

A Post Occupancy Evaluation Of The Fourplex Condominium

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Post occupancy evaluation has come to be recognized as a critical step in the process of improving the design of our physical environment. This activity involves a systematic re-examination of a design once it has been completed and occupied or used for a reasonable length of time. While this evaluation might range from simple return visits by the designer to formal research endeavors by trained researchers, its primary purpose is to identify what might be termed the problems and assets of the design. Problems are those features of the design which through oversight or error don't meet the needs of the users and consequently should be modified both in the example evaluated and in future examples, if the design is a prototypical one. Assets are those features of the design which work especially well and are highly valued by users. These features are worthy of preservation efforts in existing examples and of reiteration in future designs.

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Designers need the results of post occupancy evaluations as programmatic inputs which will enable them to systematically improve the design of the overwhelming majority of building types¹ that are done over and over as slight variations on a theme: schools, prisons, office buildings, apartment condominiums, etc. As Markus (1969) has noted, this provides the designer with a way to link isolated building projects into a single design activity, aimed at discovering the optimal solutions to typical problems. Robert Sommer (1969) described this process of incremental improvement of prototypes in his "Volkswagen Model." He contrasts the activities of the producers of the Volkswagen "Beetle," which consisted at the time of annual refinements of the basic Beetle design, with that of the Detroit designers who pursued a course aimed at producing a novel design each year with little reference to the successes or failures of preceding models. His analogy very nicely serves to illustrate the power of post occupancy or post implementation evaluation research in giving the designer the possibility of progressive design improvement as opposed to

purposeless variation.²

The Study

The various types of the residential condominium represent exactly the kinds of prototypical, frequently replicated environmental forms that can benefit from systematic post occupancy evaluation. We selected the four-plex or quadriplex condominium form for evaluation because it has become an increasingly popular form for low to medium cost housing, and so far as we can ascertain, it has received no evaluation.

In a fourplex, two townhouses are joined as in row housing. A one story unit abuts one side of the townhouses and four garages, the other. A single story "penthouse" or "carriage house" unit placed over the garages adjoins one side of the upper floors of the townhouses. Both townhouses have direct access to their garages, while neither the penthouse nor the ground floor unit does. Units typically have patios or decks. Access to the penthouse is from an interior or exterior stairway. In this case, the buildings are placed closer together to keep second level walkway lengths short.

Description of the Cases Studied

For this case study we have chosen Kimberly

Villas Condominiums and Peppertree Condominiums. The first discussed, Kimberly Villas, is located at Refugee and Courtwright Roads, Columbus, Ohio. This four year old, 240 unit complex of two and three bedroom fourplexes was designed by John Macynski with the supervision of Mussawir and Associates and developed by the E. G. Fritsche Company. Units have five possible floor plans and seven different home styles. (See figure 2 for site plans.) Units range in cost from \$25,000 to \$29,500. The cost is low partly because units have no basements. Each unit does have a one car garage and one additional parking space directly in front of the garage door. Garages face the access roads, while guest parking is provided around islands and edges of those roads. In most areas residents are not allowed to use guest parking spaces.

Most buildings face the common areas, although a few buildings on the ends of streets face the connector road. Common areas range in size and are ringed by buildings. Open fields surround the complex on all sides but one, which adjoins an apartment complex. Density at Kimberly Villas is about 11 units per acre.

Recreation facilities are separated from units by a connector road. These facilities include a swimming pool, childrens' pool, small playground, tennis court, and party house. The party

Figure 1. Typical Fourplex

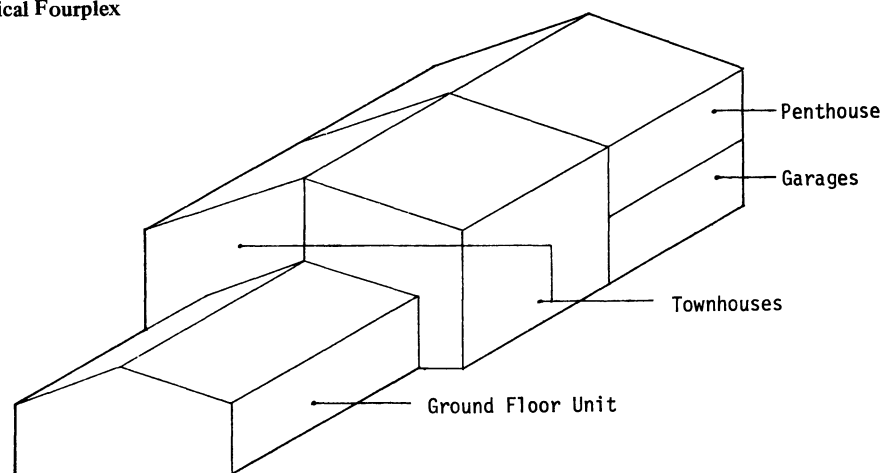




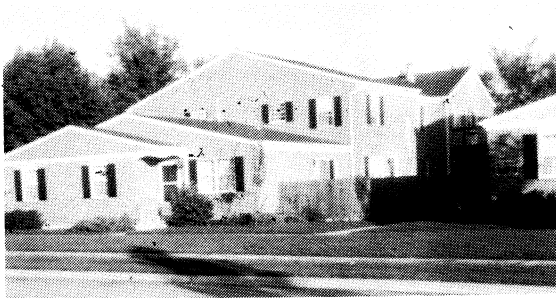
Figure 2. Site Plans

house contains a game area with a pool table, ping pong table, men's and women's exercise rooms and saunas, and a large living room area and the offices of the manager and recreation director. The party house is open after 4:00 p.m. for recreation, and can be reserved for parties by placing a deposit.

