

DEL E. WEBB CORPORATION

1964 RESEARCH HOUSE

SUN CITY, ARIZONA



A Report By  
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DEVCO

TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION	1
SECTION I	
The Wall	3
The Joint Treatment	4
The Wall Coating Treatment	8
SECTION II	
Exterior Siding	14
Solid Faced Carport Fence	15
Soffited Overhang	17
Vent-A-Ridge Attic Ventilating System	20
Homasote Expansion Joint	22
Lanai Enclosure	24
Lanai Enclosure Removable Panel	26
The Like Front Entry Door	28
Corkwood Floor Covering	31
Incandescent Light Fixtures	33
Interior Window Surrounds	35
Wardrobe Closet Shelving	37
Furnace Noise Control	40

1/90 GIFT FROM DEVCO

Electronic Air Cleaner	42
Automatic Sliding Glass Door Closer	45
Built-In Ironing Board	47
Formica Clad Kitchen Cabinets	49
Laminated Plastic Kitchen Counter Tops	52
Stainless Steel Kitchen Sink	53
Kitchen Sink Mixing Valve	56
Food Warmer Appliance	58
Fiberglass Tub with Splash & Shower Stall	60
Flexible Showerhead	64
Leakproof Center Set	66
Preprimed Mill Work	68
Vinyl Wall Covering	69
SUMMARY	71
EXPERIMENTAL HOUSE QUESTIONNAIRE FORM	75
CONTRIBUTING COMPANIES	79

## INTRODUCTION

The construction industry and certain elements supporting it have for some years tried to develop a new exterior wall which would lend itself readily to prefabrication, be readily installed, be impermeable to weather and also be economical. I do not think it would be excessive to state that some individuals we have encountered expected to produce some sort of magic as part of this subject. We have seen over the last several years dozens of samples of walls brought forward as the ultimate in the creation of the magic exterior wall. Most of these experiments have been of the sandwich type; namely, some sort of filler, and these have run the gamut from paper to all the plastics, clad by almost every material known to the building industry. Incredibly enough, most of the developers of these magic walls overlooked at least some details such as wiring, plumbing, TV jacks, openings for passage doors, joints, and, most particularly, the surface appearance both inside and out.

As the parade of these various wall specimens passed by, it became clear to us that the dimensional lumber was still the champion for exterior walls. The problem was to develop an exterior clad which would be permanent, economical, appealing to the eye and acceptable to the public. After considerable research, it

was thought that we had found a combination of materials which might produce this ideal wall. It was, consequently, decided to build a Research House in Sun City, Arizona to prove or disprove the research we had done.

It was also decided, inasmuch as we were building the house anyway, to include as many new and different products or products not previously used by us as possible to gain first hand experience with them and to subject them to the scrutiny of the Sun City residents and measure their reaction to them by means of a market research questionnaire. The products were selected, the house was designed and construction commenced during the last week of September, 1964. The house was opened to the Sun City residents on December 7, 1964. It is located on the southeast corner of Audrey Drive and 103rd Avenue in Unit 6, Sun City, Arizona.

This is a report then of the building of this Research House, of the products included in it, the costs of these products and materials, and the public's reaction to the products in particular and to the house in general.

## SECTION I

### 1. THE WALL

The wall was composed of 2 x 4's framed in the conventional manner. The interior of the wall was finished with wallboard, hung, taped and textured in the conventional manner. The exterior side of the wall was composed of four parts; namely, a tempered hardboard siding, the joint treatments, the coating, and finally one coat of vinyl paint.

It was decided to use tempered hardboard as the outer skin because it is permanent and is competitively priced and has been accepted by the public because of its long and widespread use. The tempered hardboard used on this Research House was made especially for this experiment by the Weyerhaeuser people. The principal difference between it and a standard sheet of tempered hardboard was that the long edges were tapered like wallboard for the same reason that wallboard edges are tapered. These particular sheets of hardboard were 1/4" thick, 48" wide x 96" long. The screened back was primed and the edges and other side sealed. The sheets were attached with the long dimension running with the studs and with the screened side outward. The spacing at the joints was set at .125". The field of the sheet was then pneumatically nailed with

6 penny nails at 8" intervals along the stud. This nailing pattern is excessive. The joint between the sole plate and the floor were caulked prior to hanging the wallboard. After the wallboard was up, the joint between it and the concrete stem was also caulked. The corners, where this hardboard jointed, were capped with a metal wallboard corner bead.

## 2. THE JOINT TREATMENT

The biggest single problem in the development of a wall such as the one under discussion is that of developing a satisfactory joint treatment. The joint must be able to withstand some movement, be permanent, and be invisible.

After searching out as many techniques and materials as we could turn up, it was decided to follow the technique used in making interior wallboard joints, which technique is now satisfactory in all respects. It was necessary to use other materials because of problems confronted on the exterior of an outside wall not found in the inside of the wall, such as excessive moisture, wind, heat and probably slightly more movement owing to a greater range of temperatures on a year-round basis.

Of the various joint compounds evaluated, it was decided to use a

product called Tuff-Kote. Its principal ingredient is lead. This compound was chosen because it is stable, and will retain a sufficient degree of flexibility for this usage permanently and, not being exposed to the air, it would remain chemically stable.

In the actual joint treatment, a 3" wide fiberglass tape, 3 to 5 mils thick, was imbedded in a thick film of Tuff-Kote. The Tuff-Kote manufacturer recommended bridging a crack or joint rather than filling it; however, in field practice, in this instance, the Tuff-Kote bled through the glass tape into the joint leaving a concave bead line all along the joint. Because light would reveal any imperfection on the joint, and most particularly a straight line running from the plate to the header, it was decided to patch this concave bead. On the north wall of the house another application of Tuff-Kote was floated over each joint. It corrected the objectionable bead satisfactorily but because of the viscosity of the material, it created a belt which was thought might be noticeable after the finish coating was applied. The King people then took their "squeeze box" and using U. S. Gypsum vinyl all-purpose ready-mix joint compound, floated the joints once more to fair out the Tuff-Kote build-up. To the eye, it appeared that the joint treatment would be successful after the final wall



coating had been applied.

On the east wall of the house, that portion of the wall enclosing the bedroom and family room, the King Company elected, as an experiment, to finish the joints using their standard interior wallboard material, namely, paper tape and vinyl-based ready-mix compound. The King people's argument was that since the wallboard tape and compound would be covered by the finished wall coating and a coat of vinyl paint, they were not apprehensive about any troublesome quantity of moisture reaching the wallboard joint compound.



Physically, the experiment worked out well except that a slight convex bead appeared over each joint running from top to bottom. This bead appeared when a very slight contraction in the wall occurred causing the paper tape to "bulge out", so to speak, since it has no elasticity. This slight bead cannot actually be measured with a straight edge, for instance, but any uniform imperfection will show up under the light. Needless to say, we don't intend to use any more paper tape.

