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AFFORDABLE HOUSING DEMONSTRATION COST ANALYSIS LINCOLN, NEBRASKA

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BY

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FOREWORD

The cost data contained herein were developed from on-site studies by NAHB Research Foundation industrial engineers and from the builder's own records. Because the demonstration project was incomplete at the time of this report, interpolation of some costs were necessary. Upon completion of the project, the builder's cost data will be reexamined and, if necessary, adjustments made.

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AFFORDABLE HOUSING DEMONSTRATION

COST ANALYSIS

LINCOLN, NEBRASKA

When developing comparative costs between the demonstration project and conventional homes built to local practice, codes and standards, several different approaches were considered. The approach used for this analysis was a direct comparison between demonstration land development and construction costs versus estimated costs for the same subdivision if built according to existing Lincoln requirements and conventional practice. This approach is somewhat conservative because it does not give credit to design differences between the demonstration homes and typical Lincoln homes nor does it take into account innovative platting of the site. Therefore the cost savings that follow might be understated.

Total Demonstration Cost Reduction

Total cost reduction of the Lincoln demonstration project amounted to an average of $10,118.92 per dwelling unit. Total cost savings for the entire project of 52 units was $526,183.84. Savings according to major cost categories are shown in Table 1. In-depth discussions of individual areas of savings will follow.

TABLE 1. Total Demonstration Cost Savings

Major Cost Category	Cost Savings Per Unit
Raw Land	$ 480.80
Land Development	4,474.01
Direct Construction	3,563.11
Indirect, Overhead, Financing	485.00
Reduction in processing time	1,116.00
Total	$10,118.92

Raw Land

Original zoning of the demonstration site would have resulted in a maximum of 32 units. The City of Lincoln allowed the builder, Karl Witt, to include the parcel in an already approved Community Unit Plan (CUP) which allowed a higher density when averaged with an existing project. Therefore, 52 units were built instead of 32, spreading the cost of raw land over 62.5 percent more units, resulting in a savings of $480.80 per unit.

Land Development

Total land development costs were reduced by $44,014.70 as shown in Table 2.

TABLE 2. Land Development Costs

Cost Category	Usual Lincoln Requirements	Demonstration
Engineering/earthwork	$ 54,137.36	$ 54,137.36
Utilities	114,103.29	114,103.29
Paving - streets* & parking	101,900.00	67,175.00
Sidewalks & flowlines	8,997.29	4,707.59
Streetlights	7,500.00	2,500.00
Landscaping	3,407.91	3,407.91
Equipment rental	4,594.51	4,594.51
Supervision	5,545.84	5,545.84
Miscellaneous	1,546.03	1,546.03
Totals	$301,732.23	$257,717.53

Total land development cost savings - $44,014.70

*Includes 1/2 of Fairfield Street built to city specifications.

The areas of cost reduction were paving ($34,725.00), sidewalks and flowlines ($4,289.70) and streetlights ($5,000.00).

Typically, Lincoln residential streets are a minimum of 26 feet wide and consist of a three-step paving process; 1) pour concrete curb and gutter; 2) pour 5-inch concrete base; and 3) place 2-inch asphalt topping. This method costs $80 per lineal foot of pavement. Since there were 1,273.75 feet of street, total cost would have been $101,900 if done according to existing standards. However, for the demonstration, entrance streets consisted of a 26 foot wide, 6-inch thick monolithic concrete street and rolled curb which cost $55 per lineal foot. The interior street was 20 feet wide and 6-inches thick with no curbs or gutters, costing $40 per lineal foot. Included in the project cost was 530 lineal feet of a perimeter street designed to Lincoln specifications. Total cost of the demonstration site streets was $67,175.

Lincoln standards require sidewalks on both sides of residential streets. For this demonstration, sidewalks were placed on only one side, reducing costs from $8,997.29 to $4,707.59.