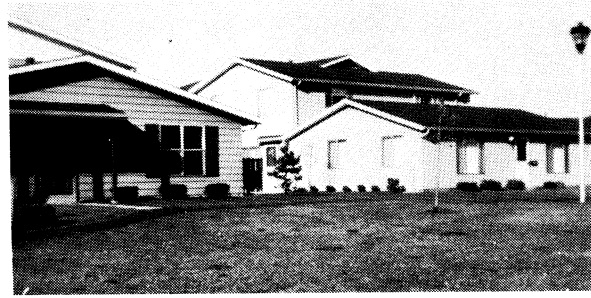
Kimberly Villas is divided into 6 sections of 40 units each. Residents of each section elect three managers. These managers, in turn, elect from among themselves a member of the Board of Trustees. The Board, which elects its own officers and manages all affairs of the complex, employs a full-time managing accountant to take care of daily business, complaints, fee collection, etc. Management fees range from \$15.90 to \$20.12 a month per unit. The recreation director is a full-time employee of the E. G. Fritsche Company, the original developer of the complex. His

duties include maintaining the pool, organizing recreation for different age groups and overseeing the party house. Recreation fees are \$6.50 a month per unit.

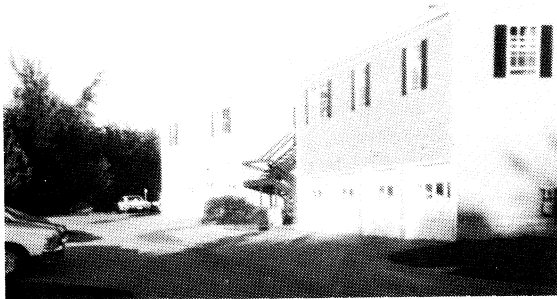
Peppertree condominiums, located on Well Fleet Drive, Columbus, Ohio, is a three and a half year old, 124 unit complex of two and three bedroom fourplexes. This complex was designed by H. Alan Taylor, Architects, and was developed by Columbia Properties. 116 units are now occupied. Units have six possible floor plans and one exterior home style. The site contains approximately 9 dwelling units per acre. Units range in cost from \$29,900 to \$37,400. All units except penthouses have basements. Each unit has a one car garage which faces an access road, with additional parking for residents and guests located on the edges of these roads. Most buildings face connector roads. The complex is surrounded by



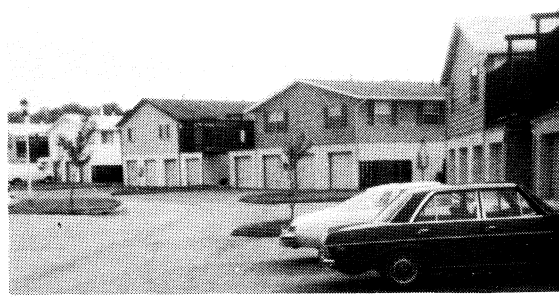
Peppertree



Kimberly Villas



Peppertree parking area



Kimberly Villas parking area

Figure 3. Front and Back Views of Fourplex Condominiums

woods and fields. Units surround the pool, playground and clubhouse, while two tennis courts are separated from units by a connector road. The clubhouse is normally locked all day, but can be reserved for parties by leaving a deposit.

Peppertree is divided in three sections of 32, 40 and 52 units. Each section elects four members to the Board of Trustees which then elects officers. The complex hired the Seguin Thomas Company to manage Peppertree in April, replacing the management company owned by the original developers. Monthly assessments, which include both management and recreation fees, range from \$30 to \$33. The recreation committee consists of two board members, with other members appointed by those two. The Seguin Thomas Company also manages the recreation facilities.

Methodology

The study employed a two-phased research design. Phase one utilized an exploratory, qualitative approach to establish the critical dimensions which were used in the second phase. The second phase utilized a more formal and structured survey approach to determine distributions and frequencies of the established dimensions.

In the first phase eight residents from the five different unit types at Kimberly Villas were interviewed using an exploratory qualitative style. They were asked what they especially liked and disliked about their complex and what characteristics they would like to see incorporated in similar units or complexes. Extensive use was made of neutral probes such as "can you think of anything else . . ." and of probes which grew out of



Figure 4. Floor Plans – Kimberly Villas

the interview such as, “you mentioned earlier . . . can you tell me more about that?” Finally, a third set of question areas was developed out of each successive interview as follows. Each interview was transcribed and thematically analyzed, and new themes or dimensions were included in the next interview schedule. Interviewing continued until two successive respondents revealed no new themes or dimensions. We took this lack of new dimensions as evidence that these interviews had revealed all of the major dimensions of interest.³ Specific questions were then developed regarding each of these dimensions and subsequently incor-

porated into the phase two questionnaire.

For phase two a self administered questionnaire was developed and pre-tested on five residents of Kimberly Villas. After revisions, the questionnaire was given to three-fourths of the residents of both complexes. Slightly over 50 percent of these were returned resulting in a total sample of 143. The questionnaire asked residents to rate their complex on each of the selected dimensions using a seven step scale from very good to very bad. Secondly, residents were asked to rate the importance of that dimension. These two ratings were later combined to determine the re-

