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UNITED STATES GENERAL ACCOUNTING OFFICE  
REGIONAL OFFICE  
SUITE 900, 1275 MARKET STREET  
SAN FRANCISCO, CALIFORNIA 94103  
(415) 556-6200

IN REPLY REFER TO:

MAY 21 1982

Major General D. K. K. Lowe  
Commanding General  
Sacramento Air Logistics Center  
McClellan Air Force Base  
Sacramento, California 95652



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Dear General Lowe:

Subject: Survey of Military Family Housing Major Maintenance  
Costs (GAO/PLRD-82-89)

During our recent survey of military family housing costs at McClellan AFB, we were advised that the base has replaced wood veneer parquet flooring in 510 of the 540 Capehart housing units with solid oak parquet flooring. The flooring was replaced because sanding, which may have been excessive, had reduced the thickness of the original veneer flooring to the point where it could no longer be refinished. The average yearly cost to replace these floors, since replacement began in about 1974, has ranged from \$2,440 per unit in FY 1976 to \$5,031 per unit in FY 1981.

The trend in new military family housing has been to use vinyl tile in many units where carpeting is not authorized or installed at the option of the contractor. However, we were told that the base did not consider replacing the Capehart floors with materials such as vinyl tile, which are less costly than veneer or solid oak parquet. In view of the high replacement and maintenance costs of parquet floors and other wooden floors, we believe that in the future, the base should consider the economic advantages that could be gained by using less costly materials to replace the hardwood or parquet floors in the remaining Capehart and other units.

The following is a summary of the information we obtained on the replacement and maintenance of parquet floors at McClellan AFB.

Floor replacement

In about 1974 McClellan began replacing floors in its Capehart housing. The floors in these houses, which were constructed in 1960, were replaced with solid oak parquet because the original 5/32-inch veneer had been sanded to a point where the adhesive was bleeding through and the plywood laminate was exposed. As discussed below, this problem may have been caused by too frequent or improper sanding prior to refinishing.

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McClellan civil engineering personnel stated that the base has replaced the flooring in 510 units. Records provided show that since 1976 the base has replaced flooring as follows:

<u>FY</u>	<u>Number of units</u>	<u>Cost</u>	<u>Average cost per unit</u>
1976	80	\$ 195,194	\$2,440
1977	101	246,720	2,443
1978	90	289,620	3,218
1979	71	264,574	3,726
1980	48	212,068	4,418
1981	<u>26</u>	<u>130,800</u>	5,031
<b>Total</b>	<b><u>416</u></b>	<b><u>\$1,338,976</u></b>	

Air Force Regulation 91-1, Operating and Maintaining Air Force Family Housing, states that materials of a better quality than that provided by the original construction can be used only when the cost can be justified by a corresponding reduction of future operation and maintenance costs. The regulation also states that materials and methods should generally be selected from those authorized by the Air Force's Guide Specifications for Military Family Housing, (AFM 85-25) based on the lowest life cycle cost of alternatives.

Air Force Regulation 178-1, Economic Analysis and Program Evaluation for Resource Management, covers the policies and procedures for economic analysis. It states that an economic analysis must be prepared when a commitment of resources to a new program is planned. We believe that an economic analysis should have been made comparing the costs to replace the Capehart unit floors with materials, such as vinyl tile, that are less costly than veneer or solid oak parquet.

Although in 1974 solid oak parquet tile was estimated to cost one-third more than veneer, it was decided to use the more expensive material because it would permit more sandings before it would need to be replaced. Civil engineering personnel informed us that no other alternatives, such as vinyl tile, were considered in replacing these floors. They stated that 30 of the Capehart units have not had their floors replaced. At the time of our survey, they planned to continue installing solid oak parquet tile in these units to complete the 540-unit project. However, we were told that in retrospect if a decision about which flooring material to use were made today, a less costly material, probably vinyl tile, would be used.

With the assistance of civil engineering personnel, we made a cost comparison analysis which indicates that the Air Force could save about \$103,000 in installation and maintenance costs if it substituted vinyl tile for solid oak parquet floors in the remaining 30 Capehart units. This amount was computed as follows based on a 30-year life and using 1981 costs in constant dollars.