According to existing standards, five streetlight poles would have been required at a total cost of $7,500. The demonstration used five house mounted lights which cost a total of $2,500.

Assuming total land development costs would be unchanged regardless of the number of units built, the zoning change from 32 to 52 units would have resulted in significant savings per dwelling unit as shown in Table 3.

TABLE 3. Land Development Costs Per Dwelling Unit

Cost Category	Typical 32 Units	Demonstration 52 Units
Engineering/earthwork	$1,691.79	$1,041.10
Utilities	3,565.72	2,194.29
Paving	3,184.38	1,291.83
Sidewalks & flowlines	281.17	90.53
Streetlights	234.37	48.08
Landscaping	106.49	64.54
Equipment rental	143.58	88.36
Supervision	173.31	106.65
Miscellaneous	48.31	29.73
Totals	$9,429.12	$4,955.11

Total Cost Savings per Dwelling - $4,474.01

Direct Construction

The Lincoln demonstration homes consisted of 12 duplexes (24 units), 8 threeplexes (24 units), and one fourplex (4 units). The first seven units (2 duplexes and 1 threeplex) were completed at the time of this cost study. Therefore, direct costs represent the average costs of the first seven units built. Table 4 shows average costs versus estimated costs if the units had been built conventionally.

TABLE 4. Direct Construction Cost Comparison Per Dwelling

Construction Item	Conventional	Demonstration
Plans and specifications	$ 104.75	$ 64.46
Permits	42.18	42.18
Insurance	51.00	51.00
Temporary utilties	50.00	50.00
Layout on site	25.82	25.82
Excavation/earthwork	259.81	259.81
Footings/foundations	1,415.68	1,415.68
Waterproofing	35.00	35.00
Drain tile	175.36	175.36
Concrete flatwork	1,042.83	1,042.83

TABLE 4. (continued)

Construction Item	Conventional	Demonstration
Precast concrete	$ 21.05	$ 21.05
Masonry	378.69	378.69
Rough carpentry	5,625.15	4,524.18
Finish carpentry	1,343.40	999.22
Insulation	800.00	800.00
Roofing	527.97	527.97
Siding	809.59	809.59
Gutters/downspouts	117.27	117.27
Doors	339.72	339.72
Windows	1,493.33	1,493.33
Hardware	210.00	153.91
Drywall	1,954.90	1,726.80
Cabinetry	685.89	685.89
Countertops	177.53	143.10
Vinyl flooring	122.83	85.06
Carpet	1,449.84	957.14
Paint	1,680.26	1,207.67
Plumbing	2,231.84	1,927.10
Heating, A/C	1,995.71	1,980.48
Electrical	1,907.01	1,548.08
Telephone	40.00	40.00
Garage doors	200.93	200.93
Equipment rental	302.30	302.39
Appliances	1,557.07	1,557.07
Final clean-up	239.42	239.42
General supervision	779.14	701.69
Total direct costs	$30,193.00	$26,629.89

Direct construction savings - $3,563.11

The major savings in direct construction costs were due to the unfinished lower levels in each of the units. Plumbing rough-ins were provided for potential second bathrooms, furring was installed and basement walls insulated. Otherwise, lower level space was left for the occupants to finish as they wished.

The builder paid $3,352 for plans and specifications for all the demonstration homes. Because 52 were built from these plans and specifications, cost amounted to $64.46 per unit instead of $104.75 per unit had only 32 units been built according to original zoning. The cost saving per unit was $40.29 because of the increased density.

24 inch on-center was used in exterior and interior walls. Metal drywall back-up clips, two stud corners, single layer plywood siding and single layer plywood floor sheathing were also used. Efficient use of lumber and plywood reduced total rough carpentry costs by $450.00 per unit. In addition, $650.97 was saved by leaving the lower level unfinished. About 24 man hours of rough carpentry labor was saved using these techniques.