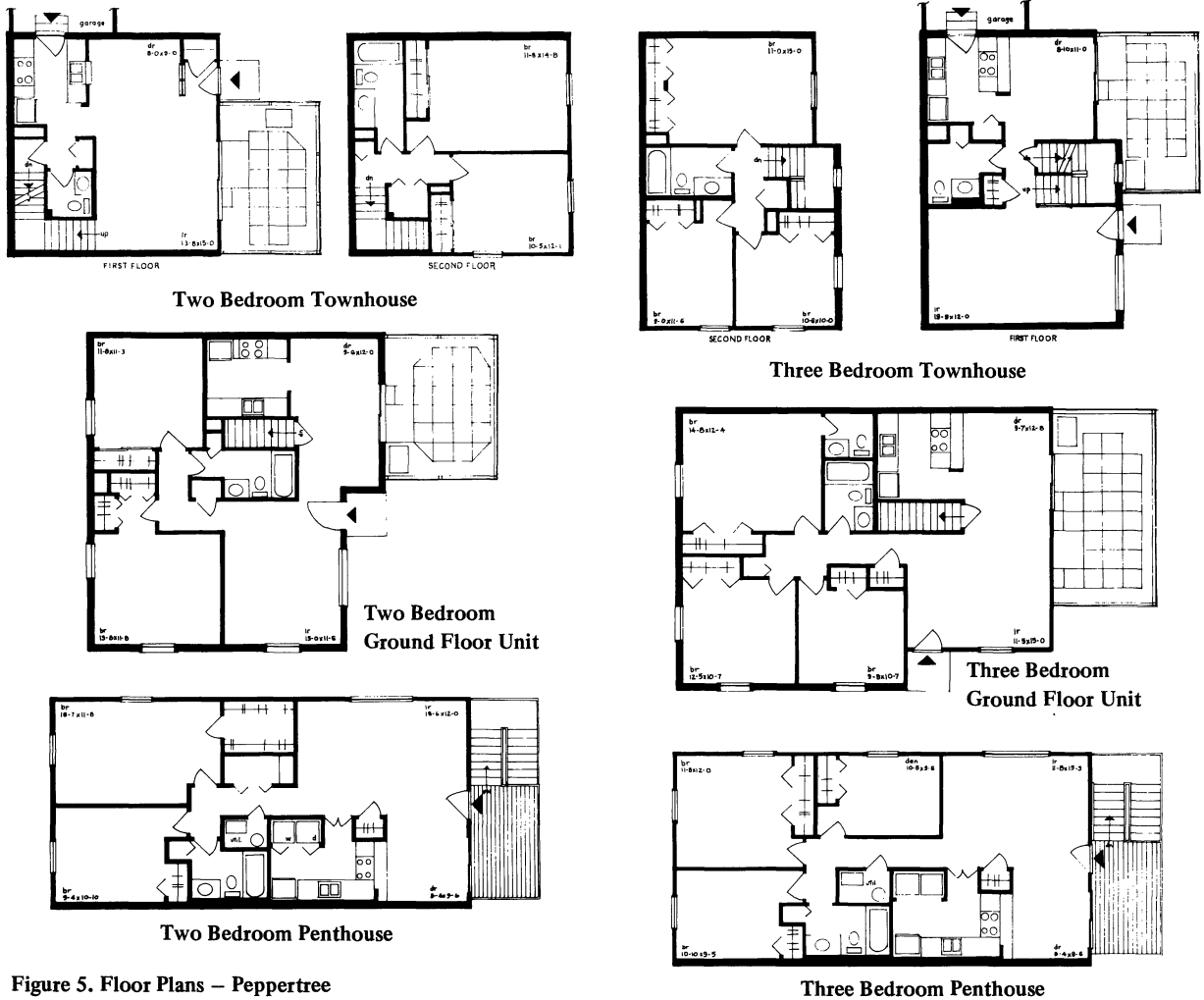


Figure 5. Floor Plans – Peppertree

relative ranking of the problems and assets.

The responses were coded, key punched and analyzed using the one-way analysis of variance program of the SPSS (Nie, 1970) computerized statistical package.

Discussion of Results

The Dwelling Units

Several of the physical aspects of the dwelling units differed both between and within complexes. For example, the overall ratings of the two complexes on the layout of the unit reveal that

both samples thought their layouts quite good; 60.7 percent and 72.2 percent respectively rated them positively (Table 1). In fact, layout was the 10th ranked asset at Kimberly Villas and the 6th at Peppertree. The residents of penthouse units at Kimberly Villas, however, rated their layouts significantly lower than the other residents, 4.22 to 2.99. Peppertree's penthouse residents showed no such difference. The reasons for such a lower rating were mentioned by all those Kimberly Villas penthouse residents interviewed. One young mother said, "I have problems rearranging the furniture because of the sliding glass doors and

Table 1. Layout of the Condominium

							Mean	
Kimberly Villas	6.5%	5.4%	7.6%	19.6%	21.7%	23.9%	15.3%	3.23
Peppertree	7.0%	2.3%	2.3%	16.3%	14.0%	34.9%	23.3%	2.74
7	6	5	4	3	2	1		
Poor						Excellent		

Table 2. Size of Other Bedrooms

							Mean	
Kimberly Villas	24.4%	16.7%	14.4%	40%	4.4%	-	-	5.17
Peppertree	9.3%	23.3%	25.6%	37.2%	4.7%	-	-	4.95
7	6	5	4	3	2	1		
Too Small					Too Large			

because of the (closet) door. There's only one way you can put the stuff and the same in the bedroom because we have a queen size bed." Another complained that, "Because of the way the window sets and the cupboard (closet) sets and the entrance to the room I can't move my furniture around. It's been like that for four years and it is getting a little tiring." They also mentioned the two side by side sliding glass doors as reasons for drafts in winter and heat in summer. Since other unit types at Kimberly Villas had the same set of sliding glass doors and equally narrow bedrooms, the problem caused by the closet door in the middle of a wall in conjunction with the above mentioned reasons seems to have caused the difference in rating. When asked about the size of the master bedroom, both complexes rated it about average. The responses to the question on the size of other bedrooms, however, varied (Table 2).

