



Implementing a Quality Assurance System: A Trade Contractor Case Study



Case Study

PATH (Partnership for Advancing Technology in Housing) is a new private/public effort to develop, demonstrate, and gain widespread market acceptance for the "Next Generation" of American housing. Through the use of new or innovative technologies, the goal of PATH is to improve the quality, durability, environmental efficiency, and affordability of tomorrow's homes.

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About the NAHB Research Center, Inc.

The NAHB Research Center is a not-for-profit subsidiary of the National Association of Home Builders (NAHB). The NAHB has 204,000 members, including 60,000 builders who build more than 80 percent of new American homes. The NAHB Research Center conducts research, analysis, and demonstration programs in all areas related to home building and carries out extensive programs of information dissemination and interchange among members of the industry and between the industry and the public.

The NAHB Research Center, Inc., prepared this report for the U.S. Department of Housing and Urban Development (HUD). The NAHB Research Center, Inc., staff responsible for the production of the report are Ed Caldeira, principal author and project manager; Mark Nowak, technical reviewer; and Edith Crane, production specialist.

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- Del Webb's Sun Cities, Sun City West, Arizona (builder)—Gregg Yensan
- Del Webb's Contracting Services, Surprise, Arizona (framer)—Hank Zolkiewicz
- K. Hovnanian Company, Edison, New Jersey (builder)—Mark Hodges and Jim Hoffner
- Schuck and Sons, Glendale, Arizona (framing contractor)—Doug Hassinger, Frank Serpa, Craig Steele, and Jim Tourek

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Implementing a Quality Assurance System:

A Trade Contractor

Case Study

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*by
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Foreword

American homebuyers are increasingly demanding higher quality, more durable homes. In response to this growing demand, in 1998 HUD and the NAHB Research Center co-hosted a Technology Roundtable for builders and manufacturers on how housing quality could be improved. Participants voiced a need for practical and effective tools to improve the quality of work performed by the various trade contractors involved in home building, e.g., framing, electrical, plumbing, and roofing. Assuring that these critical contractors provide high quality work is an essential ingredient for improving the overall quality of home construction.

Improving trade quality is one of the most challenging yet potentially most rewarding areas for improving tomorrow's homes. In response to this challenge, HUD, through our Partnership for Advancing Technology (PATH) program, commissioned the NAHB Research Center to develop a program of quality assurance for contractors that provide the wood framing for the majority of America's homes. The initial result of this effort was a publication entitled *Quality Assurance System for Wood Framing Contractors*. It was envisioned that, if successful, this approach could be applied to additional trades in homebuilding. The project involved government, industry associations, builders, and trade contractors all working together to develop the quality system and the tools to implement this system in construction operations.

This publication, *Implementing a Quality Assurance System: A Trade Contractor Case Study* reports on the second phase of this effort. It documents the experiences of builders and contractors that have tested this assurance system in the real world. The Report documents the experiences, methods, and results of contractors that implemented the system.

Hopefully, the results of this study will stimulate further efforts to improve housing quality throughout the housing industry.

Lawrence L. Thompson
General Deputy Assistant Secretary for
Policy Development and Research



Case Study Framing Contractors

All-tech Carpentry Contractors, Jamesburg, New Jersey
Del Webb's Contracting Services, Surprise, Arizona
Schuck and Sons Construction Company, Inc., Glendale, Arizona

Innovations

Three wood framing contractors developed and applied a model quality assurance system based on quality methods used by manufacturing industries.

Results

First-year results include defect rates reduced by more than 50 percent, productivity improvements offset regional labor rate increases of over 7 percent, and builder satisfaction improved to top ratings.

Study Period

August 1999 through June 2001



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Executive Summary



In a 1998 Technology Roundtable conducted by the NAHB Research Center, builders expressed frustration with the quality of trade contractors available in the marketplace. They noted that skilled labor is increasingly hard to find and retain. The resulting errors and construction defects have severe ramifications, both in the home building process and the quality of the finished house. Builders reported that existing quality assurance strategies do not reliably solve the problem.

In cooperation with the Partnership for Advancing Technology in Housing (PATH), the Research Center has adapted, demonstrated, and evaluated a quality system based on principles successfully used in the manufacturing environment.

Although these principles have been widely adopted in other sectors of the economy, they are relatively new to the home building industry. The result is an important new quality system that can help builders and framers satisfy homebuyer quality demands while increasing profits. The system represents a significant milestone in integrating quality management where it is most needed—the trade contractors that build the nation's homes.

"We have seen improved quality and consumer satisfaction. There has also been an increase in quality awareness, in the field and in management. This program simply formalizes the standards and inspection processes that exist in most companies." Frank Serpa, vice-president, Schuck and Sons Construction Company, Inc. (framing contractor)

The quality system requires trade contractors to accept responsibility for their own quality assurance without builder intervention. While inspections come to mind, they constitute only a small part of the total quality assurance system. Instead, the quality system actually focuses on prevention of errors by systematic control of the construction process. Furthermore, given that inspections may detect problems that need to be fixed, the quality assurance system also ensures that those problems are prevented by improving the construction process.

After three framing contractors implemented the trade contractor quality assurance system, each company

- reduced quality defects by more than 50 percent;
- reduced operating costs and improved productivity resulted in 7%-12% carpentry labor savings; and
- improved builder satisfaction ratings to top levels.

Encouraged by these results, PATH and private sector partners are establishing a national program to expand the quality initiative to all essential trades. Companies that operate their quality systems in compliance with the NAHB Research Center requirements are eligible for certification.



1.0 Introduction

For decades, the manufacturing industry has pursued productivity improvements through a variety of quality management approaches. With the decrease in available skilled labor, the home building industry has also taken notice of quality management techniques as a means to decrease defects, improve efficiency, and increase margins.

"Builders want to put together the best possible product. The quality assurance system makes the entire process go smoothly. The builders have less to monitor, the framers automatically produce a high-quality product, there are no callbacks, and everyone is doing it right the first time."

Hank Zolkiewicz, Del Webb's Contracting Services

This case study documents the experience of three framing contractors in establishing a quality management program and integrating it into their production process.

"My opinion is that what we do as carpentry contractors is no different from any other manufacturing except that we're exposed to the elements. It is still the same issue of inventory, supplies, and material. It is essentially the same. It is still assembly line, even though we're moving. The houses don't move down the line, we move down the line." Jalsa Urubshurow, All-tech Carpentry Contractors

The objectives of this project were to document the steps necessary for a contractor to adopt a quality management system, to provide technical assistance with the development of training tools and other aids, and to document the results of the system through follow-on audits.

Sections 2 and 3 of this report describe the collective experience of the project participants. Section 4 discusses future plans. Sections 5 through 7 discuss each framing contractor's quality system implementation, operation, and the resulting benefits.

In addition to this case study, a model for establishing a quality management plan for framing contractors was developed as part of this program. *Quality Assurance System for Wood Framing Contractors*¹, available through HUD or the NAHB Research Center can be used by contractors to assist in developing a quality management plan and quality manual for their companies.

2.0 Quality System Benefits and Results



"There are benefits to quality...reduced rework, reduced cycle time, fewer callbacks, improved customer satisfaction, better relations with the other trades in the field, and increased profits."
Craig Steele, President
Schuck and Sons Construction Company, Inc.

The NAHB Research Center, Inc., measured and analyzed the business performance of three framing contractors before and then one year after adoption of the quality assurance system.

This section discusses the collective benefits accruing to the participating contractors. Other sections discuss the specific benefits accruing to the individual contractors.

Reduced Construction Defects

The NAHB Research Center, Inc., measured more than a 50 percent reduction in construction defects at each of the participating companies.

Before implementing the quality system, each company considered itself to be among the nation's highest-quality framing companies. The results indicate that the quality system helped them improve further.

"The quality system provides the necessary means to capture and address ongoing problems and to create a system that provides for preventive actions. Over time, a company should be able to measure the direct impact from the implementation of such a system." Jalsa Urubshurow, All-tech Carpentry Contractors

Project participants reported three reasons for the improvements.

First, employees are held responsible for quality. Quality plans clearly specify the right way to do the work. There is no confusion when the quality assurance plan spells out construction details for each activity, specifies workmanship tolerances, and details the use of materials and equipment with prescribed work procedures. Field personnel are qualified to perform specific types of work. They are assigned work for which they are qualified and held responsible and accountable for their quality performance. They respond by taking pride in their work.