The experiment was certainly justifiable in that it gave us some feeling for the amount of movement that we might expect on exterior wall joints at 4'-0" intervals resulting from temperature changes and also to observe the use of United Gypsum's vinyl all-purpose ready-mix joint compound used alone on an exterior wall joint as described above. To date, although we have had fairly heavy rains and freezing temperatures, these joints across the back of these two rooms are holding fast.

The remainder of the east wall and the south wall which includes the south side of the storage room and the two sides facing the carport were treated in essentially the same manner as the north wall described above. It should be added that some patching occurred on most of the joints on the south wall because the Tuff-Kote had

been floated on fairly heavily thereby creating a shadow line which the spray coats could not take out.

### 3. THE WALL COATING MATERIAL



A material called Tex-Cote, manufactured by Textured Coatings of America, Inc. in Los Angeles, California, was selected from several others to be used on the exterior walls of this Research House. Tex-Cote was developed during World War II when it became imperative to have coatings which would protect military equipment in all climatic extremes. Subsequently, it has been

used in applications on all types of services under all conditions according to the Tex-Cote people. It is presently being used widely in the Los Angeles area on the exterior of many types of buildings.

The material is composed of synthetic elastomer-polyester base with fiberglass, asbestos, perlite and mica. Pigments used are zinc oxide, titanium dioxide and the most durable of available tinting pigments when color is desired. The material can be modified by the manufacturer to create a wide range of textures. The material has a high elasticity characteristic and is extremely resistant to water. The Tex-Cote Company guarantees this material for a 10-year period against flaking, chipping, or peeling.

The material was sprayed on the house by the Pete King people. They had used this material previously and, in fact, the mechanic handling the gun was brought to Sun City to shoot this particular house from another job since he had considerable previous experience in applying Tex-Cote.

In applying Tex-Cote, the mechanic first sprayed the north wall with a light fog coat and then returned over the same surface with a heavier coat in an attempt to achieve a finished surface. This same technique continued around the other walls of the house.

By the time he had sprayed the lanai on the east side of the house, Jerry King, who was supervising this operation, made the statement that we should only apply a sufficient amount of this material to achieve the desired texture and then, after the material had cured, roll on one coat of vinyl paint. He said this technique would cost less money than using a sufficient amount of Tex-Cote to get satisfactory coverage of the walls and that we would have greater color flexibility and a richer appearing color as well. The pigments used in this coating have a tendency to have the same characteristics in appearance that pigments added to the skin coat of stucco has.

When the house was completed, we had used about 55 gallons of Tex-Cote whereas we should have used about 15 gallons according to Mr. Jerry King. This excessive amount of material used came about as a result of continued re-spraying to cover imperfections at the joints. When this state had been achieved, a coat of vinyl paint was then rolled over the Tex-Cote. The results may be seen now on the Research House.

After the experience of completing this wall as described above, Mr. Jerry King and his people are of the opinion that the proper way to treat the walls would be: (1) to reduce the width of the

joint between the sheets of hardboard to about 40 mils; (2) to imbed the glass tape in one thin coat of Tuff-Kote; (3) allow the Tuff-Kote time to cure; (4) apply a sufficient amount of Tex-Cote to gain the desired texture on the wall surface and, after the Tex-Cote is cured, (5) to roll on one coat of vinyl paint.

### COST

The estimated costs for building exterior walls as described above are as follows:

1. Framing (Labor and Material)	\$ .15
2. Hardboard Siding	.15
3. Labor to hang sheeting	.05
4. Joint treatment, coating and painting operation	<u>.26</u>
5. Total cost per square foot	\$ .61

### SUMMARY

The overall impression of this wall is that it is pleasing to the eye. A question regarding it was not included in the market research questionnaire since it was thought that an evaluation of this feature of the Research House could best be performed by professionals. Nevertheless, many of the visitors observed the wall and expressed approval of and satisfaction with it. This

opinion was sometimes followed by a less flattering opinion of the concrete block walls such as is used in the houses in Sun City.

It is difficult, if not impossible, to describe "pleasing", "more pleasing", "attractive", etc., when evaluating such a subject; however, most of the professional construction people who have examined this wall, and this particular specimen can be improved upon, have found it to be more pleasing to the eye than the finish achieved with stucco. Also, it won't crack.

It is fortunate that the house was built when it was inasmuch as a week of heavy rain and freezing weather occurred during the operations of finishing the joints, applying the Tex-Cote, and painting the house. Since that time, which occurred early in November, we have experienced continued rains and some freezing weather. Beyond question this wall treatment should be observed during the cycle of a full year, most particularly during the late summer months, before any final evaluation can be made as to its durability. All of the people who worked on this house, including the Tex-Cote people who contributed the material and the Pete King people who applied it, are extremely confident regarding this durability aspect. In any event, we need more experience in

applying this material. Since the several materials used in covering this exterior wall are well known and established, it appears there would be a minimum of risk in using such a treatment at this time on buildings over which the Webb Company had direct control. Additional field experience at this time to permit using the application refinements indicated by this experiment would be invaluable.

Should this wall fulfill all expectations, its potential can readily be seen with respect to prefabrication techniques or as a substitute or alternate for stucco and block. The promise suggested by this experiment to date holds considerable excitement for the future. A report shall be prepared next November when the house will be one year old. The report will include the findings during periodic inspections throughout the year.



## SECTION II

### EXTERIOR SIDING

The exterior siding used on the front elevation of this house and on the carport fence is a tempered hardboard called Ruf-X-Ninety, manufactured by Masonite. It has a resawn texture on the surface and is available in sheets having half-inch grooves at 4 and 8 inches and in sheets without grooves when batts are to be used. The material is 3/8" thick.

### COST

This material costs approximately \$200 M, FOB job site, Florida, Arizona, and California. (See HS-110, September 4, 1964).

### SUMMARY

A question on this product was not included in the market research questionnaire; nevertheless, the material received much favorable comment since most people found it attractive. In fact, most people thought it was wood. Even though the material comes with a sealer on it, it must be primed before the finish coat is applied to achieve a satisfactory finished surface.

## SOLID FACED CARPORT FENCE



This fence is framed with 2 x 4's having 4'-0" panels of Ruf-X-Ninety masonite hardboard nailed to its exterior side. It has a redwood cap.

### COST

The masonite siding costs approximately 20¢ a square foot as stated in the preceding section. Added to this would be the cost for 2 x 4's, the cap, the labor for framing, and painting costs. These costs will vary slightly from job to job and therefore were not extended here.

