1 - Unknown combustibility of cubicle curtains. RAC 2

Reference: NFPA 101, Sec 31-4-5 & NFPA 701

Recommendation: Render and maintain cubicle curtains flame resistant as per NFPA 701 or purchase non-combustible cubicle curtains.

* 2 - Unknown flame spread rating of wood panaling. RAC 2

Reference: NFPA 101, Sec 6-5 & 13-3.3

Recommendation: Determine flame spread rating of panaling. Replace panaling having a flame spread rating in excess of 75.

3 - Inadequate number of exits, from Radiation Therapy. RAC 2

Reference: NFPA 101, Sec 13-2.4.1 & 13-2.4.2

Recommendation: Provide at least two (2) exits located remotely from each other.

4 - Lack of 2 hour fire seperation. RAC 2

Reference: NFPA 101, Sec 13-1.1.4.1 & 13-1.2.3

Recommendation: Provide 2 hour fire seperation for Radiation Therapy corridors.

BIBLIOGRAPHY

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Book

Hardy, Owen B., and Lammers, Lawrence B. Hospitals - The Planning and Design Process. Germantown, MD: Aspen Systems Corporation, 1977.

Periodicals

Ackerman, Bruce B. "Obtaining Capital Funds for Modernization." Hospitals 48 (February 1, 1974): 59-62.

Adams, George, and Burgun, J. Armand. "Hospital Remains in Inner City By Moving to Recycled Factory." Hospitals 52 (June 1, 1978): 61-63.

Allen, Rex Whitaker. "Renovation Saves Hospital Landmark." Hospitals 53 (February 16, 1979): 175-77.

Berg, Nels H. "Medical Center Applies Financial Strategies To Renovation Project." Hospitals 54 (February 16, 1979): 147-152.

Bettencourt, Robert J. and Coffin, Christie J. "Suburban Hospital Opts for Horizontal Growth/Old Structures Kept" Hospitals 48 (February 1, 1974): 105-108.

Boyar, Robert L. "Renovation--A Feasible Alternative To Physical Obsolescence!" Hospital Topics, September-October 1980: 3-6.

Buckley, David M. "Two HMOs Retrofit Buildings in Historic and Commercial Downtown Areas." Hospitals 53 (February 16, 1979): 155.

Csobaji, Sandor B. "Anticipating Future Codes To Allow For Later Construction." Hospitals 51 (February 1, 1977): 135.

DeNyse, Robert A. "Hospitals Meet Space and HSA Criteria Through Merger." Hospitals 53 (February 19, 1979): 137-145.

Douglas, H. Robert. "How To Rein in the Costs of Capital Improvements." Trustee 30 (May 1977): 51.

Douglass, Robert. "Forward Looking Architecture: Flexibility with Change in Mind." Hospitals 52 (February 16, 1978): 113.

- Edge, Donald R. "A Hospital Must Study Cost, Codes, Alternatives to Decide on Reuse or New Building." Hospitals 53 (February 16, 1979): 109.
- Ernst, Walter R., and Downs, Raymond H. "Changing General to Specialty Services." Hospitals 48 (February 1, 1974): 81-84.
- Ginsberg, David L., and Pierson, Paul S. "Have Building Codes Been Worth the Costs?" Hospitals 51 (February 1, 1977): 79.
- Haselhuhn, Gerald R., and Grapski, Lad. "Rebuilding for the Future: A Forward Looking Master Plan." Hospitals 53 (February 16, 1979): 167.
- Johnson, Richard L. "Construction Spending Will Be Shaped by Competition." Hospitals 56 (February 16, 1982): 89-94.
- Jonassen, James O. "Adaptation of an Urban Site." Hospitals 48 (February 1, 1974): 99-102.
- Levitan, Mark S. "To Reuse or Reconstruct: That is the Question." Hospitals 53 (February 16, 1979): 93.
- Moore, Jason P. "Cost Primarily Determines Feasibility." Hospitals 48 (February 1, 1974): 111-114.
- Parker, William, Jr. "Flexible Designs are Key to Reuse Projects." Hospitals 53 (February 16, 1979): 125.
- Parker, William T. "Facility Reuse: It Could Work For Your Hospital." Hospital Forum (Sep-Oct 1979): 12-14
- Pierson, Paul S. "An Examination of Obsolescence." Hospitals 48 (February 1, 1974): 52
- Platt, Albert J. "Code Checklist Is Indispensable in Making Codes Manageable." Hospitals 51 (February 1, 1977): 92.
- Scoular, David N. "Form Follows Function Follows Funding." Hospitals 50 (February 1, 1976): 60-62.
- "Sources of Funding for Construction." AHA Research Capsule No. 29. Hospitals 53 (February 16, 1979): 63.
- Sprague, Joseph G. "Commonsense Approach Needed In Dealing With Safety." Hospitals 51 (February 1, 1977): 67.

- _____ . "Is Recycling of Buildings A Healthy Alternative for the Hospital Industry?" Hospitals 53 (February 18, 1979): 82-84.
- Taylor, William J. "Careful Planning Can Reduce Cost Problems in Hospital Construction." Hospitals 52 (February 16, 1978): 97-102.
- Thweatt, Albert A. "Regulations Challenge Hospitals to Find Better Design Solutions." Hospitals 52 (February 16, 1978): 97-102.
- Wardrum, Earl Roy. "The Codification of Hospital Design." Hospitals 48 (February 1, 1974): 67-71.
- Weatherill, Jeffrey. "A Strategy for Reutilizing Existing Buildings." Dimensions 54 (July 1977): 25-28.

Other Sources

- Army Regulation 415-17, "Cost Estimating for Military Programming" US Army, Washington D.C., (15 February 1980)
- City of Aurora, Colorado, Department of Planning and Community Development, "Economic Impact of the Fitzsimons Army Medical Center Upon the City of Aurora and the Denver Region," Aurora, Colorado, September 1975.
- Daniel, Michael. Lecture, "Fire and Safety Codes and Standards" presented to Advanced Health Care Facilities Planning Elective, US Army-Baylor University Graduate Program In Health Care Administration, 8 June 1981.
- DD Form 1391, "Military Construction Project Data, Additions and Alterations to Hospital Bldg 500", Fitzsimons Army Medical Center, Aurora, Colorado 80014, (16 May 1980)
- Frankfurt, Short, Emery, McKinley, Architects and Engineers, "Narrative Description Hospital Additions and Alterations, Fitzsimons General Hospital, Denver, Colorado," Oklahoma City, 1967.
- US Army Health Facility Planning Agency, "Analysis of Realignment Concept, Fitzsimons Army Medical Center and US Army Hospital, Fort Carson, CO," Washington, D.C., March 27, 1978.
- Higginbotham and Associates, "Analytical/Environmental Assessment Report for Future Development Plans, Fitzsimons Army Medical Center, Denver, Colorado," Colorado Springs, Colorado, March 1977.

_____, "Capability Analytical/Environmental Assessment Report,
Fitzsimons Army Medical Center, Denver, Colorado,"
Colorado Springs, Colorado, August 1978.

Management and Planning Services, "An Economic Analysis of
Alternative Methods and Resources for Delivering
Health Services to Eligible Beneficiaries in the
Madigan Army Medical Center Area," Seattle, Washington,
June 30, 1981.

"Preliminary Input, Annual MCA Documentation Requirement",
Fitzsimons Army Medical Center, Aurora, Colorado 80014
(4 March 1982)

"Utilization and Requirements Study, Madigan Army Medical Center,"
US Army Health Facility Planning Agency, Washington D.C.
(16 September 1978)