"More than trying to focus on any specific aspect of the initiative, I think the overall issue is to establish accountability along the way...every step of the way. The initiative increases our ability to correct the problem." Jalsa Urubshurow, All-tech Carpentry Contractors

Second, employees see constant reinforcement of the company's commitment to quality. A variety of sources contribute to delivering the message: frequent discussions about company quality strategies, regular management quality reviews, formal inspection processes, and regular training in quality topics.

Third, a regular process of continuous improvement prevents quality hotspots. Hotspot is the term coined by the contractors to indicate a recurring quality problem. Contractors take it upon themselves to analyze hotspot quality issues to uncover root causes. A solution to any particular problem may require changes in materials, construction details, work procedures, or simply ensuring conformance with a quality process. Regardless of the solution, regular hotspot training of field personnel communicates the right way to do the job. One by one, recurring defects are effectively prevented. The longer the quality system remains in operation, the fewer the quality defects that will occur. Participants expect progressively fewer and fewer quality defects over the coming years.

Prevention of quality defects is fundamental to each of the benefits and results that follow.



Improved Productivity

Seven percent increases regional carpenter wage rates were offset by productivity improvements. Contract pricing on renewed bids was not increased during the one-year study. In comparison, the most recent U.S. Department of Labor cost data² for carpentry labor increased by between 7 and 12 percent.

All of the contractors participating in the study believe that the benefits from the quality system were instrumental in offsetting regional labor rate increases.

Productivity improvements have successfully offset rising labor costs as well as any additional costs of operating the quality system.

The contractors report other cost benefits, including a reduced average hourly wage rate for field labor, lower overhead costs, and reduced postclosing warranty costs. Details are provided in the case study for each contractor.

"After the initial information-gathering process, a company can expect to invest less than an hour per house. That time is more than offset by reduced callbacks." Frank Serpa, Schuck and Sons Construction Company, Inc.

Participants report that they spend less time correcting errors and more time building homes. Employees are trained to perform a job right the first time, to correct problems at the time of detection, and, most important, to prevent recurrences. Problem avoidance from the outset lowers the cost of repairs made at preclosing inspections and during the warranty period.

Both builders and other contractors benefit from accurate and precise framing. Carefully prescribed workmanship tolerances, appropriate training, and quantitative inspection procedures ensure the definition and maintenance of installation tolerances such that window/door openings are correctly sized, floors are level, walls are straight, trusses are vertical, and so forth. Precision at one point in the process expedites the installation of other products down the line (e.g., doors, windows, tile, cabinets, and so forth) and reduces waste.

Improved Workforce Development

Each contractor has significantly increased its training for field personnel. Just-in-time training provides field personnel with a regular stream of training on hotspot quality issues both when and where it is most needed—on the jobsite.

Because training results in immediate quality improvements, most field supervisors view hotspot training as a tool that makes their job easier. It prevents recurring problems, thereby removing a major source of frustration among supervisors. Turnover of the contractors' field supervisors has been less than 5 percent.

Crew foremen and aspiring foremen have a clear development path that encourages personal growth. With clearly defined qualification requirements for each type of crew, the contractor helps employees evaluate their current capabilities and determine the skills they need to acquire for moving to the next level. Crew members respond by developing the skills required to become a foreman, and foremen develop the skills needed to lead a wider variety of crew types.

² U.S. Department of Labor, *National Occupational Employment and Wage Statistics*. Carpenter mean hourly wage rate for New Jersey and Arizona (1998 and 1999).



Increased Builder Satisfaction

Each contractor made significant gains in builder satisfaction ratings as determined by survey results. At completion of the study, each of the framing contractors was consistently achieving high builder satisfaction ratings.

Builder field personnel report benefits from framers who take responsibility for quality. To the extent that quality defects are reduced, the builder's field personnel can monitor quality rather than provide inspection services at their time and expense. When quality issues arise, the contractor has the means to prevent recurrences. Builder superintendents appreciate that quality issues are addressed in a meaningful way.

Improved Durability Expected

Reduced defect rates as described above are expected to lead to improved durability and to extend the service life of the home.

The quality system improves conformance to building codes, product installation instructions, and good construction practices. For framing, conformance relates to the proper use and installation of roof sheathing, connectors, and fastening systems and of floor, wall, and roof components. Each of these elements is critically important for improving building system integrity and avoiding premature product failure.

While improved quality can be observed and measured at time of construction, it will be a number of years before statistical data can measure improved durability.

Reduced Natural Disaster Losses Expected

The ability of a home to withstand natural disasters such as hurricanes and earthquakes is largely determined by the characteristics of the foundation and framing. For example, NAHB Research Center, Inc., studies show that consistent and correct connection of roof sheathing to roof trusses and trusses to walls is an essential factor in hurricane resistance. Installers must use the appropriate nails and connectors, in the right locations, to the required penetration depth and spaced in accordance with the connector type. Unfortunately, a natural disaster must occur before the impact of a quality system on these results can be evaluated.



3.0 Implementation of the Quality System

The participating framing contractors simultaneously implemented and refined the quality system over a one-year period. Each framing company amended its existing quality assurance procedures to conform to the guidelines outlined in *A Quality Assurance System for Wood Framing Contractors*.³

This section discusses the common implementation process shared by the contractors. Other sections discuss the specific customized implementation details for each participating contractor.

The participating contractors were already performing many of the activities required by the quality system. Implementation, however, focused on formalizing the performance of the activities on a regular basis and then documenting the results.

"Most companies do not realize it but they probably have some type of quality system already implemented. Where many companies fall short is in the documentation of the quality requirements that they are already performing. The quality system provides the necessary means to capture and address ongoing problems and to create a system that provides for preventive actions. Over time, a company should be able to measure the direct impact from the implementation of such a system." Jalsa Urubshurow, All-tech Carpentry Contractors

Implementing the quality system is a one-time investment to make the quality system operational. Once the system is operating, documentation of the quality system needs updating only as materials or work procedures change.

While the order of activities varied, all contractors followed what can be described as a six-step implementation process as follows:

Step One

A seminar provided an overview of how the quality system works. Participants previewed the implementation process and developed a project plan. The company president named a quality representative.

Step Two

A baseline assessment analyzed quality performance and current quality assurance practices. Each contractor developed a customized quality manual that built on its quality accomplishments. The manuals contain policies, procedures, and forms specific to customer requirements, construction methods, division of labor, and organizational structure.

"Depending on the level of existing policy and procedures, it is not difficult at all. It all comes down to documenting current procedures and measuring those against the standard." Jalsa Urubshurow, All-tech Carpentry Contractors

Step Three

Each contractor prepared an approved material list of commonly used building products, required equipment, and workmanship tolerances. These items, along with related installation instructions, were added to the quality manual. Foremen and superintendents were formally evaluated and qualified to lead and/or inspect specific types of work crews. At the end of this step, the contractor introduced the quality system to employees.

Step Four

Inspection forms were tailored to the company's existing field reporting requirements. A single form tracks production status as well as quality data. Field employees were trained in the new inspection procedures, which then took effect.

Step Five

Managers and superintendents began documenting their field review observations. Contractors institutionalized regular training of field employees on quality hotspot improvements. Contractors initiated the administrative procedures for managing the quality system.

³ NAHB Research Center, Inc., *Quality Assurance System for Wood Framing Contractors* (NAHBRC, 2000), Upper Marlboro, MD; 800-638-8556.



Step Six

Monitoring of the system operation led to adjustments and refinements. Contractors tracked the benefits of the quality system for comparisons with the baseline data identified in step two. After six months of operation, audits verified system operation.

"The NAHB Research Center, Inc., was our resource group. They were very good at facilitating the initial formation of this Quality assurance program...they were very knowledgeable...they were very open to suggestions. They didn't go in with blinders on and just go in one direction. They took information from all parts of the country to put this generic quality system together. They have been very helpful and always there to answer any questions that we may have when implementing." Hank Zolkiewicz, Del Webb's Contracting Services

One year after implementation, follow-on audits by the NAHB Research Center, Inc., verified continuing operation of the quality system.

"Quality is not luck, it is the end result of a specific plan."
Jim Hoffner, K. Hovnanian



4.0 Plans for the Future

Encouraged by the success of the quality assurance system, several industry initiatives are underway.