## SUMMARY

The purpose for designing this fence was to elimin~~ate~~ate the open-type, framed fence, having different patterns which we have used in the past, because of its excessive maintenance problems and cost. In most cases, the solid fence would probably have a lower original cost than the open fences. Also, it provides more privacy which appeals to many people.

## THE SOFFITED OVERHANG



A soffited overhang was included in this house in order to compare its appearance with that of houses nearby having exposed rafter tails, and to gain first-hand experience with costs toward the end of eliminating those callbacks common to exposed overhangs. Regular half-inch gypsum board was used for the soffit material owing to the dryness of the area. There is no concern about using interior gypsum wallboard for this application. It has been used here

successfully for years.

COST

(SCFFITED)

Assume an overhang 30' long x 3'-0" wide:

Wallboard installed .10 S. F. x 30 x 2.5 \$ 7.50

Paint No Difference

Continuous Vent-A-Strip .072 x 30 2.16  
(Model 70, Home Comfort Products)

Labor to install  
Vent-A-Strip .03 x 30 .90

\$ 10.56

(NOT SOFFITED)

Frieze Boards Installed .33 x 15 \$ 4.95

Paint No Difference

C-C Exterior Plywood .035 x 4' x 30' 4.20  
(Cost over C-D)

\$ 9.15

The unsoffited overhang figure above does not include costs for reworking crooked or defective rafter tails, roofing nails, shiners or callbacks for paint complaints.

SUMMARY

If a nominal figure is added to the unsoffited cost shown above

for rework or callbacks, it can be seen that the costs of the two methods are virtually a standoff. The soffited overhang gives the house a finished look which the exposed rafters do not approach. The maintenance costs on the soffited overhang will be substantially less owing principally to the ease of repainting. The soffited overhang should eliminate the callbacks caused by exposed rafters and sheeting described above.

## VENT-A RIDGE ATTIC VENTILATION SYSTEM



Continuous Vent-A-Ridge combined with continuous frieze or soffit venting provides an attic ventilating system having a uniform air flow throughout the entire attic regardless of wind velocity or direction. Summer attic temperatures can approach the outside temperatures. Winter condensation in moist climates can be controlled to more tolerable limits. Vent-A-Ridge provides 18 square inches of net free area per lineal foot. It is available in 8 and 10 foot lengths. It is barely noticeable when in place. It is less noticeable than dormer or gable end vents.

## COST

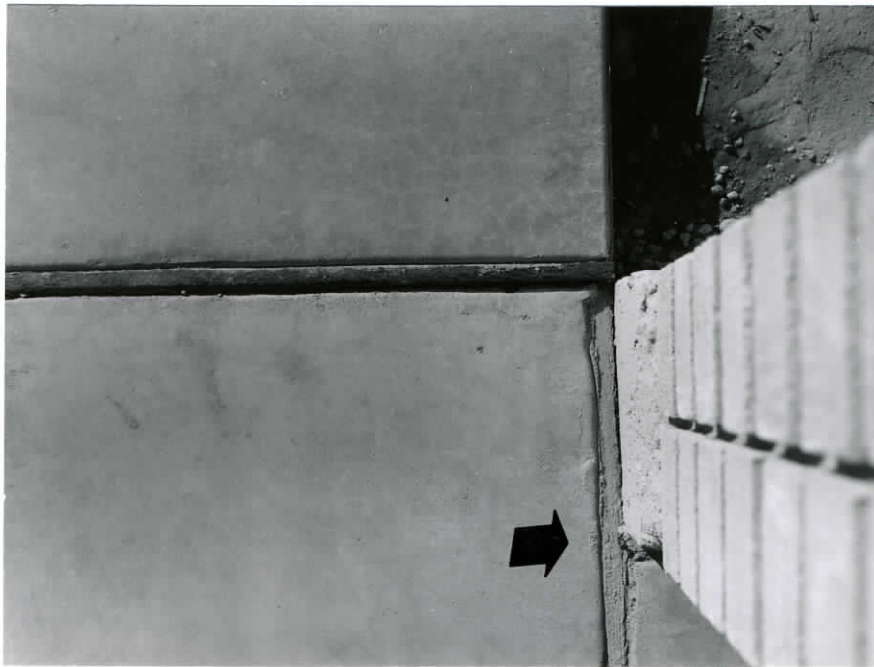
The cost of this material in LTL quantities to Phoenix installed, including connectors and end plugs, is approximately 55¢ per lineal foot. This does not take into consideration any allowance for credit for ridge shingles.

## SUMMARY

From the picture above it can be seen that the Vent-A-Ridge makes only a minimum projection beyond the ridge line. On a year-round basis it is a superior system to that which we are presently using because (1) it functions in the desired manner regardless of weather or wind conditions and (2) provides better ventilation throughout the attic. Estimates show that its costs are comparable to those of the method we are presently using.



## HOMASOTE EXPANSION JOINT



Homasote expansion joint called Homex was installed at the joint between the front porch floor and the driveway. This material is made of wood fibers derived from the repulping of No. 1 grade news stock with waterproofing ingredients added. It is available in the standard sizes that all other expansion joint materials are available in. Homex expansion joint meets federal specification, HH-F-341a and American Association of State Highway Officials Specification M-153-54, Class III.

There is no fill in Homex strip: they will not extrude regardless

of the weather. It is easy to saw and to bend. This material is the same color as concrete.

#### COST

This material is competitive in price with the asphalt expansion joint material.

#### SUMMARY

The chief advantages of this expansion joint over the asphalt impregnated type is that its color blends almost perfectly with the concrete thereby giving a more finished appearance to the work and also because women's spiked heels cannot penetrate it in extremely hot weather.

## LANAI ENCLOSURE



The lanai enclosure framing members were made of architectural aluminum extrusions now in common use for this purpose, and Fiberglass screening. This section of the enclosure was set on a 30" high, 6" concrete block wall having an 8" wide cap. The 8" cap was used for appearance sake but it turned out to be a mistake in that it just catches rainwater dripping from the roof. It should have been a 6" cap. The enclosure has a quality door.

## COST

There are 33 lineal feet of wall area in this enclosure including the door.

Complete Enclosure Costs Installed (Including the door)	\$ 175.00
Masonry Wall Cost	<u>85.00</u>
Total	\$ 260.00

## MARKET RESEARCH QUESTION #11

Have you had your lanai enclosed with screen?

Yes 180

No 315

If your answer was "no", would you have bought one if the aluminum enclosure with wall on display, at a cost of \$300.00, had been available?

Yes 134

No 181

## SUMMARY

The main purpose for including this particular enclosure in the Research House was to gain the public's reaction to a unit which would be virtually maintenance free, more attractive and, with a wall, easier to keep clean and possibly usable more frequently during inclement weather. The vote tells the story.