Overall, both complexes had a mean rating of about 5; when broken down by unit type and number of bedrooms, Kimberly three bedroom townhouse residents showed a mean rating of 6, significantly different from the 4.6 mean rating given by Kimberly two bedroom townhouse residents. The size of the extra bedrooms in Kimberly Villas three bedroom townhouses is 9'-6" by 9'-8". When comparing these to the size of cor-

Table 3. Closet Space

							Mean	
Kimberly Villas	29.0%	10.8%	10.8%	41.9%	6.5%	-	1.1%	5.10
Peppertree	7.0%	9.3%	11.6%	53.5%	16.3%	2.3%	-	4.30
7	6	5	4	3	2	1		
Too Little					Too Much			

Table 4. Kitchen Cabinet Space

							Mean	
Kimberly Villas	47.3%	18.3%	7.5%	22.6%	3.2%	-	1.1%	5.80
Peppertree	23.3%	20.9%	14.0%	32.6%	9.3%	-	-	5.16
7	6	5	4	3	2	1		
Too Little					Too Much			

responding bedrooms at Peppertree, 9'-0" by 11'-6" and 10'-6" by 10'-0", and with those of the three bedroom ground floor units at Kimberly Villas, 9'-0" by 9'-9" and 9'-0" by 11'-2", having both bedrooms especially small seems to be the only major difference among them.

Various types of storage space caused problems for both complexes (Table 3). Overall, Kimberly Villas rated its closet space less than average. This problem was tied for Kimberly Villas' fifth ranked problem. Peppertree residents, on the other hand, ranked their closet space as average. Not only are Peppertree Condominium rooms usually wider, allowing for longer closet space, but they often provide one closet more (in or near the kitchen) than some of the floor plans of Kimberly Villas.

The question concerning the amount of kitchen cabinet space received a lower than average overall rating from both complexes (Table 4). This problem was Kimberly Villas' second highest ranked overall problem, and the first ranked overall problem at Peppertree. The most cabinet space provided, 24.75 linear feet at two bedroom townhouse units at Peppertree, was still rated less than average by those residents. This problem is even worse for residents who own dishwashers, for a dishwasher requires two linear feet of base

Table 5. Storage Space for Seldom Used or Seasonal Items

							Mean
Kimberly Villas							5.37
38.7%	10.8%	10.8%	32.3%	4.3%	2.2%	1.1%	
Peppertree							4.45
11.9%	11.9%	14.3%	42.9%	11.9%	4.8%	2.4%	
7	6	5	4	3	2	1	
Too Little			Too Much				

Table 6. Washer and Dryer Location

							Mean
Kimberly Villas							1.99
1.1%	5.5%	2.2%	7.7%	8.8%	15.4%	59.3%	
Peppertree							1.72
-	-	2.3%	7.0%	7.0%	27.9%	55.8%	
7	6	5	4	3	2	1	
Very Inconvenient			Very Convenient				

cabinet space. Several residents of Kimberly Villas complained about the two 12" wide base cabinets on each side of the range of every unit; their narrow width prohibits their use for storing larger pots and pans. Many stated that they added more cabinets, usually over the dryer, while a few reported that they had put in cabinets or shelving in the garage to make a pantry. At neither complex did the size of a unit correspond to the number of kitchen cabinets provided. For instance, three bedroom townhouses at Peppertree had 4.5 linear feet less of cabinet space than did the two bedroom units.

The third type of storage that residents were questioned about was for seldom used or seasonal items. Peppertree residents rated their space about average, while Kimberly Villas residents rated it less than average (Table 5). This problem was 8th ranked in a list of overall problems for Kimberly Villas. The probable cause for this discrepancy is that basements are available for such storage at Peppertree, while Kimberly Villas residents have only small sheds with 300 cubic feet of storage space.

Although washer and dryer hook-ups were located in the basements of most units at Peppertree and the kitchen of units at Kimberly Villas, both rated their location as nearly excellent. (Table 6)

Table 7. Size of the Patio or Deck

							Mean
Kimberly Villas							4.89
18.3%	14.0%	14.0%	47.3%	5.4%	1.1%	-	
Peppertree							5.16
27.9%	14.0%	14.0%	39.5%	2.3%	-	2.3%	
7	6	5	4	3	2	1	
Too Small		About Right			Too Large		

Having a convenient location for a washer and dryer was the highest ranked of all assets at both complexes. A few residents at Kimberly Villas stated that they would have preferred having the washer and dryer behind a door so that they "could leave the laundry out without making the kitchen look messy."

A breakdown of unit type showed one significant difference: townhouse units at Kimberly Villas rated their patios significantly smaller (5.45 versus 4.15) than residents of other units at Kimberly Villas. While their patios are the smallest of their complex (10'-0" x 13'-8"), the patios of penthouse residents at Peppertree are much smaller (7'-6" x 12'-0"); yet those residents rated the size of their decks as average (Table 7). One possible reason for this contradiction might be that since the visual privacy on Peppertree penthouse decks was practically non-existent, it rendered the deck useless for most activities. A larger deck would have been equally useless to those residents. Other reasons, however, could have caused the difference as well.

Both complexes rated their units above average for ease of cleaning and repairing (Table 8). Ease of cleaning the dwelling unit was tied for 4th ranked asset at Kimberly Villas and the 8th ranked asset at Peppertree, while ease of repair was ranked 8th and 11th at the respective complexes. The amount of cleaning and repairing required in the dwelling units was rated as less than average for both complexes (Table 9). The small amount of repair necessary for privately owned areas ranked 7th in the list of assets for both Kimberly Villas and Peppertree.