Because the lower levels were unfinished, finish carpentry costs were reduced by $344.18 per unit. About 10 man hours were saved. Hardware costs were reduced by $56.09. Drywall cost reduction was $228.10 because of the unfinished area. The common wall between units (firewall) was finished as were garage walls in those units that had garages in the lower levels. About 8 man hours were saved. A bathroom lavatory countertop was saved, reducing costs by $34.43.

Total flooring savings amounted to $530.47, of which $37.77 was vinyl flooring and $492.70 was carpeting. The builder installed higher grade carpet than would have been necessary because of marketability. Ironically, he had to obtain a HUD-FHA waiver to do this because the higher grade was not "FHA minimum" approved. A total of about 10 man hours in labor was saved. Painting costs were reduced by $472.59 in the demonstration units because of the unfinished area. Time savings amounted to about 20 man hours.

Plumbing, electrical and heating costs were reduced substantially because the lower levels were unfinished. All plumbing rough-in was included but fixtures were not installed. Total savings amounted to $304.38. About 4 man hours were saved. Electrical costs were reduced by $358.93. Fourteen duplex outlets and switches and one bath fan were eliminated in the lower level. About 12 man hours were saved. Heating ducts were installed in the lower level, so very little was saved. The $15.23 savings represents an additional register that would be required had this area been finished. General supervision time was reduced by roughly 6 man hours, for a total savings of $77.45.

Processing Delay Costs

Costs to a specific builder/developer as a result of unscheduled delays are difficult to determine. Increased carrying charges for land, increased overhead costs, increased property taxes and increased costs of labor and material due to inflation are all important factors to consider. In addition, the builder/developer runs the risk of negatively affected sales because of changes in the market over the period of the unscheduled delay. Another important factor in delay cost is the tie-up of capital in raw land and facilities - capital that could be put to use in alternate investments.

Depending upon the individual builder/developer, cost factors and their importance can vary considerably. It is probable that the most important factor for many is the carrying costs of land to be developed. At an interest rate of 15 percent per year, a six month delay on a $50,000 parcel of land increases cost of land by $3,750. Property taxes also must be paid over this period. Assuming effective property taxes on undeveloped land are $1.20 per $100 market value, taxes for a six month unscheduled delay on a $50,000 parcel would be $300. The fair market value of the land might also be increasing due to inflation, neighboring development or other factors.

Overhead costs are likely to accrue as a result of delay since office space, staffs and equipment must be maintained. The extent of extra overhead costs are difficult to determine because some builders either have other projects underway which absorb some of the these costs or they are sufficiently flexible that they can quickly reduce staff if construction is delayed. However, it is likely that many builders are not flexible nor do they have other projects underway. Therefore, a considerable amount of overhead might be applicable to the delayed project. Even if no increase in overhead can be directly attributed to the delay, frequent expansion and reduction of staff size can result in a less efficient organization, thereby increasing total overhead costs.

An indirect cost of delay is the market variation due to time of completion and the amount of competition from other builders. Some may actually benefit from delays, especially if adding housing units to an already depressed market can be avoided. This type of delay, however, should be based on business decisions and should not be left to opportune unscheduled delays.

Cost of delay per housing unit depends upon the size of development and the proposed density. For example, assume two side-by-side parcels of land equal size and original market value. Also assume that development of each parcel was delayed exactly the same amount of time, the delay costing each developer the same amount of money. On one parcel, 30 single family detached homes will be built while on the other, 90 attached units will be built. On a cost per unit basis, the added cost of delay for the detached homes will be three times the amount for the attached homes.

The actual cost of delay is very much related to when the delay occurs. Should the delay occur prior to any development or construction activity as would be the case in approval processing, the cost would likely be different than, say, if the delay occurs after the land is developed but before construction begins. In this case, delay costs will include interest on raw land as well as interest on loans obtained for land development. Once construction of the homes begins, an inspection delay will cost even more because of the accumulation of interest on land, land development and construction loans to that point. The most expensive delay, therefore, would likely be a delay in obtaining final occupancy permits.