## LANAI ENCLOSURE REMOVABLE PANEL



As a further refinement in the technique of making lanai enclosures usable even during cold and wet weather, the Screen City Screen Company made some removable panels which were installed on the enclosure of this house. These panels have extruded aluminum frames over which is stretched a clear plastic sheet called Glassin having a thickness of .020. Specifications on this plastic sheet are not on hand as yet but we have been informed that it is the same material as is used in the rear windows of convertible automobiles. The panels installed on the Research House lanai were fastened

by means of a spring loaded pin. This pin fastening arrangement wasn't stout enough. Subsequently, a method of attaching the panels by using spring loaded clips has been worked out to complete satisfaction.

### COST

Costs on these removable panels have not been developed yet.

### SUMMARY

Many people who visited the Research House were quite interested in these removable panels. If they can be manufactured for a reasonable cost, it appears they would be very desirable. They would make the room usable during rainy and windy weather and would even permit the room to be heated as long as the temperature remained in the upper 40's or higher.

## THE LIKE FRONT ENTRY DOOR



The distinguishing feature of the front entry door in this house is that the exterior skin, which is made of tempered hardboard, has a burlap-like texture with a contemporary design milled into it. Otherwise, this door is just like any other hollow core door with tempered hardboard skins on each side.

### COST

Cost for the operation of making burlap texture on the exterior skin

increases the skin cost about 10% over a smooth-surfaced tempered hardboard skin normally used for such application. This should be the only increase in cost for this door.

MARKET RESEARCH QUESTION #1

What is your opinion of the entry door?

Very attractive	<u>313</u>
O. K.	<u>91</u>
Not Sure	<u>26</u>
Don't like it	<u>81</u>

SUMMARY

According to the research questionnaire, the door was well received. It is available with many different decorative details on it or with custom designs machined on it. Also, the rough texture permits satisfactory touch up or patching work to the paint in the event the owner mars the door while moving in. The doors in Sun City have been painted with a gun for sometime and have, consequently, a fine mirror-like surface. This fine surface contained a built-in problem for the painter, namely, how do you touch it up when a customer called to complain that the door was scratched. A brush doesn't work very well under such circumstances. We have minimized the problem somewhat in Sun City by having the key receipt man make



a particular point of the perfect surfaces on all the doors at the time the customer takes the house. This Like door, in addition to solving the above problem, and having a distinct appearance of its own, would lend itself most particularly to the contemporary elevations of our designs.

## CORKWOOD FLOOR COVERING



Corkwood is a block flooring 3/8" thick and 9" square, tongue and groove with a grooved back. It is made from graded wood chips impregnated with synthetic resin, formed and cured under heat and pressure. It is said to resist indentation 2 1/2 times as well as oak. It may be installed over wood or concrete. It is set in a mastic. It is available in two colors, light and dark.

### COST

Estimated costs submitted to us range from 40¢ per square foot installed for the large jobs to 70¢ per foot for small custom jobs.

MARKET RESEARCH QUESTION #2

If wood flooring were available (at additional cost), would you (a)  
prefer it to carpet in some rooms ?

No            342

Yes           181

(b) prefer it to tile in some rooms ?

No            211

Yes           193

SUMMARY

This pre-finished flooring is warmer and more resilient under foot than is concrete or hard floor coverings. The market research questionnaire revealed that there are many people who prefer to have wood flooring of some type in some parts of their homes to other floor coverings. It is strongly indicated that this or some similar material should be available to our customers on an optional basis.

## INCANDESCENT LIGHT FIXTURES



The incandescent light fixtures in this house were made by Progress Manufacturing Company. The fixtures over the two dressing tables and in the breakfast nook were designed and made especially for this house. The fixtures in the entry way, dining room and hallway were changed after the house was closed to Sun City residents to other fixtures which were thought to be more appropriate for our market.

COST

The fixtures installed in this house cost slightly less than comparable fixtures being used in our present production houses.

MARKET RESEARCH QUESTION #3

Which two (2) light fixtures appeal to you most?

Name the rooms in which they are located:

(Fluorescent kitchen ceiling fixture)--Kitchen

(Dressing table fixtures)--Bedroom

SUMMARY

The light fixtures were generally well received. Interestingly enough, the fixture which received far and away the most votes and comments (and it wasn't even intended that it should be a contender) was the fluorescent kitchen fixture by Skyline which we have been using for several years.

## INTERIOR WINDOW SURROUNDS



Radco Products, Incorporated, has developed an extruded aluminum interior window surround. It is self-fastening. The fastening is accomplished by means of a hooked finger-strap attached to the window frame which engages with one of a series of saw-tooth-like serrations running along the back of the extrusion. The extrusion has a 1" wide return over the face of the room wall which has a fluted decorative detail on the face.

### COST

These surrounds cost approximately 25¢ per foot.

## SUMMARY

The surrounds were quite attractive in appearance. They do eliminate the cracking and dust collecting normally found on all wallboard returns in such places. Some field experience would be required to get the wall framing, particularly on the bottom side of the window at a correct height with respect to the window frame, to make a firm fit for the surround. A question regarding this feature was not included in the market research questionnaire. From a number of remarks made by people visiting the house and others written under the general comments of the questionnaire, it can be stated that a window sill made of some hard material would be appreciated by many ladies who find the textured and painted surface of the wallboard sill impossible to clean.

## WARDROBE CLOSET SHELVING



Three different types of wardrobe closet shelving were used in this house. One of these was the conventional wood shelving with a clothes pole which we have been using for years. The second type was a 3/16" diameter, plastic-coated wire-rack type manufactured by Pemco.

The third type is known as X-Panda Shelf and is made by the Home Comfort Products Company. They are adjustable shelves made from cold roll steel, bonderized, then coated on both sides with an alkyd baked-on enamel. The units are complete in each



carton with installation screws, wall brackets, and other necessary accessories. Extra mid-support brackets are available for long spans and for joining two shelves together where required. These shelves used in the Experimental House were off-white in color with the clothes poles having the nickel finish.

#### COST

Various estimates on the standard wood shelving with clothes pole, installed and painted have indicated a fair price would be approximately 75¢ a foot. The cost of the Pemco shelving would run approximately \$1.06 per foot plus installation. The cost of the Home Comfort shelving was comparable with wood shelving with the added advantage of being an absolute known fact whereas handling and set up costs for wood shelving is thought to be higher by some people than the figures used for these estimates.

#### MARKET RESEARCH QUESTION #16

Which one of the three types of shelving in the closets in this house would you prefer?

Wood shelving	<u>139</u>
Pemco shelving	<u>166</u>
Home Comfort Products shelving	<u>208</u>

## SUMMARY

The Home Comforts Products shelving was the popular favorite in this category. There were a number of strong feelings expressed against wood shelving in the General Comments section of the questionnaire particularly with respect to the unsightly appearance of them after they had been in use for a while.