4.1 NHQ Certified Trade Contractor Program

Participants in the demonstration project have proposed the creation of the National Housing Quality (NHQ) Certified Trade Contractor Program to

- improve housing quality and customer satisfaction;
- improve productivity and cycle time;
- reduce exposure to construction defect litigation and insurance costs; and
- streamline the code inspection process.

The participants recommended that the program concentrate on

- developing trade contractor quality assurance guidelines based on ISO 9000 quality management principles;
- educating, training, and providing implementation assistance to home builders and their network of trade contractors;
- independently certifying trade contractors;
- promoting program awareness and program participation; and
- campaigning for insurance pricing incentives and regulatory streamlining.

At the time of this writing, the program is in the concept stage of development.

4.2 Expansion to Other Trades

The NAHB Research Center Inc., will be conducting quality system implementation directed at broadening the quality system to include other essential building trades. Sponsoring the effort are the Partnership for Advancing Technology in Housing and the U.S. Department of Housing and Urban Development (HUD).

The quality system will be implemented in several geographic regions. The aim is to create a critical mass of quality trade contractors in each region.

Participation is expected by local home builder associations, leading builders in the various regions, and their network of trade contractors.

Through this process, the NAHB Research Center, Inc., expects to prepare a series of model quality assurance guides for the major building trades, along with a case study report and implementation training materials.

Since the three framing contractors implemented the quality system, the six-step process has undergone refinement and streamlining. The NAHB Research Center, Inc., crafted a series of workshops around the six-step process to aid implementation of the quality system by other trade contractors.

"We've taken a good year and a half for implementation and going through the process.

That's not the way it will be for everyone, I think, because we were obviously creating [the quality system] as well."

Jalsa Urubshurow, All-tech Carpentry Contractors

As of October 2001, K. Hovnanian, a national builder, is using the six-step process to implement the quality system with 20 trade contractors in New Jersey. The quality manager at K. Hovnanian has been closely involved in the development and implementation of the quality system for the framing contractors. The quality manager is using the experience to adapt the quality system to other building trades.



4.3 NAHB Research Center, Inc., Trade Contractor Certification

One of the ways that the NAHB Research Center, Inc., is supporting the NHQ Certified Trade Contractor initiative is through the creation of a trade contractor certification program. The program is open to all building trades that meet the requirements of the quality system and abide by the NAHB Research Center, Inc.'s, certification guidelines.



Certification qualification involves a full-day qualification audit of quality records, employee interviews, and jobsite verification of quality policies and procedures. Ongoing certification requires annual audits starting six months after initial qualification.

Additional information is available from the NAHB Research Center, Inc.⁴

"Nothing is mandatory, but in an ever-increasingly competitive market, builders who expect quality will find value in a certified framer focused on and committed to quality."
Frank Serpa, Schuck and Sons Construction Company, Inc.

4.4 Resources and Information

There are a number of resources available to builders and trade contractors on the quality system and its implementation, and on new developments.

- Publications, including manuals, guides, case studies, and articles related to the quality system, will be available from the NAHB Research Center, Inc. (www.nahbrc.org or 800-638-8556), and from the U.S. Department of Housing and Urban Development.⁵
- Quality and building technology questions are answered at no charge by the NAHB Research Center, Inc.'s, ToolBase Hotline (www.toolbase.org or 800-898-2842).
- Seminars will be presented at the International Builders Show, regional builder shows, and local home builder associations.⁶
- Quality articles relevant to the quality system will continue to be published in the *ToolBase News*,⁷ the *Fieldworks*⁸ newsletter, the *Pathways*⁹ newsletter, and *Professional Builder*¹⁰ magazine.
- ToolBase webpages and free subscriptions to the ToolBase email news will keep interested parties informed (www.toolbase.org).

⁴ Contact the NAHB Research Center, Inc., at bhill@nahbrc.org, www.nahbrc.org, or 301-430-6237.

⁵ Contact the HUD Department of Policy Development and Research at www.huduser.org or 800-245-2691

⁶ Seminar schedules will appear at www.nahbrc.org. Local home builder associations considering a seminar should contact ecaldeira@nahbrc.org or 301-430-6310.

⁷ *ToolBase News* is published quarterly by the NAHB Research Center and distributed free to NAHB members by local home builder associations and is available online at www.toolbase.org.

⁸ *Fieldworks* is published by the HUD Department of Policy Development and Research. Contact www.huduser.org or 800-245-2691.

⁹ *Pathways* is published by the Partnership for Advancing Technology in Housing. Contact www.pathnet.org or 202-708-4277.

¹⁰ *Professional Builder* magazine is published monthly. Contact www.housingzone.com or 847-635-8800.



5.0 All-Tech Construction, Inc.

"I think our company has always had a reputation for being the best at what we do in our market.... We had achieved a record year in sales and profitability, but we also noticed some trends like our service calls that are increasing disproportionately. We felt that size and volume were creating problems."
*Jalsa Urubshurow, President,
All-tech Carpentry Contractors*

Implementation of the quality assurance system began in June 1999. The quality assurance system became fully operational in May 2000.

On February 1, 2001, All-tech Carpentry Contractors became one of the first three framing contractors to be certified by the NAHB Research Center, Inc.

5.1 Company Profile

Area served	New Jersey, New York, and Pennsylvania
Type of homes	Multi- and single-family homes \$175,000 to more than \$1,000,000
Services	Carpentry contractor
Workforce	70 employees 400–500 carpenters in contracted crews organized by phases of framing
Other	All crews are independent contractors Stick-built construction

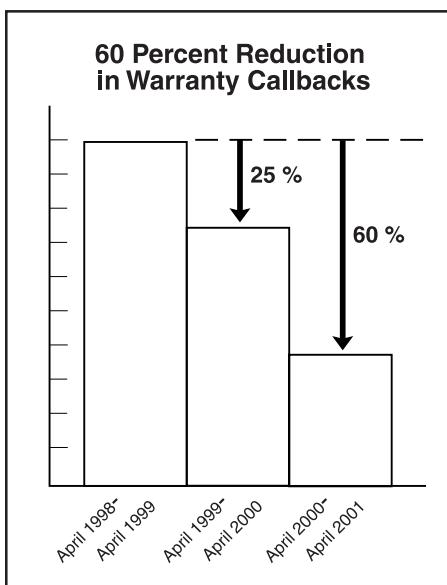
5.2 Benefits and Results

*"We're already feeling the success. We've had dramatically improved customer relations." Jalsa Urubshurow,
All-tech Carpentry Contractors*

The NAHB Research Center, Inc., measured and analyzed business performance before and then one year after installation of the quality assurance system. The following areas showed significant improvements:

Warranty Callback Reduction

All-tech Carpentry Contractors has experienced a 60 percent reduction in warranty callbacks. The warranty items per home were tabulated for one year before implementation of the quality system and for the year after the quality system became operational.



Warranty Reduction

"We've already reduced our service calls by half...so for it to produce that kind of result during its implementation is a pretty amazing thing. The decrease in warranty tickets not only saved on field man hours, it also made fewer administrative hours needed to schedule appointments, and most importantly increased homebuyer satisfaction." Jalsa Urubshurow and Don Perrin, All-tech Carpentry Contractors

Prevention of Quality Problems

Detailed framing inspections revealed a reduction in observed quality problems. Before implementation of the quality system, the project team made a detailed framing inspection of two homes. From the observations, the team identified a baseline of the ten most important quality issues.

One year after implementation, only two of the ten baseline quality issues were observed during detailed framing inspections of two homes in the same community. Eight of the ten original quality issues were not observed.

Builder field inspection records confirm a reduction of the ten baseline quality issues. The NAHB Research Center, Inc., reviewed the builder's framing inspection records for seven homes in the same community. The builder inspections observed only one of the baseline quality issue in two homes. None of the other nine quality issues was evident.

The same builder's corporate quality assurance specialists performed independent inspections of 16 homes in the same community over a period of three weeks. Only one of the original ten quality issues appeared in one home. None of the other nine quality issues was evident.

Improved Productivity

Despite escalating regional labor carpenter costs, contract pricing on renewed bids and profitability remained at current levels. In comparison, most recent U.S. Department of Labor¹¹ cost data for carpenter labor increased by more than 7 percent.