Table 8. Ease of Maintenance of Individually Owned Areas

Kimberly Villas								Mean
cleaning								
4.3%	2.2%	4.3%	27.2%	10.9%	28.3%	22.8%		2.86
repairing								
5.6%	4.4%	5.6%	33.3%	13.3%	17.8%	20.0%		3.22
Peppertree cleaning								
4.8%	-	2.4%	26.2%	19.0%	23.8%	23.8%		2.77
repairing								
4.9%	2.4%	2.4%	39.0%	14.6%	22.0%	14.6%		3.19
7	6	5	4	3	2	1		
Very Difficult				Very Easy				

Table 9. Amount of Maintenance of Individually Owned Areas

Kimberly Villas								Mean
cleaning								
1.1%	2.2%	3.2%	57.0%	14.0%	12.9%	9.7%		3.42
repairing								
2.2%	-	4.3%	44.6%	14.1%	19.6%	15.2%		3.12
Peppertree cleaning								
4.9%	7.3%	-	58.5%	2.4%	17.1%	9.8%		3.63
repairing								
4.9%	-	2.4%	39.0%	9.8%	31.7%	12.2%		3.07
7	6	5	4	3	2	1		
Very Large Amount			Very Small Amount					

Visual privacy in the dwelling unit was rated quite highly for both complexes; in the list of overall assets, visual privacy rated 5th for Kimberly Villas and 2nd for Peppertree. (Table 10)

Visual privacy on the patio or deck, on the other hand, had a very wide spread distribution and did show significant differences among building types. (Table 11)

When broken down by building type, Kimberly penthouse residents scored the visual privacy of their decks significantly higher, and Peppertree penthouse residents, significantly lower than the rest of the units. The reason for such contradicting answers lies with a 5'-6" fence which effectively protects penthouse residents at Kimberly Villas from being seen, on the deck, and the lack of any fencing which effectively puts penthouse

Table 10. Visual Privacy of the Dwelling Unit

Kimberly Villas								Mean
5.4%	6.5%	6.5%	16.1%	18.3%	21.5%	25.8%		2.97
Peppertree								
2.3%	2.3%	2.3%	30.2%	4.7%	23.3%	34.9%		2.58
7	6	5	4	3	2	1		
No Privacy at All				Very Private				

Table 11. Visual Privacy of the Patio or Deck

Kimberly Villas								Mean
12.0%	14.1%	7.6%	23.9%	15.2%	15.2%	12.0%		3.90
Peppertree								
11.6%	23.3%	7.0%	27.9%	7.0%	14.0%	9.3%		4.26
7	6	5	4	3	2	1		
No Privacy at All				Very Private				

Table 12. Acoustical Privacy of the Dwelling Unit and Patio or Deck

Kimberly Villas								Mean
dwelling unit								
9.8%	3.3%	10.9%	23.9%	14.1%	23.9%	14.1%		3.42
patio or deck								
18.5%	17.4%	10.9%	21.7%	9.8%	13.0%	8.6%		4.39
Peppertree dwelling unit								
2.3%	7.0%	18.6%	14.0%	14.0%	11.6%	32.6%		3.05
patio or deck								
18.6%	18.6%	7.0%	34.9%	4.7%	4.7%	11.6%		4.50
7	6	5	4	3	2	1		
No Privacy at All				Very Private				

residents at Peppertree "on stage."

While the patios at Kimberly have the same fencing as the decks, they do not have their height (and thus, their additional privacy). This added privacy was appreciated by the penthouse owners interviewed. As one said, "With my unit, I especially like the deck . . . being upstairs, for the privacy."

Acoustical privacy, which was rated average for the patios and had widely distributed answers, was rated fairly high for the dwelling units (Table 12). This asset was ranked 9th highest at Kimberly Villas and 5th at Peppertree. As one owner emphatically stated, "The only thing I like about my condominium is, people don't realize how really

Table 13. Noise from Neighbors' Garages

Kimberly Villas							Mean
penthouse residents							
55.6%	5.6%	11.1%	11.1%	5.6%	5.6%	5.6%	5.56
other residents							
6.5%	3.2%	12.9%	3.2%	3.2%	25.8%	45.2%	2.48
Peppertree							
penthouse residents							
30%	20%	10%	20%	—	10%	10%	4.90
other residents							
11%	3%	12%	3%	6%	23%	42%	2.48
7	6	5	4	3	2	1	
Very Noisy				No Noise			

Table 14. Return on the Investment in the Condominium

Kimberly Villas							Mean
6.3%	8.7%	10.0%	28.7%	18.6%	20.0%	7.5%	3.65
Peppertree							
2.7%	—	8.1%	29.7%	29.7%	18.9%	10.8%	3.16
7	6	5	4	3	2	1	
Very Unprofitable				Very Profitable			

quiet it is.''

When questioned about noise from adjoining units, most answers were widely distributed for all building types. When responses to the question on noise from neighbor's garages were separated into penthouse units and other units, however, the distributions became quite narrow. (Table 13) The difference in means is significant and striking. Residents complained that *"The garage doors make a terrible racket when you open them if you live upstairs,"* and *"We can hear the neighbor's car start up to leave."* Since these units are located above four garages, the "racket" occurs several times each day and night. Yet both complexes used construction with Sound Transmission Class rating of 50 as required with government financed units.

Most respondents felt that buying their condominium was a profitable investment. This investment was the 8th ranked asset at Kimberly and the 9th at Peppertree (Table 14).

The responses on the amount of parking space were divided, likely because in certain areas extra parking was available. (Table 15) At Kimberly

Table 15. Number of Parking Spaces Provided

Kimberly Villas							Mean
personal spaces							
40.9%	4.3%	9.7%	43.0%	2.2%	—	—	5.39
guest spaces							
60.2%	12.9%	5.4%	20.4%	—	—	1.1%	6.07
Peppertree							
personal spaces							
16.3%	11.6%	9.3%	62.8%	—	—	—	4.80
guest spaces							
31.0%	26.2%	9.5%	31.0%	2.4%	—	—	5.50
7	6	5	4	3	2	1	
Too Few			Too Many				

Villas, this occurred by happenstance when an area originally planned for additional fourplexes was left unused. At both complexes, homes near the connector road used this for additional parking. Most residents, however, are limited by having few spaces available to them and additional spaces located too far away. Kimberly Villas residents are even more handicapped since the only personal parking spaces available are in the garage of each unit and directly in front of the garage door.