## FURNACE NOISE CONTROL



Noise from the gas furnace blower and combustion has long been a source of customer complaint. An attempt was made here to solve this problem and it was highly successful. Two principal steps were taken here:

1. The combustion air was taken from the attic rather than through the furnace door. This eliminated the need for a grille in the furnace door. The back side of the furnace

door was faced with a sheet of 1/2" Celotex;

2. The entire area of the return air chamber under the furnace floor and including the concrete floor was covered with 1" ( 1 1/2# density) blanket of Johns-Manville Micro-Bar.

Of these two steps, the first is easily the more important. This may be tested simply by opening the furnace room door.

#### COST

The cost of taking the combustion air from the attic rather than from the house is about a stand-off. The total cost of lining the return air chamber is approximately \$3.00.

#### SUMMARY

No attempt was made to measure the reduction of the furnace noises accomplished in this house. We have guesstimated simply by listening that the noise was reduced at least 50% and possibly as much as 70%. This substantial reduction in noise should eliminate one source of the customer complaint. The pleasant thing about this experiment was that it is easy to do and costs very little money.

## ELECTRONIC AIR CLEANER



A two-stage electrostatic precipitator commonly referred to as an electronic air cleaner was installed in this house in the return air stream under the furnace where the return air grille is normally located. This unit was composed of a power pack and filter made by Honeywell and a container, grille and electrical hookup package made by Goettl. The furnace floor had to be raised 6 inches to accommodate this unit. This electronic air cleaner will remove a minimum of 70% and a maximum of 95% of all particles in suspension in the air passing through it. Particles in suspension in

the air include dust, pollen, lint, cooking grease, and tobacco smoke. Having this device in a house would tend to keep upholstery, drapes, carpet, and walls cleaner longer. Since tests show that this device removes 99% of air-born pollen from the air circulating through it, it could be highly beneficial to people who suffer from allergies caused by pollens. The device is silent except for an occasional sharp, snapping noise made when a large particle of dust or lint is trapped in it. The permanent electronic cell requires washing every two to four months. It should be washed in warm water having dishwasher-type detergent in it. This operation is very simple.

#### COST

1. Operating Costs: It costs about 2 1/2¢ per day for electricity to operate this machine. It is virtually maintenance free.

2. Air Cleaner--Original Cost

On individual installations this device presently costs approximately \$400 each installed. The Goettl Company has, working at our instigation, through quantity purchasing potential, designing and making their own case and by simplifying the electrical hookup, been able to offer us the following price:

- |  |                |
|--|----------------|
| A. All houses on a tract                     | \$ 175.00 each |
| B. All housing with refrigeration on a tract | \$ 185.00 each |
| C. Buyer's Option                            | \$ 200.00 each |

MARKET RESEARCH QUESTION #17

Are you interested in a filter which can remove 70% of the particles from the air?

Yes      349

No        124

If you answered "yes", are you interested sufficiently to pay \$250.00 for it?

Yes      175

No        166

SUMMARY

The market research questionnaires reflect a strong interest by the residents of Sun City in this device. In fact, it was the second most desired product displayed in the house as recorded on the questionnaire by the visitors. The interest aroused by the filter suggests it could be a powerful sales feature.

## AUTOMATIC SLIDING GLASS DOOR CLOSER

This door closer, called Air-Flo, is manufactured by the U. S. Products Company in Phoenix, Arizona. The device consists of three principal parts, a stainless steel aircraft cable, air valve, and piston. These parts are encased in an aluminum extrusion, the I. D. of which is 1.125" in diameter. This assembly is attached to the center style on the fixed glass section with the cable attached to the leading edge on the movable section of the door. The unit has been operated over 100,000 times in test without failure. It is simple enough to be installed on a do-it-yourself basis.

### COST

The prices quoted to us by the manufacturer for this unit range from \$15 each in small quantities up to a 15% discount on quantities of 1,000 or more. Large quantity buying may be received on an installment basis. The maximum installation time has been estimated to be 20 minutes; a minimum time would be 10 minutes.

### MARKET RESEARCH QUESTION #10

Would you pay \$20.00 for this door closer?

Yes      222

No        281



## SUMMARY

This product would be most useful in housing located in warm climates and where there were children living in them particularly where the door was located in a place to invite heavy traffic. Since the unit may be installed after the house is built and even on a do-it-yourself basis, and since there are no children living permanently in Sun City, it is doubtful that this item could be considered important enough to justify the expense as a standard item.

## BUILT-IN IRONING BOARD



A built-in ironing board made by Iron-A-Way was installed in the utility room specifically to determine its desirability for our market. This unit was recessed into the wall between two studs. The case was made of wood and had a door. The exposed door and sides of the case were painted the wall color resulting in a neat, unobtrusive arrangement. The board, which had a 4-inch adjustment up or down, was three feet long. There is

storage space for an iron inside the case.

COST

This particular unit was quoted to us in the \$16-18 range in quantities of 50 or more.

MARKET RESEARCH QUESTION #9

Which type of ironing board do you prefer?

Portable	<u>290</u>
----------	------------

Built-in	<u>224</u>
----------	------------

SUMMARY

As reflected by the question above the majority prefers the portable ironing board. One comment which appeared occasionally in the general comment section of the questionnaire was that the board was too short. Longer built-in ironing boards are available on the market; however, the desirability of including such a board in our product does not appear to be justified at this time according to our market research questionnaire.

## FORMICA CLAD KITCHEN CABINETS



The use of high pressure laminates for covering the exterior of kitchen cabinets has been growing in other parts of the country. Buying good kitchen cabinets which comply consistently with our specifications, particularly with respect to workmanship and finish is always a problem. For these reasons, it was decided to use cabinets clad with a high pressure laminate. The finish used was Formica's No. 601, White Tidewood. The interior of the cabinets was finished with a grayish-white coat of Zolatone.

COST

Quotations submitted to us were competitive with the pre-finished ash cabinets we are presently using.

MARKET RESEARCH QUESTION #4

Do you find these cabinets as acceptable as hardwood cabinets?

Yes	<u>359</u>
No	<u>136</u>

SUMMARY

The finish on these cabinets was very favorably received according to our market research questionnaire. Also, there were a number of written comments approving this type of finish because of its permanency and ease of cleaning. The interior of these cabinets left something to be desired because of the finish coating; however, this could be easily corrected. Some of the doors, which were made of chipboard, have warped since the cabinets were installed in November, a common problem with doors having a high-pressure laminate applied on one surface.

We are at present investigating another plastic material which is said to have all the favorable properties of the high pressure laminated plastics but without the built-in stresses. This feature is said to eliminate the warping problem associated with high

pressure laminates. A separate report on this material should be forthcoming shortly.