Company management cites improved labor productivity as the main reason for cost containment. Productivity improvements have offset rising labor costs as well as any additional costs of operating the quality system.

¹¹ U.S. Department of Labor, *National Occupational Employment and Wage Statistics*. New Jersey carpenter mean hour rates 1999 and 1998.



Builder Satisfaction

Overall, builder satisfaction survey ratings rose from an average rating of 72 points in 1999 to 86 points in August 2000.

"One of our large customers does composite surveys...they'll survey several projects that we're on and come up with a composite score. Their evaluation of us had dropped before our involvement in the quality initiative with the NAHB Research Center...we had dropped into the mid-70s. This past winter we received 97 percent after we were involved in this program. It was a dramatic change." Jalsa Urubshurow, All-tech Carpentry Contractors

K. Hovnanian, a large national home builder, awarded its 2000 Excellence Award to All-tech Carpentry Contractors for outstanding achievement.



K. Hovnanian Achievement Award

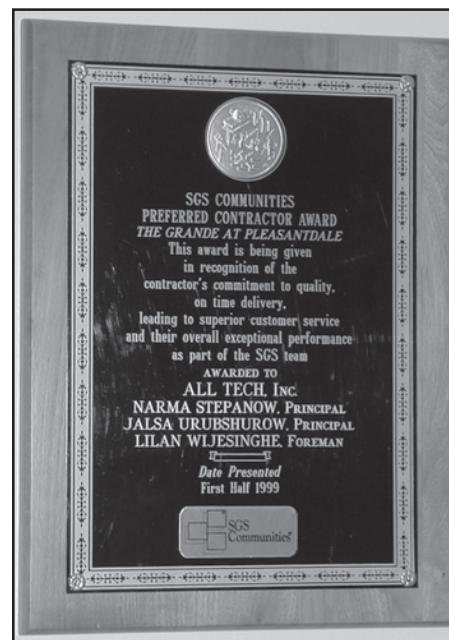
All-tech Carpentry Contractors also received the SGS Communities 1999 Preferred Contractor Award for commitment to quality, delivery, and overall exceptional performance. SGS Communities is a New Jersey division of D.R. Horton, a national builder.

Pulte Delaware Valley Division awarded All-tech Carpentry Contractors its 1999 Contractor-of-the-Year Award. Pulte Corporation is a large national builder.

"We have seen significant improvement from our builder surveys, and our reputation for building a quality house has grown. I now have national home builders pursuing me, and I feel the program has definitely given me a competitive edge."
Jalsa Urubshurow, All-tech Carpentry Contractors



Pulte Contractor-of-the-Year Award



SGS Communities Preferred Contractor Award

Workforce Development

"We've got really great, wonderful people. That's how we were able to get to where we are in our market. I think that's a common factor when I look around and see other successful framers and people who do what we do. It's the people. It always is. A lot of companies, I think, forget that." Jalsa Urubshurow, All-tech Carpentry Contractors

There has been more training of field personnel in the last year than ever before. Recent hotspot topics include

- framing details for top plate breaks in bearing walls;
- glue and nail decking for flush girders in TJI floor systems;
- vertical full sheets for exterior corner sheathing;
- tape measuring of the first row of roof sheathing; and
- 12-inch minimum bearing for double rim board over basement windows.

"The full effect of the quality program has yet to be realized. Since the certification program was completed on February 1, 2001, it is an ongoing process for which the benefits should continue to grow for us as a company and our builder clients." Jalsa Urubshurow, All-tech Carpentry Contractors



Jobsite Training



5.3 Implementation of the Quality System

Before implementation of the system, All-tech Carpentry Contractors performed many of the activities required by the quality system. Therefore, implementation focused on formalizing the activities, performing them on a regular basis, and documenting results.

To establish the quality assurance system, the All-tech Carpentry Contractors operations manager and vice president of operations, K. Hovnanian (builder), and the NAHB Research Center, Inc., collaborated to provide a detailed quality plan.

A two-person team led the implementation of the quality assurance system. The operations manager adapted the system to the specific needs of the company. The vice president of operations was appointed as the company quality representative and led implementation of the system in field operations.

"We had an operations manager who actually was an ISO 9000 auditor, so that was very helpful. He joined us before this initiative. It is kind of interesting that that happened—it was a coincidence. We had hired this gentleman to be a manager of our operations; this initiative came along so we were able to let him focus on it. Plus one of our vice presidents of operations was assigned to the quality control project to take ownership of our involvement.... So here was a gentleman who knew operations; knew the system; was familiar with ISO 9000, coupled with our 25-year veteran of the industry who kind of led this into the field."
Jalsa Urubshurow, All-tech Carpentry Contractors

Appointment of a Quality Representative

Overall, the responsibilities of the quality representative did not change substantially. He was responsible for the quality of field operations and was a chief decision maker on field quality issues. He performed job audits on a regular basis as part of his normal duties. Now, field review observations are recorded on a form, whereas they were not documented before system implementation.



All•tech, Inc. Quality Statement

All•tech, Inc.'s quality statement is to be an innovative industry leader, totally committed to customer satisfaction, employee satisfaction, integrity and teamwork. We are committed to the workmanship quality, performance, and durability of all constructed products and strive to build all our homes defect free. To this end, we pledge:

- Compliance with applicable construction codes, regulations, safety requirements, and good workmanship practices.
- Contract requirements will be fulfilled in their entirety
- All crews will work under the direction of an on-site qualified Supervisor
- QA system policies and procedures will be followed at all times
- Continual improvement toward the prevention of defects

Quality is everyone's responsibility. All employees have a personal responsibility to ensure their own safety and the safety of others. All employees have a personal responsibility for the quality of their work and to:

- Use only approved materials and construction procedures.
- Materials or equipment must be in good condition.
- Prevent potential problems that may adversely affect safety or quality.
- Stop work if conditions are unsafe.

Supervisors are responsible to ensure that:

- Employees are capable of performing assigned tasks.
- Work activities comply with approved materials.
- Only approved materials and equipment are used.
- Job inspection records accurately record job activity.
- Each job meets good workmanship practices, contract, code, regulatory, and quality system requirements.
- The builder is notified of any unresolved nonconformance remaining at the completion of the job.

President

Quality Representative

Date

Date

Quality Statement

Among the first activities was formulation of a company quality statement that articulated the importance of quality to the organization and outlined the quality responsibilities of all employees.

The company president introduced the quality policy to area supervisors at a weekly production meeting. The area supervisors then reviewed the quality policy with each field crew at a weekly toolbox talk. The reviews brought together employees as well as independent contractors. Copies of the quality policy were inserted into the pay envelopes of all employees and included with payments to all independent contractors.

Quality Statement



Lists of Qualified Crew Foremen

It was common practice to assign crews to specific phases of framing based on demonstrated capabilities. The process was formalized by listing the names of the foremen and the types of crews they were qualified to lead.

NAME	LAYOUT		FRAMING		ROOF TRUSS		SHEATHING		BLOCKOUT FASCIA	
	Crew Leader	Foreman	Crew Leader	Foreman						
Luis A			X				X		X	
Basan B	X		X		X		X		X	
Fernando B	X	X	X	X	X	X	X	X	X	X
Lonny B	X	X	X	X	X	X	X	X	X	X
John C	X	X	X	X	X	X	X	X	X	X
Jeff C	X	X	X	X	X	X	X	X	X	X
John C	X	X	X	X	X	X	X	X	X	X
Rick C	X	X	X	X	X	X	X	X	X	X
Felix G	X		X	X	X	X	X	X	X	X
Patricio G									X	
Fernando G			X	X			X	X	X	X
Tom H	X	X	X	X	X	X	X	X	X	X
Ladislav H	X		X	X	X		X	X	X	X
Khyen I	X	X	X	X	X	X	X	X	X	X

Qualified Foreman List

Lists of Standard Materials

Builder scopes of work and architectural drawings specify most materials. However, some clients do not have well-defined specifications. Accordingly, the quality representative compiled a comprehensive list of approved materials. Approved materials were specified at the lowest level of detail that produces quality results.