Many complaints were like that of the woman who said, *"The parking is a problem, because I park in the garage and my husband parks behind it, and then every morning I've got to move his car and then move mine."* Several residents used their garages for storage or even finished them as dens or family rooms, thus eliminating a parking space. Other households owned more than two cars or owned recreational vehicles and thus needed more parking spaces.

Most residents interviewed felt the guest parking provided was extremely inadequate, too. As one said, *"When a person has three or four guests, you wind up with them parking in front of your garage. You can't get out. That's really a problem in the morning when you've got to go to work."* The number of guest spots at Kimberly Villas varied greatly, but averaged at about one for every four units. 44 units out of 240 adjoined streets or areas that could be used for extra parking. At Peppertree, about two extra spaces were

Table 16. Complex Facilities

								Mean
Kimberly Villas								
swimming pool								
1.1%	1.1%	3.4%	14.8%	10.2%	15.9%	53.4%	2.07	
party house								
1.1%	—	2.3%	21.6%	10.2%	21.6%	43.3%	2.23	
rest of the facilities								
6.0%	6.0%	4.8%	29.8%	10.7%	16.7%	26.2%	3.12	
Peppertree								
swimming pool								
—	2.4%	4.9%	29.3%	14.6%	24.4%	24.4%	2.73	
party house								
—	2.4%	9.8%	39.0%	19.5%	17.1%	12.2%	3.24	
rest of the facilities								
—	—	2.4%	53.7%	12.2%	22.0%	9.8%	3.17	
7	6	5	4	3	2	1		
Poor			Average		Excellent			

Table 17. Availability of Play Areas for Children

								Mean
Kimberly Villas								
44.3%	13.6%	12.5%	11.4%	11.4%	4.5%	2.3%	5.45	
Peppertree								
15.4%	15.4%	30.8%	33.3%	2.6%	—	2.6%	3.03	
7	6	5	4	3	2	1		
None Available				Plenty Available				

provided for every four units, but 88 units out of 124 adjoined such streets. In addition, several buildings are partly or wholly unoccupied. The too few number of guest parking spaces available was the biggest problem that Kimberly Villas had, with too few personal parking spaces ranked third. At Peppertree, these problems were ranked second and third.

Ratings on swimming were quite high. The pool was the 3rd ranked asset at Kimberly Villas and the 10th at Peppertree (Table 16). Kimberly Villas facilities were larger and better equipped, and often mentioned as one of the assets of the complex. For example, one young mother said, “We just love the pool that close. It’s a nice sized pool and never packed where you can’t enjoy it.”

Responses about play areas for children, however, were quite the opposite. While Kimberly Villas residents felt that they had very few play areas available, Peppertree residents reported that they had many (Table 17). Similar results

Table 18. Quality of Play Areas for Children

								Mean
Kimberly Villas								
43.9%	12.2%	13.4%	15.9%	9.8%	2.4%	2.4%	5.48	
Peppertree								
—	2.6%	5.3%	31.6%	42.1%	10.5%	7.9%	3.24	
7	6	5	4	3	2	1		
Poor				Excellent				

Table 19. Nuisance of Pets Using Common Areas as Bathrooms

								Mean
Kimberly Villas								
40.5%	13.1%	14.3%	16.7%	4.8%	4.8%	6.0%	5.3	
Peppertree								
22.9%	17.1%	17.1%	34.3%	—	2.9%	5.7%	4.97	
7	6	5	4	3	2	1		
Major Nuisance				No Problem at All				

were obtained for the quality of play area. Quality of play areas was the 10th ranked problem and the unavailability of them, 11th for Kimberly Villas residents. Several residents interviewed explained the situation. “We’d like to see a playground put in somewhere,” said one young couple. “That’s our major thing. That’s one thing they argue about over and over again up there. They decide to put it in someplace and then some older couples decide, no we don’t want it there.” Another young mother of two remarked, “There’s no area for kids to play. And that’s something that was promised in the area and it was never given.” While Peppertree’s children’s play area is in the middle of the complex and has equipment for several age groups, Kimberly Villas’ area is located as far away from the units as possible; that is, across the connector street and behind the pool. The equipment provided is mainly for toddlers, who must be accompanied by an adult. Even more limiting is the fact that the area is only accessible when the pool is open (Table 18).

The open areas used by pets at Kimberly Villas are often surrounded by units as opposed to open areas at Peppertree, which usually have units on one side and woods or fields on another. The open areas at Kimberly are thus used by more people (and dogs), creating a bigger nuisance than at

Table 20. Noises from the Complex

								Mean
Kimberly Villas								
children's play in common areas								
20.9%	16.5%	17.6%	13.2%	9.9%	5.5%	16.5%	4.43	
parking area								
9.7%	15.1%	14.0%	18.3%	10.8%	12.9%	19.4%	3.78	
Peppertree								
children's play in common areas								
7.3%	17.1%	17.1%	17.1%	9.8%	7.3%	24.4%	3.77	
parking area								
7.5%	7.5%	10.0%	22.5%	12.5%	20.0%	20.0%	3.35	
7	6	5	4	3	2	1		
Very Noisy					No Noise			

Peppertree. (Table 19) The problem of pets using the common areas was the 7th ranked problem at Kimberly Villas and the 4th at Peppertree. Kimberly Villas residents interviewed were well aware of the problem, especially mothers of small children. One remarked, "Out front we don't even own a dog and he can't play out there because of the dog messes. This winter they went on the sidewalks and it's still on the sidewalks. You've got to step over it."