The market research questionnaire contained some unfavorable comments about the well-known problems with hardwood cabinets finished with stains and lacquers, namely, the unsightly scratches which occur at the door pulls, the problems of cleaning them, and refinishing them. It has been clearly established that there is a substantial degree of acceptability to our market for a satisfactory cabinet having a plastic finish.

## LAMINATED PLASTIC KITCHEN COUNTER TOPS

The kitchen counter top was made of Formica, an old and well known product that needs no comment here.

### COST

Laminated plastic kitchen counter tops are competitive with the ceramic tile product we are presently using.

### MARKET RESEARCH QUESTION #5

Have you ever had a kitchen with a formica counter top?

Yes	<u>359</u>
No	<u>156</u>

If your answer to the above question was "yes", which do you prefer:

Formica	<u>301</u>
Ceramic Tile	<u>112</u>

### SUMMARY

In this survey, the plastic kitchen counter top received an overwhelming endorsement.

## STAINLESS STEEL KITCHEN SINK



The kitchen sink was a seamless, double compartment Elkay sink, Model 43322, drawn of No. 20 gauge non-nickel bearing, type 430, stainless steel. All exposed surfaces have a No. 4 satin grind finish. The interior corners of the compartments have a minimum 3" radii. A sound dampening material is applied to the underside of the sink. The mounting rim is integral with the sink (separate mounting frame not required).

### COST

This competitively-priced stainless steel sink would cost us



approximately \$10.00 more than we are presently paying for porcelain sinks.

MARKET RESEARCH QUESTION #7

Which type of sink would you prefer?

- |              |            |
|--------------|------------|
| 1. Porcelain | <u>285</u> |
| 2. Stainless | <u>231</u> |

If you prefer stainless steel (Number 2 above), would you be willing to pay \$15.00 extra to have it?

Yes	<u>156</u>
No	<u>69</u>

SUMMARY

While the porcelain sink received approximately a 50 vote margin over the stainless steel, there were a number of written comments which indicated that some women strongly prefer the stainless steel sink although there was no indication that we were losing any sales as a result of using porcelain. The use of the stainless steel units is becoming more widespread and the costs are dropping correspondingly.

The Elkay Company recommends a thorough cleaning of their sinks after each use. In spite of the new satin finishes, the

surfaces tend to water mark, a characteristic some people find objectionable. Actually, all sinks should be cleaned after each use: grease and food cling readily to porcelain. Porcelain marks and stains easily. While water marks show up more prominently on the stainless steel, other types of marks and deposits show up more readily on porcelain. The "unsightly" argument between the two is probably a stand-off.

While the porcelain sink is still acceptable to our market, the fact is that the stainless steel people are selling the desirability of having their product to the market with growing success.

### KITCHEN SINK MIXING VALVE

The single handle, single spout mixing valve used at the kitchen sink was a Delta Model 450 DX. It is a well established, well known product said to have the largest number of installations in the market of any similar product according to its manufacturer. This unit was of particular interest in this installation since it was accompanied by a dishwashing attachment and two dispensers for hand lotion and liquid soap. The containers holding these liquids are filled simply by lifting up the pump to open the container throat. The dishwashing attachment has its own reservoir for liquid soap.

=

The mixing valve is fairly simple. It has a sphere with two ports and a mixing chamber which control the temperature and volume as it is rotated back and forth. The only parts in this valve said to be subject to wear are two spring-loaded neoprene gaskets.

### COST

The Delta faucet Model 450 DX with the two dispensers and dishwashing attachment would cost us approximately \$16 more than we are paying for the straight mixing valve presently being used in our houses.

MARKET RESEARCH QUESTION #8

Do you consider the dispensers and dishwashing features to be desirable?

Yes	<u>307</u>
No	<u>192</u>

If you answered "yes", would you be willing to pay \$15.00 extra for them?

Yes	<u>219</u>
No	<u>71</u>

SUMMARY

This mixing valve is attractive in appearance. It is virtually "grabproof". The majority of the ladies liked the attachments on this valve and a substantial number were willing to pay extra for them as indicated by the survey. Whether the dishwashing attachment would cut into our dishwasher sales is not known. Also, whether the dispensers continue to be used after the newness has worn off is also an unknown. The wiser course at this time might be to continue using a mixing valve without gadgets described here. After all, the mixing valve is a fairly remarkable device in itself and its characteristics are well known.

## FOOD WARMER APPLIANCE



The Salton Hot Tray Model BT-152A food warmer was installed in the island section of the kitchen counter top. The purpose of this appliance is to keep food warm with little or no further cooking over an extended serving period. The heat is said to transfer in this electric appliance by radiation rather than by conductance; hence, it is almost burnproof to hands. The appliance has a switch which can be wall mounted that controls the degree of heat as well as the on-off position. It has a hot spot in one corner for coffee. The maximum amount of heat generated by this appliance is 200° F. It uses 115 volts a. c.

COST

The unit was quoted to us at \$22.50 FOB New York, for quantity orders although the shipments could be on the installment plan.

A junction box would be required to receive the switch.

MARKET RESEARCH QUESTION #6

Would having this food warmer appliance be worth \$30 to you?

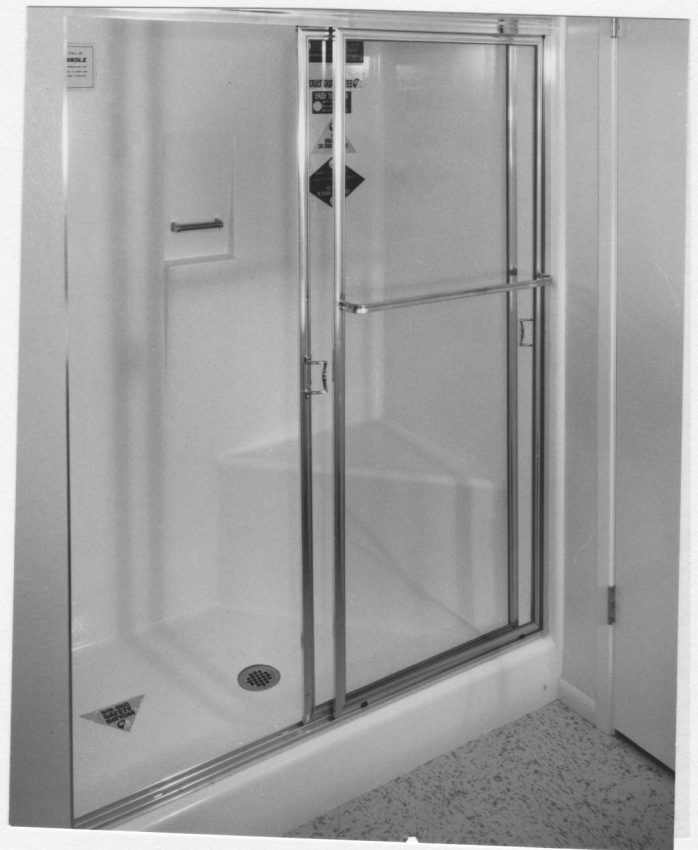
Yes                    268

No                     237

SUMMARY

This appliance would be most useful for large families or for any people who serve food while entertaining. It is an attractive and well proven appliance. The questionnaire contained a number of remarks in the comment section to the effect that a portable unit would be desirable. Incidentally, the portable units are available with a large, rectangular-shaped, clear-plastic cover which could house a 20 pound turkey, for instance. This cover would be most useful as a barrier against wind and insects when the device is being used outdoors. This appliance might best fit in at this time in our largest house as a luxury item.