Material/ Equipment	Approved Use and Placement		Specification	Installation Method	Source of Requirements
	As Needed				
Nail Guns	As Needed		Select make of choice. Guns may not be modified.	Manufacturers use instructions.	
Circular Saws	As Needed		Select make of choice. Saws may not be modified.	Manufacturers use instructions	
Hammers	As Needed		Select hammer of choice.	Standard practice.	
Ladders	As Needed		Type 1 250 pound duty rating.	Manufacturers use instructions affixed to ladder.	
Hardhats	Worn at all times by everyone.		ANSI Z89.1-1997	N/A	
Eye Protection	Worn at all times by everyone when there is potential for flying debris.		High impact protection. ANSI Z94.3/Z87.1	N/A	
Footwear	Worn at all times by everyone.		Hard-soled work boots must be worn. Allowable Exception: Roof sheathers working on the roof and framers walking on tops of trusses and top plates may wear sneakers.	N/A	

Approved Materials List



Regulatory Requirements

The quality assurance system references the applicable sections of the national building codes and the *New Jersey Regulations Governing New Home Warranties*.

Workmanship Performance Tolerances

Before implementation of the system, All-tech Carpentry Contractors relied on an array of important performance tolerances documented in a 17-page publication entitled *All-tech Standard Operating Procedures for the Field*.

The quality representative created a set of workmanship tolerances to supplement the manual.

Unless superseded by builder specifications, the operating manual and the workmanship tolerances serve as default specifications.

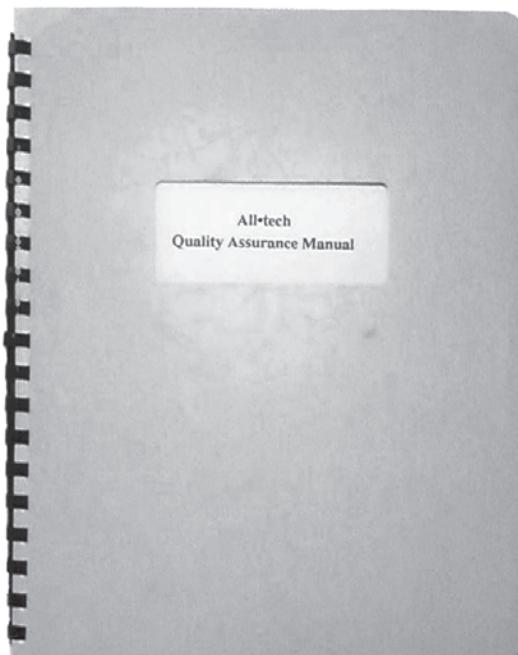
Quality Manual

The above items were assembled into the "All-tech Quality Manual."

"Like any other initiative, you've got to have another layer or another tier...or team that will come in and make sure that those checklists are being done properly and that has to be regular. Just like you get certified as a framer, you've got to have a review and then people come in and do audits. That's to make sure that the process continues and is adhered to and continues." Jalsa Urubshurow, All-tech Carpentry Contractors

10. Marking out plates.
Mark out studs 16" O.C. or 2' O.C. as specified by the Foreman.
When conventional framing studs must line up with the floor joist below.
Place studs under every 2nd plate break.
Place studs for pt. loads as marked.
Mark all king studs and liners for door and windows as marked.
Place studs for the medicine cabinets, tub nailers and tub diverters.
Mark out the top of the plates for the floor joist.
In a two or more story building, framers should make all studs, floor beams and ceiling beams line up on top of each other from the ground to the ceiling to the roof.

Standard Operating Procedure



Quality Manual



5.4 Operation of the Quality System

The system became fully operational in May 2000 as verified by a quality assurance system review. In September 2000, the NAHB Research Center, Inc., performed a full-day certification audit of quality records, interviewed employees, and verified jobsite quality assurance policies and procedures.

Job Inspections

All-tech Carpentry Contractors area supervisors perform inspections on each home. They are responsible for all framing crews working in a community and approve the completion of each phase of framing construction.

"There were no real substantive changes in the true scope of work for our field personnel. It provided a systematic approach to the accomplishment of these duties, and compliance that could be tracked, creating true accountability." Jalsa Urubshurow, All-tech Carpentry Contractors

An area superintendent performs a foundation condition inspection before framing layout begins. Dimensions, square, flatness, and straightness are verified, as are hotspot problem areas. Problems that arise are documented on the foundation condition report and then reported to the builder's superintendent. If job-ready conditions are violated, builder or quality representative instructions for proceeding are recorded. Work proceeds only when problems have been resolved.

All•tech Foundation Condition Report

1095 Cranbury-South River Road, Suite 21
Jamesburg, New Jersey 08831
(609) 860-8790 fax (609) 860-9530

Builder/Customer _____
Community _____
Tel # _____
Fax # _____

Attn: _____
CC: _____

This document hereby serves to notify you of the deficiencies that All•tech has encountered with regard to the foundation of the building listed below.

As a reminder, All•Tech's scope on foundations is as follows:

All•Tech is responsible for squaring and performing a visual inspection of the foundation or slab. All•Tech can not determine the levelness of the foundation or slab. All•Tech will inform the builder representative of any visual dips, humps or dimensional problems. Upon receipt of this information it is the responsibility of the builder to instruct All•Tech on how to proceed.

Date Checked _____ Building/Lot/Unit _____ Model/Elev. _____
Notified _____ Date Notified _____ Mason _____

FOUNDATION PROBLEM(S)

Overall dimension Girder pockets High spot(s) Footings Slab not poured
 Out of square Low spot(s) Piers Not back-filled Garage Slab

Other: _____

All•tech Forema _____ Date _____

Please respond by checking the appropriate course of:

COURSE OF ACTION

Stop Work All•Tech to Repair
 Mason to Repair Issue Work Order

Other: _____

Foundation Condition Report

"It was not an overnight acceptance by any means. It involved a higher level of accountability and more work in some ways—administrative work and checklists and things of that nature." Jalsa Urubshurow, All-tech Carpentry Contractors



The inspection forms are a modification of the existing production status reporting form. A single form documents inspection results, updates production status, and automatically initiates payment to the independent contractor that performed the work.

"It is more scrutiny and there's more paperwork than the way we were doing it before, which also had paperwork, but not as focused. We revamped our entire billing system. [We] linked the approval of their payments to the quality control checklist. A subcontractor will not get paid unless that supervisor running that project has checked his work."

Jalsa Urubshurow, All-tech Carpentry Contractors

Initially, crew foremen did not formally inspect their own work. Instead, they were concerned only with repairing problems identified by the supervisor. The process changed, however, when the evaluation of crew performance focused on first-time quality rather than simply on the completion of punch-out items. Under these circumstances, most crews chose to self-inspect in anticipation of the supervisor review.

