

Waste Today, Wall Tomorrow: Assessment of an Innovative Straw Block for Residential Construction

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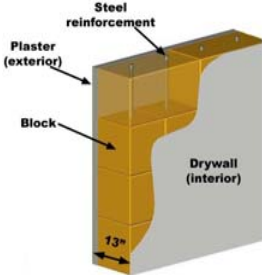
Background

The increase in current demand for residential housing, coupled with the changing prices of conventional building materials, presents a growth opportunity for alternative building materials and methods. The CP Block, a new building block made of highly compressed rice straw, is currently being developed as a substitute for conventional wood frame and cinder block construction. Rice straw is an agricultural byproduct that has historically been treated as a waste in California's Sacramento Valley. With over 1.2 million tons of rice straw generated every year, the CP Block is being introduced as a solution to both the problem of rice straw removal and the need for alternative building materials.

The CP Block provides benefits to both homebuyers and society. Improved indoor air quality and lower energy costs are examples of private benefits. Decreased energy consumption and reduced amounts of harvested lumber are just two of its public, or environmental, benefits.

THE CP BLOCK

- 24" L x 12" W x 12" H
- Made of compressed rice straw
- Highly insulating
- Above average soundproofing
- Resistant to fire and pests
- No chemical off-gassing
- Reduces agricultural waste



CONSTRUCTING A WALL

- Similar to cinderblock construction
- Blocks are stacked and reinforced with steel rods (rebar)
- 2 x 6 framing lumber is used for the header at the top of the wall and the floor plate to anchor the wall's base to the concrete foundation
- Drywall is used for the interior wall
- Various materials can be used for exterior walls, including plaster, vinyl siding, plywood, etc.

Problem Statement

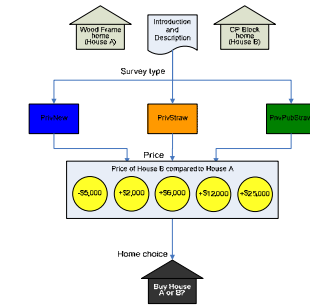
The CP Block is an innovative and experimental product. Oryzatech, Inc. plans to introduce the product to the green building and mainstream construction markets as a substitute for conventional wood frame and cinder block construction. In response, our project investigates:

- The amount homebuyers are willing to pay for a CP Block home compared to a wood frame home
- Whether or not homebuyers value the environmental benefits associated with the CP Block
- The "straw effect" – whether homebuyers are deterred by building with straw
- Characteristics of consumers more likely to choose a CP Block home
- How builders rate the potential performance of the CP Block
- Whether or not the industry professionals would be willing to build CP Block homes
- Where the prime geographic markets for the CP Block are located

Approach

CONSUMER DEMAND

We used a contingent valuation survey to estimate the consumer demand for a CP Block home. Survey respondents were asked to choose between a conventional wood frame home and a CP Block home. The survey had multiple variations:



INDUSTRY ASSESSMENT

Although consumer demand is important, homebuyers typically do not build the homes they live in; they usually purchase a home already built. We asked industry professionals to:

- Estimate the percentage of new homebuyers that would choose the CP Block home over a conventional home across a range of prices
- Rate the factors that consumers would consider important when deciding between the conventional house and the CP Block house
- Rate the potential performance of the CP Block
- Decide whether or not they would be willing to build CP Block homes

Results

CONSUMER DEMAND

1,024 respondents participated in our nationwide consumer survey.

If the price of the CP Block house increases by \$1,000, the percentage of buyers decreases by 1.2%

Results from survey variations:
When the environmental benefits of the CP Block house are described, the percentage of buyers increases by 7.3%

When the CP Block is identified as straw, the percentage of buyers decreases by 10%

Demographic results:
Respondents that do not currently own a home are 10% more likely to purchase the CP Block home

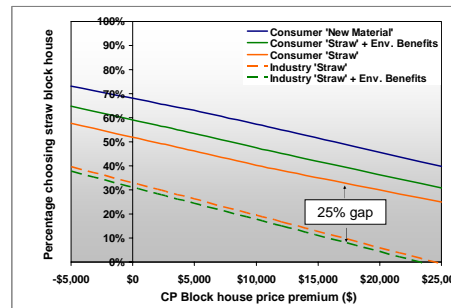
INDUSTRY ASSESSMENT

74 respondents participated in our nationwide industry survey; however, the sample was small and non-random. Results of the industry assessment are not to be used as a statistical predictor, but rather as a preliminary evaluation of the CP Block's performance.

The slope of the industry estimated demand curve was very similar to the calculated slope of the actual demand curve:

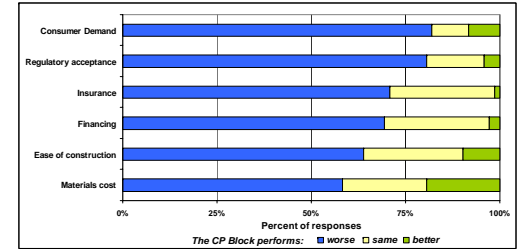
If price of the CP Block house increases by \$1,000, the proportion of estimated buyers decreases 1.3%

Consumer Demand and Industry Estimation of Consumer Demand



Why is there a 25% gap between the calculated consumer demand and the industry estimation of consumer demand?

The industry rated the performance of a CP block wall compared to a conventional wall:



The industry rated the CP Block as performing worse than a conventional wall, which could explain why their estimation of consumer demand was lower than the actual demand for the CP Block. In addition, the actual consumer demand is most likely an overestimate, due to yea-saying.

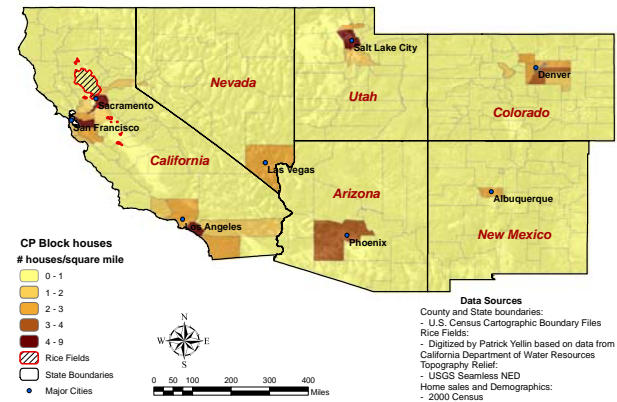
Are industry professionals willing to build CP Block homes?

- 42% of 71 respondents indicated they would be willing to build CP Block homes
- Further analysis showed 2 factors significantly influenced their willingness to build:
 - Ease of construction
 - Consumer demand

GEOGRAPHIC MARKET

We utilized county demographic and housing starts data from the US Census and our logit model to project the number of CP Block houses sold per square mile by counties in the Southwestern region of the United States. Data on rice agriculture in CA was incorporated to compare the hotspots to rice straw supplies to density of CP projected home for production convenience.

Predicted density of CP Block homes purchased in the Southwestern United States



Recommendations to Oryzatech, Inc.

- Promote private and environmental benefits to consumers
- Minimize use of the term "straw" in marketing
- Demonstrate ease of construction and consumer demand to builders
- Target first-time homebuyers and hotspots in the Southwestern U.S.