FIBERGLASS TUB WITH SPLASH AND SHOWER STALL



Bathing fixtures made of fiberglass, manufactured by the Universal-Rundle Company, were installed in the baths. These bathing fixtures have been improved substantially during the last year and a half owing to improved unit design, production techniques, quality control procedures and improved gel-coat materials. (See HS-2, January 6, 1965). These fixtures were white with gold fleck. The same fixtures are available in the standard Universal-Rundle fix-



ture color line at approximately a 5% increase in price. The wall thickness of these units is approximately 1/8" except the bottoms of the tub and shower which are approximately 3/8". All these surfaces are reinforced by glass-resin ribs having about a 1" radius. The gel-coat on the bottom of the tub and shower is applied to a thickness of about 20 mils whereas the thickness on walls may be a minimum of 10 mils. The surface is not cold to the touch during cold weather as porcelain is. The gel-coat surface is also said to be 3 1/2 times less slippery than a porcelain surface. The Universal-Rundle people state that experienced mechanics can install one unit in 10 minutes provided they do not encounter any abnormal problems.

#### COST

Direct costs of the fiberglass fixtures installed is comparable to that of cast iron tubs having a 12 course tile splash and with ceramic tile shower stalls having 18 courses of tile. One extremely important consideration here is that a two-bath house normally has three working days scheduled for the tile operations while the fiberglass fixtures may be installed in one hour.

#### MARKET RESEARCH QUESTION #15

Would you consider this shower stall to be equivalent to the one

you have now?

Yes	<u>238</u>
No	<u>156</u>

### SUMMARY

Question 18 in the market research questionnaire asked the viewers to select the one product of all shown in the house that they would most like to own. The fiberglass bath fixtures was the winner, closely followed by the Formica counter top and the air cleaner. This reaction to the fiberglass bathing fixture was certainly based on visual appeal since almost none of the viewers had any prior exposure to such facilities. The simple, clean lines, the sparkling appearance of the surface and the absence of joints are the points which impressed them. In view of the public's acceptance to this product, the substantial improvement in the product itself over the past three years and particularly in view of the necessity for shorter construction schedules and the necessity of moving toward pre-fabrication, this product can no longer be ignored.

### FLEXIBLE SHOWERHEAD

A flexible showerhead called Unica was installed in the master bedroom bath. This head may pivot 180° on its mounting bracket, which bracket may also be raised or lowered as much as 24". The bar on which the mounting bracket for the head slides may also be used as a grab bar. The head may be removed from the bracket and held in the hand for showering or shampooing, if desired. This arrangement is made possible by the use of a five foot flexible hose made of a chromed brass cable having a neoprene liner. All the metal parts in this assembly are made of brass. The water supply for the flexible shower hose may come through the wall as it does for a conventional showerhead, or lower if desired, or the supply may come from a special tub spout which has an automatic diverter and adapter which fits the coupling on the end of the flexible hose. This shower assembly is foreign made.

### COST

This shower assembly was quoted to us at \$18.00 in quantities of 1 to 50. The adapter spout would cost \$6.00.

### MARKET RESEARCH QUESTION #13

Would you prefer this UNICA shower arrangement to the one you presently have?

Yes	<u>239</u>
No	<u>240</u>

SUMMARY

50% of the viewers voted affirmatively to Question 13. Since few, if any, of these people had seen this unit before, this vote probably should be interpreted as being somewhat stronger than the actual count suggests. This flexible showerhead would probably be most useful for children, shampooing children's heads, and for the infirmed. Because of the obvious advantage this unit has for the infirmed or physically restricted, it might be wise to offer this unit on an alternate basis which would be little trouble since either the shower supply or spout-diverter arrangement could be used.

### LEAKPROOF CENTER SET

The Universal-Rundle Model 82350 Center Set with pop-up waste was installed in the lavatories. These faucets are remarkable in that their cartridges, called Met-1-Pak, carry a life-time guarantee against leaking. Specifically, the Universal-Rundle Company will provide a new cartridge in any case where one has failed in the field. They do not pay for the labor to exchange the cartridges. It should be pointed out that changing cartridges is an extremely simple operation. This faucet cartridge contains no washers, packing rings, or threads. The stem, which is isolated completely from the water, rotates in one plane. Permanent, precision-honed and matched plates with ports in them control the flow of water as the stem is rotated by the handle. The handles are long and easy to grasp.

### COST

This brass would cost us approximately \$8.00 more per set than we are paying for the material presently being used.

### MARKET QUESTION #14

Would you be willing to pay \$10.00 extra in order to have a wash basin valve carrying a lifetime guaranty against leaking?

No	<u>57</u>
Yes	<u>381</u>

SUMMARY

The overwhelming vote for this fitting at an extra cost as reflected in Question 14 suggests that this item would be a very good sales feature.

### PREPRIMED MILL WORK

All the interior mill work except the kitchen and family room cabinets was primed at the mill. The purpose of this experiment was to weigh its advantages and disadvantages. The prime coat was sprayed on and artificially dried.

### COST

The estimate submitted for this work was \$84.00. This figure did not include any work whatever on the kitchen cabinets or family room cabinets. It should be noted that this was a first estimate and is undoubtedly high.

### SUMMARY

The painting contractor stated that it did not eliminate the necessity for him to reprime this material because of the scob marks inflicted on the material during shipping and because the color and thickness were such that it precluded the possibility of a finish coat to cover the surface satisfactorily. These problems could be corrected. There is no real reason why a satisfactory prime coat could not be applied at the mill. The question is not one of feasibility regarding this operation but rather its desirability at this time. More study needs to be given to the matter, particularly when action is taken to shorten production schedules.

## VINYL WALL COVERING



This vinyl wall covering made by Colamco is distinctive for its deep relief in the pattern. The exposed vinyl has a 3/8" thick urethane blanket backing which is covered by muslin. The patterns are almost unlimited. They are made by the use of ribbon dyes and heat. The material is made in 4'-0" x 8'-0" sheets. The colors and textures of the vinyls offered are also almost unlimited. The material is hung on the wall by the use of a synthetic adhesive used for hanging wall paper.