Jobsite _____		Start Date _____			
Lot Number _____	Unit Number _____	Inspected By _____			
Model _____	Elev. _____	Foundation (Circle one)	Slab Full W/O English Daylight		
1ST FLOOR DECK Subcontractor _____		2ND FLOOR DECK Subcontractor _____		3RD FLOOR DECK Subcontractor _____	
<input type="checkbox"/> Joist or Trusses Complete <input type="checkbox"/> Columns Installed <input type="checkbox"/> Beams Nailed & Correctly <input type="checkbox"/> Steel Shims Installed <input type="checkbox"/> Straps Nailed Correctly <input type="checkbox"/> Bolts Installed Correctly <input type="checkbox"/> Studs Nailed & Correctly <input type="checkbox"/> Siding Nailed & Glued Correctly & Complete <input type="checkbox"/> Stair Wall Rails <input type="checkbox"/> Stair Well Covered <input type="checkbox"/> Safety Rails Installed Correct & Complete <input type="checkbox"/> Steps Nailed & Tied @ End <input type="checkbox"/> Squash Blocks Installed Correctly & Complete <input type="checkbox"/> Point Loads Checked <input type="checkbox"/> Bridging Installed Complete <input type="checkbox"/> Hangers Installed & Complete <input type="checkbox"/> Nails Installed Complete <input type="checkbox"/> Draft Steps Installed <input type="checkbox"/> Check Frame w/D Sheet <input type="checkbox"/> Clean-Up Complete <input type="checkbox"/> Hardhats Worn		<input type="checkbox"/> Joist or Trusses Complete <input type="checkbox"/> Grids Installed Correctly <input type="checkbox"/> Columns Nailed & Glued Correctly & Complete <input type="checkbox"/> Stair Wall Rail <input type="checkbox"/> Stair Well Covered <input type="checkbox"/> Safety Rails Installed Correct & Complete <input type="checkbox"/> Steps Nailed & Tied @ End <input type="checkbox"/> Squash Blocks Installed Correctly & Complete <input type="checkbox"/> Point Loads Checked <input type="checkbox"/> Bridging Installed Complete <input type="checkbox"/> Hangers Installed & Complete <input type="checkbox"/> Nails Installed Complete <input type="checkbox"/> Draft Steps Installed <input type="checkbox"/> Check Frame w/D Sheet <input type="checkbox"/> Clean-Up Complete <input type="checkbox"/> Hardhats Worn		<input type="checkbox"/> Joist or Trusses Complete <input type="checkbox"/> Grids Installed Correctly <input type="checkbox"/> Columns Nailed & Glued Correctly & Complete <input type="checkbox"/> Stair Wall Rail <input type="checkbox"/> Stair Well Covered <input type="checkbox"/> Safety Rails Installed Correct & Complete <input type="checkbox"/> Squash Blocks Installed Correctly & Complete <input type="checkbox"/> Point Loads Checked <input type="checkbox"/> Bridging Installed Complete <input type="checkbox"/> Hangers Installed & Complete <input type="checkbox"/> Nails Installed Complete <input type="checkbox"/> Draft Steps Installed <input type="checkbox"/> Check Frame w/D Sheet <input type="checkbox"/> Clean-Up Complete <input type="checkbox"/> Hardhats Worn	
1ST FLOOR FRAME Subcontractor _____		2ND FLOOR FRAME Subcontractor _____		ROOF SYSTEM Subcontractor _____	
<input type="checkbox"/> Walls Installed Per Specification <input type="checkbox"/> Headers & Lintel Nailed Correctly <input type="checkbox"/> All Openings Installed Per Plan <input type="checkbox"/> Rough Openings Correct <input type="checkbox"/> Walls Braced & Sided Properly <input type="checkbox"/> Nails Installed Correctly <input type="checkbox"/> Gable End Bracing <input type="checkbox"/> Clean-Up Complete <input type="checkbox"/> Hardhats Worn		<input type="checkbox"/> Walls Installed Per Specification <input type="checkbox"/> Headers & Lintel Nailed Correctly <input type="checkbox"/> All Openings Installed Per Plan <input type="checkbox"/> Rough Openings Correct <input type="checkbox"/> Walls Braced & Sided <input type="checkbox"/> Nails Installed C <input type="checkbox"/> Gable End Bracing <input type="checkbox"/> Clean-Up Cr		<input type="checkbox"/> Walls Installed Per Specification <input type="checkbox"/> Headers & Lintel Nailed Correctly <input type="checkbox"/> All Openings Installed Per Plan <input type="checkbox"/> Rough Openings Correct <input type="checkbox"/> Walls Braced & Sided <input type="checkbox"/> Nails Installed C <input type="checkbox"/> Gable End Bracing <input type="checkbox"/> Clean-Up Cr	

Inspection Form

"Anytime someone is held accountable, it can feel uncomfortable, that's just life—that is a normal, human thing to do. The reality is that in time... quickly... compared to what I might have thought it could take, people accepted that responsibility because they ultimately had it anyway. All we were doing is refining the way [we use] systems to identify who is responsible. To some degree a little more under the magnifying glass."

Jalsa Urubshurow, All-tech Carpentry Contractors



Quality Improvement and Training

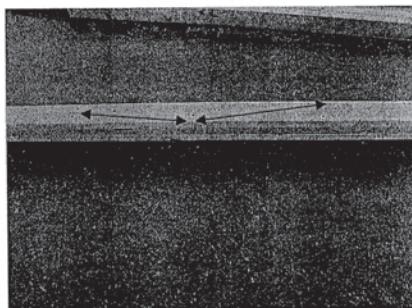
After the review of inspection trend data, hotspot training is introduced as a periodic agenda item at Monday production meetings.

"After reviewing the trend data, we discuss the problem areas with our supervisors. Training sheets are developed for foremen to use when they discuss quality practices in weekly toolbox talks with their crews. The focus on quality is the same as our focus on safety; we take this very seriously, and our end goal is to produce a zero-defect home." Narma Stepanow, vice president, All-tech Carpentry Contractors

In a hotspot session, the vice president of operations leads a discussion on the hotspot and hands out a single-page training sheet. Front and back are identical except that the text is in English on one side and in Spanish on the other. The sheets are produced in-house with the use of a digital camera and Microsoft Word.

Hotspot training requires crews to change what they have been doing to conform to a documented best practice. Most crews have responded well, but some have been reluctant to improve their practices. After several warnings without a response, several crews have been severed from the company.

Double, Triple Stud Nailing



- Double and triple studs will be nailed on both sides every 16" staggered.

Hotspot Training Sheet

One area supervisor coined the term “feed and weed,” a twist on a tag line for lawn care products. He explained that hotspot training nourishes good crews, permitting them to grow and get better. At the same time, it weeds out undesirable crews that do not seem to care. Before, they were able to hide, but not anymore.

"This is a good thing. It makes my life easier. I used to have to go back to the same crews for the same things all the time." Area supervisor, All-tech Carpentry Contractors



5.5 Future Plans

All-tech Carpentry Contractors management reports that many of the quality system benefits come from the hotspot quality improvement process. All-tech plans to focus future efforts on increasing the frequency of quality hotspot improvements and related field training.

"Now the greatest challenge is to keep refining it, to sustain it, and to keep people proactive about it." Jalsa Urubshurow, All-tech Carpentry Contractors

5.6 Contact

Jalsa Urubshurow, president
All-tech Carpentry
Contractors
1095 Cranberry South River Rd.,
Suite 21
Jamesburg, NJ 08831
609-860-8790



6.0 Del Webb's Contracting Services

"For years, Del Webb's Contracting Services has been a leader in innovation and quality. We were interested in applying this system because we felt it would strengthen our existing quality procedures and help us keep our competitive advantage. It was easy to implement and didn't take a lot of staff resources or money given the payback—a system that allows you to identify problems right away." Hank Zolkiewicz, General Manager, Del Webb's Contracting Services

Implementation of the quality assurance system began in June 1999. The system became fully operational in May 2000.

On February 1, 2001, Del Webb's Contracting Services became one of the first three framing contractors to be certified by the NAHB Research Center, Inc.

6.1 Company Profile

Area Served	Phoenix, Arizona, metropolitan area
Type of homes	Single-family homes \$115,000 to more than \$500,000
Services	Carpentry contractor In-house open panel plant
Workforce	70 employees organized by phases of framing and trim
Other	500 homes per year division of a home builder all crews are company employees

6.2 Benefits and Results

"We have definitely seen an increase in the quality of the homes we build. Fewer write-ups, and rarely do we get a red tag or turn down from the city inspector." Hank Zolkiewicz, Del Webb's Contracting Services

The NAHB Research Center, Inc., measured and analyzed quality performance before and then one year after implementation of the quality system. The following areas showed significant improvement:

Quality Improvement

Quality correction items were reduced by 54 percent. The NAHB Research Center, Inc. , reviewed builder superintendent inspection data for the six months before implementation and 12 months following implementation.

"It showed the inconsistencies we had from one framing crew or even from one individual to the next on how the houses are put together. It made us start framing in a more consistent manner...how many nails are used, what kind of spacing, to get some consistency in how we frame from one house to another and from one individual to the next." Hank Zolkiewicz, Del Webb's Contracting Services

Improved Productivity

Despite regional carpenter labor wage increases, contract pricing on renewed bids and profitability remained at current levels.

In comparison, the most recent U.S. Department of Labor¹² cost data for carpenter labor increased by more than 12 percent.

"There is no additional direct job cost incurred. The focus is primarily on the administration and may actually end up costing less in the long run." Hank Zolkiewicz, Del Webb's Contracting Services

The company's overall average wage rate was reduced by more than \$1 per hour over the study period. The increased supervisor wages were offset by the hiring of lower-wage carpenters. Del Webb's Contracting Services management explained how the company could hire lower-wage carpenters and increase quality.

- Weekly training in toolbox talks helped improve skills at an accelerated rate.
- Orientation training on past hotspots helped new hires avoid past problems.
- Increased foreman accountability for quality results encouraged mentoring of new crewmembers.