	<u>Parquet</u>		<u>Vinyl tile</u>	
	<u>Cost</u>	<u>Present Value (note a)</u>	<u>Cost</u>	<u>Present Value (note a)</u>
<b><u>Replacement costs</u></b>				
FY 1981 average cost/unit	\$ 5,031		\$ 1,005	
Number of units remaining	<u>30</u>		<u>30</u>	
	\$150,930	\$150,930	\$30,150	\$30,150
Cost to prepare floor for vinyl (1,000 SF x \$.70/SF x 30 units)	--		21,000	21,000
Cost to refloor at 15 year life	--		<u>b/30,150</u>	4,276
<b><u>Maintenance costs</u></b>				
Sanding and refinishing (1,000 SF x \$.75/SF x 30 units) at:				
10 years	22,500	6,007		<u>c/</u>
20 years	22,500	<u>1,901</u>		
		<u>\$158,838</u>		<u>55,426</u>
Difference				<u>\$103,412</u>

a/ Present value rates are based on the average yield on Treasury obligations as of March 31, 1982, 14.117 percent 10 years or less and 13.150 percent more than 10 years.

b/ Amount includes cost to prepare old vinyl floor.

c/ Maintenance is the occupant's responsibility.

According to contracting personnel, since the contract to replace parquet floors is a requirements-type contract, the Government would not incur penalties if the requirements were changed.

Wood floor maintenance

DOD instruction 4270.21, Policy and Criteria for Operation, Maintenance, and Repair of Defense Family Housing, states that wood flooring shall not be completely sanded or refinished except when general deterioration has occurred. The DOD instruction states that normally an interval of not less than 10 years should elapse before such work becomes necessary. The Department of the Air Force has restated the DOD criteria in AFR 91-1, which also states that the sanding of wood floors must be minimized.

In 1960, the 540 Capehart units were constructed with 7/16-inch wood parquet tile floors with a 5/32-inch veneer. In 1974, 14 years after construction, the base sought approval to replace about 72 units because, in many instances, the veneer had been penetrated to the mastic and plywood laminate due to sanding.

Although records contain dates for floor maintenance and repair, we could not determine if the maintenance and repair pertained to sanding, refinishing, or floor replacement. We were told by civil engineering officials responsible for contract management, that after the original parquet floors received an average of two sandings, it was necessary to replace them. They were unaware of the 10-year criteria for floor sanding and refinishing. It appears that if the 10-year criteria had been observed, two sandings would equate to a 30-year life for the floors and the floors would not require replacement until at least 1990.

We were told by a representative for the service maintenance contractor that the parquet floors in the Capehart units are subject to water damage from overflows and that they are difficult to repair. Because the parquet squares interlock, if one block must be replaced it may be necessary to remove and replace a series of blocks. Also matching squares are difficult to obtain because of differences in the size and color of the blocks installed in the units. The representative believed that parquet floors should not be installed in rental units.

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On April 6, 1982, we met with you and your staff to discuss these matters. From your comments, we understand you were concerned with the following regarding the replacement of floors with other than solid oak parquet in the Capehart units:

- whether economics should be the overriding consideration,
- the esthetics of less costly materials such as vinyl tile and their impact on retention of personnel,
- the better insulation properties of wood floors as compared to vinyl tile, and

--the lower move-out rate for family housing units at McClellan as compared to other installations such as Travis AFB. A lower move-out rate at McClellan could result in the need for less sanding and refinishing of the parquet floors and therefore lower maintenance costs in the future.

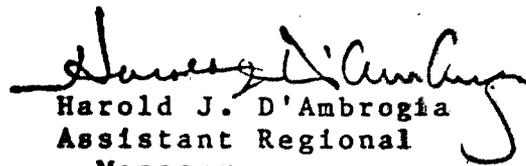
In discussing replacement of parquet floors at Air Force Headquarters, we were told that economy would be the determining factor in the type of flooring for new military family housing. Generally, the Air Force would not replace hardwood with hardwood, but rather with a resilient type of flooring. The exception to this would be quarters that are of a historical significance or those occupied by flag officers.

While wood floors may offer some benefits as compared to vinyl tile, there are no available studies on this within the Department of Defense (DOD), and DOD does not require that new family housing be designed with parquet or other wood floors to provide for personnel retention or insulation. We also noted that McClellan did not install parquet floors in the Wherry housing when it replaced the existing flooring with vinyl tile.

Using DD Forms 1410, Inventory and Occupancy of Military-Owned and Controlled Family Housing Units, we compared move-out rates for McClellan and Travis AFBs. For fiscal year 1981, McClellan's overall move-out rate was 41.5 percent of the units as compared to Travis AFB's which was 46.2 percent. For Capehart units the move-out rate was 43.0 percent for McClellan and 39.4 percent for Travis. Although this indicates a higher turnover rate for McClellan in the Capehart units, in our opinion, these rates are not significantly different.

In view of the above, we believe that you may want to consider life cycle costs of other less costly materials in future floor replacements in Capehart and other units with parquet or hardwood floors. Also, we believe that compliance with the DOD criteria for floor sanding and refinishing could reduce the need for replacing the floors. Your comments on these matters will be appreciated.

Yours truly,

  
Harold J. D'Ambrogia  
Assistant Regional  
Manager