## COST

This material in quantities of 25 to 100 panels would cost approximately 45¢ per square foot. Smaller quantities would cost somewhat more. Costs for hanging this material would be comparable to those for hanging wall paper.

## SUMMARY

Many people found this wall treatment to be quite attractive and even exciting. It would be particularly effective in many commercial treatments although its uses for decorative purposes are almost unlimited. The material also has surprisingly good sound deadening properties.

## SUMMARY

A number of remarkable and even surprising things came out of the experience of designing and building the Research House, most particularly some of the information revealed by the Market Research Questionnaire completed by residents of Sun City. Certainly one rewarding thing about this experience was the enthusiastic interest in the house shown by the residents of Sun City.

As a result of a small article in the local newspaper and word of mouth on the project, some 4,000 people visited the house during the two weeks it was open. These people completed over 1,700 Market Research Questionnaires, a copy of which is included in this report. Some of these people spent as much as two and three hours studying the house and its details while completing the questionnaire.

Many of these people expressed their admiration for the effort the Webb Company was making in trying to build a better house, a more attractive house and one which took their special needs into consideration more extensively.

Perhaps the most startling fact produced by the Market Research Questionnaire was this market's attitude toward plastic-type products. Question 18, which asked the viewers to select the one

product of all shown in the house which they would most like to own. Of some 25 products and features shown in the house, the fiberglass tub with splash, the fiberglass shower, and the formica counter top received the most votes. This would suggest that not only is there no onus attached to plastic products but rather they are acceptable to the public without reservation.

The electronic air cleaner was another product that created wide interest and for which many expressed a desire to own. In view of its obvious sales appeal aspect and in the reasonable pricing for it offered by Goettl, this is a product which certainly should receive careful consideration when any new models for retirement communities are designed.

The sound reduction experiment on the furnace, which was extremely successful, is another idea which should be given careful consideration on any new models. The amount of the sound reduction could not be fully demonstrated owing to the fact that the house was unfurnished, usually filled with large numbers of people, and also because it wasn't operating very much. The real improvement here will be most evident in a house being lived in.

Another fact revealed by this experiment, and one which will come as a surprise to many people is that, to Sun City residents at least,

the concrete block is not sacred. A question regarding the exterior wall treatment was not included in the Market Research Questionnaire because it was thought that professional construction people were best qualified to evaluate its merits; nevertheless, according to the hostess who manned the Research House there was general interest in and frequent questions about the wall from the visitors. She said the remarks concerning it were overwhelmingly favorable and often accompanied by unflattering remarks concerning concrete block, most particularly when exposed on interior walls.

The people in Sun City are certainly quality conscious especially where practical considerations are involved. Question 14 asked about their willingness to pay \$10 extra in order to have a lavatory faucet carrying a life-time guaranty against leaking. The vote was an overwhelming 'yes'.

The question now arises, 'What do we do next?' In the immediate future, it appears that the use of the exterior wall treatment and the fiberglass bathing fixtures should be used in some limited program in order to gain more experience with them, to learn more about them and to increase their exposure to our market gradually.

Most of the other products and features used in this house should

be carefully compared with comparable products presently being used during the planning of any new models.

The designing and building of this house was a highly rewarding and informative experience for me and I am confident that it will produce far reaching returns for the Company in the future.

EXPERIMENTAL HOUSE QUESTIONNAIRE  
SUN CITY, ARIZONA

1. What is your opinion of the entry door?

Very attractive	313
O. K.	91
Not sure	26
Don't like it	81

2. If wood flooring were available (at additional cost), would you (a) prefer it to carpet in some rooms?

No	342
Yes	181

(b) Prefer it to tile in some rooms?

No	211
Yes	193

3. Which two (2) light fixtures appeal to you most?  
Name the rooms in which they are located:

(Fluorescent kitchen ceiling fixture)--Kitchen (Dressing table  
fixture)--Bedroom.

4. Do you find these cabinets as acceptable as hardwood cabinets?

Yes	359
No	136

5. Have you ever had a kitchen with a formica counter top?

Yes	359
No	156

If your answer to the above question was "yes", which do you prefer:

Formica	<u>301</u>
Ceramic Tile	<u>112</u>

6. Would having this food warmer appliance be worth \$30.00 to you?

Yes	<u>268</u>
No	<u>237</u>

7. Which type of sink would you prefer?

1. Porcelain	<u>285</u>
2. Stainless Steel	<u>231</u>

If you prefer stainless steel (Number 2 above), would you be willing to pay \$15.00 extra to have it?

Yes	<u>156</u>
No	<u>69</u>

8. Do you consider the dispensers and dishwashing features to be desirable?

Yes	<u>307</u>
No	<u>192</u>

If you answered "yes", would you be willing to pay \$15.00 extra for them?

Yes	<u>219</u>
No	<u>71</u>

9. Which type of ironing board do you prefer?

Portable	<u>290</u>
Built-in	<u>224</u>

10. Would you pay \$20.00 for this door closer?

Yes	<u>222</u>
No	<u>281</u>

11. Have you had your lanai enclosed with screen?

Yes	<u>180</u>
No	<u>315</u>

If your answer was "no", would you have bought one if the aluminum enclosure with wall on display, at a cost of \$300.00, had been available?

Yes	<u>134</u>
No	<u>181</u>

12. Which would you prefer?

Tub with shower in the master bedroom	<u>273</u>
Tub with shower in the hall bath	<u>193</u>

13. Would you prefer this UNICA shower arrangement to the one you presently have?

Yes	<u>239</u>
No	<u>240</u>

14. Would you be willing to pay \$10.00 extra in order to have a wash basin valve carrying a lifetime guaranty against leaking?

No	<u>57</u>
Yes	<u>381</u>

15. Would you consider this shower stall to be equivalent to the one you have now?

Yes	<u>238</u>
No	<u>156</u>



16. Which one of the three types of shelving in the closets in this house would you prefer?

Wood shelving	<u>139</u>
Pemco shelving	<u>166</u>
Home Comfort Products shelving	<u>208</u>

17. Are you interested in a filter which can remove 70% of the particles from the air?

Yes	<u>349</u>
No	<u>124</u>

If you answered "yes", are you interested sufficiently to pay \$250.00 for it?

Yes	<u>175</u>
No	<u>166</u>

18. Of all the products displayed in this house, which one would you like to own most?

1. Fiberglass all in one	<u>58</u>
2. Formica Counter Tops	<u>49</u>
3. Air Filter	<u>46</u>
4. Hot Tray	<u>19</u>

19. General Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

COMPANY

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