¹²U.S. Department of Labor, *National Occupational Employment and Wage Statistics*. Arizona carpenter mean hour rates 1999 and 1998.



- The panel assembly operation provided a structured environment that permits beginning carpenters to learn basic carpentry skills as well as gain familiarity with field training topics.

Cost reductions have also been documented in other areas

- Overhead costs decreased by 5 percent.
- Preclosing framing correction problems decreases by 16 percent.
- Postclosing warranty costs decreased by 5 percent.

100 Percent Builder Satisfaction

Del Webb's Contracting Services consistently receives 100 percent builder satisfaction survey ratings. Even before system implementation, Del Webb's Contracting Services enjoyed a history of high satisfaction ratings. The quality system helped make the excellence ratings more reliable.

Builder superintendents at Dell Webb's Contracting Services Sun City Grand rate all trade contractors every month on their quality performance. Although Del Webb's Contracting Services is a captive supplier, it is rated alongside all trade contractors by identical criteria.

"We got involved because Del Webb's Contracting Services has always wanted to do a better job on the quality of the product that they deliver to the customer." Hank Zolkiewicz, Del Webb's Contracting Services

Enhanced Workforce Development

Del Webb's Contracting Services has increased in-house training as part of its quality program. Before quality system implementation, quality training was presented on an as-needed basis. Only safety training occurred regularly. Now, employees receive weekly training on safety, trade abuse, and hotspot quality issues as part of the normal business process.

New employees receive orientation training and use the weekly toolbox training materials. This accelerates the learning process and helps apprentices achieve higher levels of performance sooner than on-the-job mentoring alone.

"When they have new people on their crew, they are also learning about the way things should be framed to builder requirements. From one crew and one person to the next, we are all reading from the same book." Hank Zolkiewicz, Del Webb's Contracting Services

Cycle Time Reduced

Framing cycle time per home was reduced from six days to 4.5 days, a 25 percent improvement. The contractor considers the quality system as a contributing factor in conjunction with tighter scheduling and better communications. Del Webb's Contracting Services cites the following reasons the quality system was a factor in the cycle time reduction:

- accountability for "doing it right the first time";
- less pick-up that allows for tighter scheduling; and
- fewer punch-out items at framing final inspection.

6.3 Implementation of the Quality System

Before implementation of the quality assurance system, Del Webb's Contracting Services was performing many of the activities required by the system. Therefore, during the study period, implementation focused on formalizing activities, performing them on a regular basis, and documenting results.

"As far as getting the project going...for us it wasn't too bad because we had a lot of computer reports already available to us that we enhanced a little bit without creating a huge burden for anybody." Hank Zolkiewicz, Del Webb's Contracting Services

To establish the quality assurance system, the general manager and the NAHB Research Center, Inc., collaborated to provide details required by the quality plan.

"Then we took the overall program and customized it for our geographic area and how we do business.... We took the entire program and condensed it into a user-friendly foreman's version." Hank Zolkiewicz, Del Webb's Contracting Services



Appointment of Quality Representatives

The general manager appointed two area superintendents as quality representatives. Each representative manages a different division of the framing company. One manages panel fabrication, the other field operations. The appointments formalized the representatives' responsibility for the operation and effectiveness of the quality system.

Two general field superintendents had been performing regular job audits as part of their normal duties. Under the pilot study, the Division Manager charged them with the authority to perform independent job reviews through a memorandum.

The most significant change in the area superintendents' scope of responsibilities was the requirement to record their field inspections. Superintendents had always performed field surveys as part of their normal job duties. Now they record their observations on a form.

DEL WEBB'S CONTRACTING SERVICES
QUALITY REPRESENTATIVES

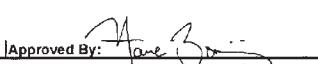
THE FOLLOWING INDIVIDUALS HAVE BEEN APPOINTED QUALITY REPRESENTATIVES

KEVIN JUDD
ED RUSSELL

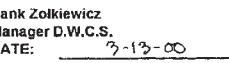
Who, irrespective of other responsibilities, are accountable to:

- * Ensure overall effectiveness of the quality system
- * Ensure company wide performance of the quality system requirements
- * Report to senior management on performance of the quality management system, including needs for improvement
- * Act in the capacity of liaison with parties outside of the company on matters relating to quality
- * Ensure awareness of customer requirements throughout the organization

The QUALITY REPRESENTATIVE will assure that adequate resources are available for management, performance work, and verification activities that affect quality results and the effectiveness of the QUALITY SYSTEM.

Approved By: _____ Approved By: 

GREGG YENSON
V.P. CONSTRUCTION
DATE:  3/13/00

Hank Zolkiewicz
Manager D.W.C.S.
DATE:  3-13-00

Quality Representative Approval Letter

"The quality representatives had to do more documentation and be more accountable so that they could use that information in doing their appraisals of the foremen and their crews...they were more detailed and conscientious."
Hank Zolkiewicz, Del Webb's Contracting Services



DEL WEBB'S CONTRACTING SERVICES, INC.

Creating Quality and Value in our Products and Service

Quality Statement

Our company is committed to the workmanship quality, performance and durability of the constructed product. To this end we pledge:

- Compliance with applicable construction codes, regulations, safety requirements and good workmanship practices.
- Contract requirements will be fulfilled in their entirety.
- All crews will work under the direction of an on-site qualified foreman.
- QA systems policies and procedures will be followed at all times.
- Continual improvement toward the prevention of defects.

Quality Responsibilities

Quality is everyone's responsibility. All employees have a personal responsibility to:

- Use only approved materials and related construction procedures.
- Never use defective or damaged materials or equipment.
- Prevent and/or report potential quality and safety problems.
- Stop work in the affected area if continuing work in that area may be unsafe.

The foremen have additional responsibilities to ensure that:

- Employees are capable of performing assigned tasks.
- Work activities comply with approved materials.
- Only approved materials and equipment are used.
- Job inspection records accurately record job activity.
- Each job meets good workmanship practices, contract, code, regulatory, and quality system requirements.
- The builder and appropriate trade contractor is notified of any unresolved non-conformances remaining at the completion of the job.

Manager

5-30-00
date

Quality Representative

5-30-00
date

Quality Statement

The Del Webb's Contracting Services quality statement explains, in English and Spanish, the company's quality objectives and the personal quality responsibilities of all employees. Copies of the quality statement were framed and posted in the company's main office and in the panel yard office.

The general manager reviewed the quality statement with superintendents and foremen at a series of production meetings. The foremen distributed copies of the quality statement to all crewmembers and reviewed the policy during jobsite toolbox talks. All personnel signed a log after receiving the quality statement.

"We had a training session for the foreman to go over the entire program, and then over their specific parts that have to do directly with them. The foremen took it to their crewmembers at the toolbox sessions." Hank Zolkiewicz, Del Webb's Contracting Services

Quality Statement



List of Qualified Crew Foremen

Each quality representative uses a foreman's evaluation form to assess 18 criteria that address a crew foreman's knowledge and demonstrated skills for each of six types of crews.

Del Webb's Contracting Services
Foreman Qualification Verification

Name: _____ Verification Date: _____

Phase							
	Layout	Panel	Yard	Ext. Walls	Interiors	Roof Crew	Q.A.
Knowledge							
Safety Procedures							
Work Procedures							
Company Quality Statement							
Control of non-conformances							
Quality System Requirements							
Requirements & Regulations							
* Building Codes							
* Exhibit B							
* State Registrar Regulations							
Schedule							
Blueprint Reading							
Proper use of Tools & Equip.							
Demonstrated Skills							
Safe Work Habits	N/a	n/a	n/a	n/a	n/a	n/a	
Applies the Company Quality Statement	N/a	n/a	n/a	n/a	n/a	n/a	
Applies the Company Values	N/a	n/a	n/a	n/a	n/a	n/a	
Workmanship	N/a	n/a	n/a	n/a	n/a	n/a	
Achieve Reliable Results	N/a	n/a	n/a	n/a	n/a	n/a	
Hardware Application	N/a	n/a	n/a	n/a	n/a	n/a	
Job Site Cleanliness	N/a	n/a	n/a	n/a	n/a	n/a	
Total Points							
Exceeds standards =	3						
Meets standards =	2						
Needs Improvement =	1						
Unacceptable =	0						

A minimum of 28 points is required to qualify a foreman for a given phase.