The responses to the questions about noise from children's play in the common areas and noise from the parking areas were distributed quite widely. (Table 20) The responses to noise from parking areas showed a significantly higher rating (5) from penthouse residents at Kimberly Villas when compared to responses from residents of other units there (3.5). Since the penthouses at Kimberly are nearest the parking areas, they naturally hear more noise from there than other units. While this is true for penthouse units at Peppertree, it is not a problem for them. At Kimberly, the parking areas serve a great number of buildings and serve as the place where most of the unplanned socializing and some of the children's play activities occur. At Peppertree, the parking areas usually serve only a few buildings. Unplanned socializing and children's play occur both in front of the buildings and behind buildings next to the parking areas.

Common property maintenance was rated lower for Kimberly Villas than Peppertree (Table

Table 21. Maintenance of Common Property

							Mean
Kimberly Villas							
13.0%	21.7%	10.9%	38.0%	6.5%	6.5%	3.3%	4.64
Peppertree							
4.8%	11.9%	9.5%	35.7%	19.0%	9.5%	9.5%	3.8
7	6	5	4	3	2	1	
Poor			Average		Excellent		

Table 22. Accuracy of Common Area Maintenance Information

							Mean
Kimberly Villas							
29.5%	10.2%	18.2%	23.9%	4.5%	6.8%	6.8%	4.89
Peppertree							
10.0%	5.0%	17.5%	17.5%	22.5%	17.5%	10.0%	3.7
7	6	5	4	3	2	1	
Very Inaccurate				Very Accurate			

21). One reason was that snow removal at Kimberly Villas did not include limited common areas, that is, areas that serve only one unit such as sidewalks or drives directly in front of the garages. Many of Kimberly's residents had the same complaints as the young woman who said, "When I pay \$17.34 a month and they tell me they're going to remove snow and keep the grass cut, I expect that to be done. We haven't had very good service. We had ice back behind the garages like you wouldn't believe. When they shoveled, they shoveled just enough for you to walk, a narrow path. That's not shoveling snow as far as I'm concerned."

While Peppertree residents rated the accuracy of information given to residents before they moved in, on maintenance of common property and areas as above average, those at Kimberly Villas rated it below average (Table 22). As one older woman complained, "When I bought this house, one of the main selling points was that I'd never have to shovel snow or mow the grass again. This is what I wanted. Our snow removal was nil here. Every bit of snow that was shoveled off my driveway, I shoveled. Well, come to find out that this is what is called limited common area, and I'm responsible for it." This problem was tied for the 5th ranked problem that the residents of Kimberly Villas had.

Table 23. Fulfillment of the Developer's Claims and Promises

							Mean	
Kimberly Villas	48.2%	9.4%	10.6%	14.1%	7.1%	5.9%	4.7%	5.41
Peppertree	7.9%	5.3%	2.6%	5.3%	18.4%	28.9%	31.6%	2.66
	7	6	5	4	3	2	1	
	Unfulfilled						Fulfilled	

Similar responses were given when residents rated the developer's claims and promises (Table 23). Peppertree respondents rated the developers claims as mostly fulfilled, while Kimberly Villas residents rated them unfulfilled. The claims referred to most were the children's play areas which were mentioned in the brochure for Kimberly Villas but were never built, and a golf course which was planned but never constructed. One woman explained, *"The thing that bothers me most is they promised a golf course out here and that didn't go through. You had to pay more for your unit for that and they never adjusted it. That's why we located back here. We were supposed to look right out on it. Now I don't think they're planning to have one at all."* As a result of that claim and others, unfulfilled developers claims was the 9th ranked problem at Kimberly Villas.

Summary of Findings

The principal results of this study are summarized below in lists that facilitate comparison of the major assets and problems of Kimberly Villas and Peppertree Condominiums. These assets and problems are ranked by the numerical product of the mean rating of the quality of that factor (how good or bad it was) and the mean rating of the importance of that factor. A factor that was rated excellent in quality and rated very important would receive a 1; one that was rated poor in quality and rated very important would receive a 49. This score is given in parentheses following each factor on the lists. The following lists are valid for each complex as a whole, and not for specific unit types.

Design Implications

These specific results in turn point towards more general implications for designers of future fourplex condominium complexes that are similar in size, population and location to the ones studied. Design implications for dwelling units are as follows.

1. The location of washer and dryer hook-ups should be in the basement, or if units have no basements, in the kitchen. If possible, washers and dryers located in the kitchen should be screened from view.
2. More than 25 linear feet of kitchen cabinets should be provided for dwelling units. Base cabinets should be at least 18" wide⁵ so that larger, heavier cookware can be stored horizontally.
3. At least 7'-6" of uninterrupted wall space⁶ should be provided for at least two of the living room walls to give residents a choice of locations for couches, large pictures, etc. Avoid putting doors or niches in the middle of a wall for the same reason.
4. A closet should be provided in or near the kitchen for storage of cleaning equipment (mops, brooms, cleansers, etc.)
5. Avoid putting two sliding glass doors side by side because of the resulting heat loss and gain and problems in furniture placement.
6. More than 300 cubic feet of storage space for seldom used or seasonal items should be provided for units without basements.
7. The minimum width of master bedrooms should be 10'-6" to give residents a choice of locations for king and queen size beds. Avoid putting doors in the middle of walls for the same reason.
8. Second bedrooms of three bedroom units should have at least 100 square feet of floor space; third bedrooms should have at least 81 square feet. Avoid designing two extra bedrooms of approximately 90 square feet each.
9. A Sound Transmission Class rating significantly greater than 50 should be provided for the ceiling/floor construction between pen-

Table 24. Ranking of Major Assets and Major Problems.