Labor and material costs invariably increase over time. Minor exceptions may occur over a short period but, overall, delays create higher direct construction costs. If subcontractors agree to hold prices to the builder constant over time, it must be assumed that delay "fudge factors" have already been built into the prices. Otherwise the subcontractors would soon be out of business. Each subcontractor and each material supplier must cover his own direct, indirect and overhead costs. He may be willing to absorb some of his increased costs by reduced profits, but eventually the builder must pay for labor and material price increases. Some subcontractors will make a firm bid for a specified period of time after which the price to the builder will be renegotiated. In any event, delays create extra labor and material costs.

Upon completion, the builder will sell his homes based upon his total costs plus profit. The amount of profit will vary depending upon market conditions at the time of sale. In the short run, the builder may be willing to sell some homes at less than cost, but in the longer run he must at least recover all costs plus an acceptable level of profit. In a sense, then, even the amount of profit to be made is a function of time, or better yet, timing, because if timing is thrown off by unscheduled delays, the profitability of the project may change.

Because the builder must keep up with market demand, over time homes become larger and smaller; amenities are added or taken away; styles change; one-story, bi-level, split level mix varies, etc. Prudent builders review site plans and house plans with an eye toward what the public will want to buy, not only presently, but in the future. In other words, each builder takes a risk that the product offered will be marketable. Because of this, it might be reasonably argued that the principal function of providing shelter is constantly being modified to meet market demands. New home styles and preferences are usually slow in changing, but they do indeed change.

The complexity of the problem of determining the true cost of delays for any one project is considerable and might be misleading if construed to be "typical". If it can be assumed that all costs are eventually passed on to the home buyer and that the builder profit is reasonably established based upon marketability at a point in time, then it can be also assumed that increases in sales prices are related to time. The average monthly increase in new home sales price reflects the average cost of time to the home buyer.

In the period between 1977 and 1981, new home sales prices increased, on the average from $53,600 to $79,670 in the West North Central region of the nation according to Housing Industry Dynamics surveys. This amounted to a monthly compounded increase of 0.8291 percent using the present value/future value formula $FV = PV(1 + i)^n$, solving for i. Therefore, an average home selling for $50,000 will sell for $52,539 in six months assuming the same average monthly increase. In the case of the Lincoln demonstration project, the average initial sales price was about $45,000 per unit. Because of city cooperation, construction began at least three months earlier than anticipated based upon past processing performance. This resulted in an estimated cost saving to the home buyer of $1130 per unit using the historical monthly compounded increase of 0.8291 percent.

Karl Witt's own estimated unscheduled delay costs were practically the same as the regional estimate based on increases in sales prices. His estimates included carrying charges on raw land, property taxes, overhead and increased labor and material costs. He was unable to affix monetary values on changes in market or capital tie-up. Because the demonstration represented a very high proportion of his total work, overhead allocations to the project were high, amounting to $160 per month per unit. Carrying charges and property taxes amounted to $12 per month per unit. The most unpredictable cost factor was the inflation costs of labor and material. Over the past years, the inflation rate has been in the neighborhood of 10 percent per year. In years of normal housing activity, unscheduled delays would cost the builder about $200 per month per unit in increased labor and material costs. Therefore, total estimated cost savings due to a three month early start were as shown in Table 5.

TABLE 5. Estimated Savings Due to Processing Delay Reduction

Cost Item	Total Est. Savings/Unit
Overhead	$ 480.00
Carrying Charges & Taxes	36.00
Labor and Material	600.00
Total	$1,116.00

Indirect, Overhead, Financing

The total cost savings of indirect, overhead and financing was estimated to be $485 per unit based upon the builder's records of percentages applied to all other costs. Cost categories that might be considered indirect or overhead by some builders are typically included in direct construction costs by the Lincoln demonstration builder. These include such items as plans and specifications, permits, insurance, temporary utilities, supervision, etc.