Assets	Problems
Major Assets of Kimberly Villas	Major Problems of Kimberly Villas
1. The location of washer and dryer hook-ups in the kitchen. (3.30)	1. The inadequate number of guest parking spaces. (35.99)
2. The location of the personal parking spaces adjacent to or within the same building as the dwelling unit. (5.10)	2. The inadequate number of kitchen cabinets. (34.40)
3. The pool. (5.69)	3. The inadequate number of personal parking spaces. (34.30)
4. The ease of cleaning the dwelling unit. (6.01)	4. The inadequate maintenance of the common areas in winter. (33.20)
5. The visual privacy of the dwelling unit. (6.06)	5. The inadequate amount of closet space. (30.60)
6. The small amount of repair necessary in privately owned areas. (6.21)	6. The inaccurate information given on common area maintenance. (30.60)
7. The ease of repair of privately owned areas. (6.57)	7. The nuisance of pets using the common areas as a bathroom. (30.30)
8. The return on the investment in the condominium when reselling. (6.60)	8. The inadequate amount of storage space for seldom used or seasonal items. (29.30)
9. The acoustical privacy in the dwelling unit. (6.70)	9. The claims and promises of the developer were unfulfilled. (27.81)
10. The layout of the dwelling unit. (6.91)	10. The poor quality of children's play areas. (25.81)
	11. The inadequate number of children's play areas. (25.67)
Major Assets of Peppertree Condominiums	Major Problems of Peppertree Condominiums
1. The location of washer and dryer hook-ups in the basement or kitchen. (3.65)	1. The inadequate number of kitchen cabinets. (31.52)
2. The visual privacy of the dwelling unit. (4.80)	2. The inadequate number of guest parking spaces. (29.54)
3. The location of the personal parking space within the same building as the dwelling unit. (5.1)	3. The inadequate number of personal parking spaces. (28.70)
4. The claims and promises of the developer were fulfilled. (5.12)	4. The nuisance of pets using the common areas as bathrooms. (27.40)
5. The acoustical privacy in the dwelling unit. (5.58)	
6. The layout of the dwelling unit. (5.62)	
7. The small amount of repair necessary on privately owned areas. (6.45)	
8. The ease in cleaning the dwelling unit. (6.90)	
9. The return on the investment in the condominium when reselling. (7.02)	
10. The pool. (7.62)	
11. The ease of repairing privately owned areas. (8.00)	

those units and garages. Garage door closers with nylon rollers should be specified to reduce noise that could disturb penthouse residents.

10. A Sound Transmission Class rating of 50 or more should be provided for wall or ceiling/floor construction between dwelling units.
11. At least 5'-6" high fencing should be provided around patios and decks to insure the visual privacy of residents using them.
12. More than two personal parking spaces should be provided for each unit. No parking space should limit the access to any other parking space.
13. More than 2 guest parking spaces should be provided for each building (½ per unit).
14. Avoid clustering parking spaces for more than four buildings near garages to reduce noise from this area that could disturb penthouse residents.
15. Play areas and play equipment for several age groups should be provided near the dwelling units. These areas should not be located across major thoroughfares from units, and should be accessible to residents all year.
16. Dog runs or areas that would not be walked on by residents and located a maximum of a few minutes walk from dwelling units should be designed as areas to be used by pets as bathrooms.
17. A swimming pool should be provided for the residents' use.

Discussion of Methodology

In general we believe that the method worked very well. The phase I qualitative interviews were an efficient way of developing comprehensive

information on major problems and assets which formed the basis for the phase II questionnaire. Several residents commented on the thoroughness of the questionnaire, or stated that "*it hit all the right points.*" The drop-off pick-up method of administering the questionnaires produced a fairly good return rate of over 50 percent.

We would make the following changes in the method. In the first phase we would take the respondent either verbally or physically through each room and each area and facility of the complex asking for likes, dislikes, etc. We feel that this would insure a more comprehensive list of problems and assets upon which to base the second phase questionnaire. Secondly we would try to increase the return rate on the questionnaires.

Suggestions for Further Research

Most importantly we would like to see a new fourplex development designed and built incorporating our suggestions so that it in turn could be evaluated. We believe this to be far more important than the usual scholarly pleas for replication of our study in other similar complexes or in complexes with different population compositions or with different conditions of various sorts. We realize that this is a stance which seems exceedingly incautious to most scientists. However, given the rapidity with which this building type has been accepted by developers, we believe that a research program which emphasizes a commitment to re-evaluation, re-assessment and continuous refinement is an orientation much more likely to be contributive to rational design policies than is the traditional scholarly posture of rigor and caution.

Notes

1. It should be noted that only a very small proportion of these types have been evaluated, and almost none have been subjected to the chain of successive revisions and evaluations which are envisioned by the advocates of post occupancy evaluation.
2. One important limitation to the Volkswagen Model is that this successive incremental refinement of prototype like the "Beetle" does not produce dramatic design breakthroughs or new form conceptions as in the case of the "Rabbit."
3. We also included a request at the conclusion of the interview for the respondent to describe any aspects of the development which he viewed as either a problem or an asset which had not been covered in the interview.
4. Copies of unit floor plans can be obtained from authors.
5. 18" was chosen because it is the length of most large frying pans. While such a pan could be stored horizontally in a smaller place, retrieval becomes difficult.
6. 7'-6" was chosen by adding 5', the length of most couches, 2', the width of two end tables, plus 6" total of clearance space in between them.
7. 10'-6" was chosen by adding 6'-6", the width of a king size bed, and 4" total for bedside tables, walkway and closet door swing.

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