Signature _____

Foreman Verification Form

When a foreman meets all criteria for a specific crew type, the individual's name is entered on a qualified foreman list. A similar form is used to list qualified independent contractors.

Del Webb's Contracting Services, Inc.

Qualified Foreman List

Foreman Name:	Qualification Phases:	Approved By:	Date:
Gregory B	Layout, Q.A.	Ed Russell	06/19/2000
Brandon C	Exterior, Roof	Ed Russell	06/19/2000
Bob B	Interior	Ed Russell	06/19/2000
Robert G	Roof, Exterior	Ed Russell	06/19/2000
Leslie H	Interior	Ed Russell	06/19/2000
John K	Roof	Ed Russell	06/19/2000
Tracy L	Panel, Interior, Q.A.	Ed Russell	06/19/2000
Rickey L	Layout, Q.A., Exterior, Roof, Interior	Ed Russell	06/19/2000
Jose G M	Roof	Ed Russell	06/19/2000
Carmelo M	Roof	Ed Russell	06/19/2000
Gregorio S	Roof	Ed Russell	06/19/2000
Jeff Y	Exterior, Interior	Ed Russell	06/19/2000

Qualified Foreman List



List of Approved Materials

II. MATERIAL SPECIFICATIONS:

- A. Wall Framing - Stud grade framing material shall be S4S. Lumber stamped "Utility" or not stamped will not be acceptable.
 - 1. Studs and trimmers shall be surface-dried 19% moisture content or less stud grade or better, utility grade or "No Stamp" will not be acceptable.
 - 2. Plates, cripples, sills, bracing, backing, and fire blocking shall be surface-dried 19% moisture content or less kiln-dried White Fir or Hemlock. Furdown rails will be kiln-dried Pine and joists kiln-dried Hem-fir. Exterior and interior bottom plate shall be treated as per code. All 2 x 6 and 2x4 exterior walls shall be constructed with 16" o.c. stud spacing and double top plate.
 - 3. Window and door headers shall be surface-dried 19% moisture content or less White Fir No. 2 or Glu-Lam beams as required by load bearing and plans.
 - 4. Box or truss beams may be substituted for dimensional beams at door and window headers. All box beams shall be first approved by Webb. Prior to such approval, however, raised seal engineering by a State of Arizona Certified Engineer shall be provided to Webb as proof of structural integrity.
- B. Roof Systems
 - 1. Joists and rafters shall be as required by City of Surprise Building Code (UBC).
 - 2. Truss material shall conform to truss engineering requirements in accordance with local, state and FHA specifications. Trusses shall be fabricated by an approved manufacturer. Truss pitches shall be as per plans for roof profile and interior vault (scissor truss) effect.
 - 3. For semi-custom changes to roof structure, roof drawings (provided by Del Webb) will be required to be engineered and stamped and returned to Del Webb for submittal to governmental agency for permitting.
 - 4. 7/16" OSB sheathing shall be APA approved (15/32" or flat Decks).
 - 5. Framing for soffits and venting as per plan.
 - 6. Framing contractor to provide all backing and blocking for lath to assure correct installation of foam and wire lath, which should be determined by the lathing contractor and added to the plans as required.
- C. Rough Hardware
 - 1. Miscellaneous rough hardware shall be supplied and installed as required by Plans and City of Surprise Building Codes. Rough hardware anchors, ties and straps shall be as manufactured by Simpson Company, Silver Metal Products, Inc. or equal.

Material Specifications List

Builder scopes of work and architectural drawings specify most materials. Del Webb's Contracting Services supplemented the builder requirements with a list of materials that it felt was necessary to ensure quality results. For example, the builder may have specified generic glue, whereas the framer preferred to standardize the use of a particular manufacturer's glue. Other secondary materials not specified by the builder were also listed.

The quality manual includes copies of installation instructions for the list of materials specified by the builders and the contractor, i.e., the Simpson Strong-tie catalog and NER reports for engineered wood products. A separate list of material specifications documents additional material requirements.

Regulatory Requirements

The quality manual references the applicable sections of the 1997 Uniform Building Code and the State of Arizona Registrar of Contractors warranty regulations.



Workmanship Performance Tolerances

Del Webb's Contracting Services established internal standards for workmanship tolerances that address builder specifications as well as its own standards of performance.

"The system enhances what we are already doing. It just forces us to put everything in writing and be accountable for normal everyday tasks." Hank Zolkiewicz, Del Webb's Contracting Services

FRAMING

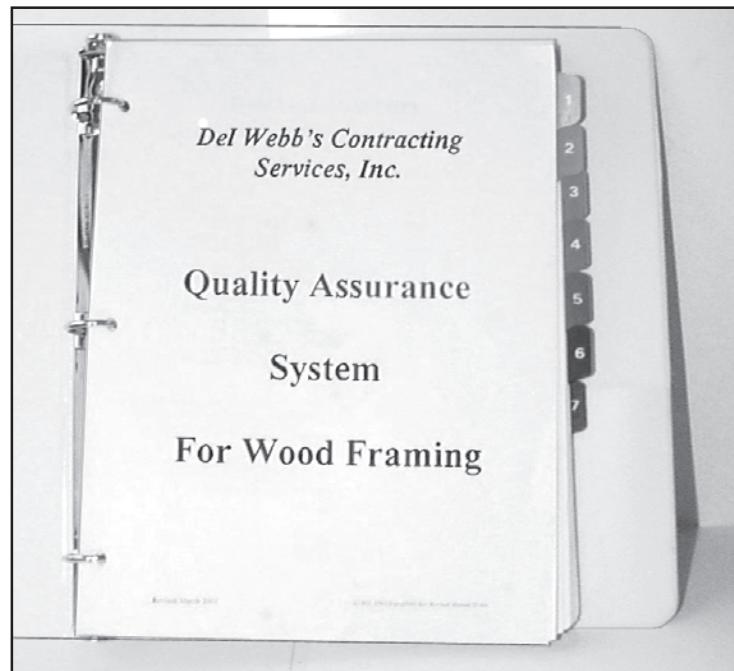
Prior to the beginning of framing, all layout is transferred from the blueprint to the concrete. All window, door openings, and tub reference lines are considered and chalk lines are struck.

1. All framing material shall be S4S or as indicated.
2. Studs stamped utility grade or no stamp at all will not be acceptable.
3. All framing material shall not exceed 19% moisture content (min. SD19).
4. Interior walls shall be straight within 1/4 inch and plumb within 1/4 inch in 8 feet.
5. Stud walls will not be bowed more than 1/4 inch in 8 feet horizontally and 1/8 inch along cabinet walls.
6. Window / door trimmers and wrapped openings shall have no greater than 1/8 inch twist in 5 feet.
7. Windowsills shall be no more than 1/8 inch out of level in 8 feet.
8. Windowsills will have no more than 1/8 inch twist in 8 feet.
9. Window and door trimmers shall be full length on each side.
10. All drop ceilings shall be plumb and level.
11. Window openings shall be plumb within 1/8 inch in 8 feet.
12. All wrapped openings shall be plumb within 1/8 inch in 8 feet.
13. All framing must be structurally sound with a flush interior fit.
14. Roof trusses must be manufactured to specification and placed in accordance to plan and specifications.
15. Trusses must be reasonably plumb and straight with truss ties per code.
16. Roof sheeting shall not have gaps less than 1/8 inch or more than 3/8 inch.
17. Where roof sheeting meets at the truss ridge, gaps will not exceed ½ inch on each side.
18. Patches in the roof sheeting shall be no less than 2' x 2'.
19. Ceilings should not sag more than 1/4 inch in 8 feet.
20. Interior load bearing partitions shall be bolted or pinned as called for on plans, shear schedules, and per code.

Workmanship Specifications

Quality Manual

The "Del Webb Quality Manual" compiles the above items into a three-ring binder. The manual closely follows the *Quality Assurance System for Wood Framing Contractors*.¹²



Quality Manual

¹² NAHB Research Center, Inc., *Quality Assurance System for Wood Framing Contractors* (NAHBRC, 2000), Upper Marlboro, MD; 800-638-8556.



6.4 Operation of the Quality System

The system became fully operational in May 2000 as verified by an internal quality system review. In August 2000, the NAHB Research Center, Inc., performed a full-day certification audit of quality records, interviewed employees, and verified jobsite quality policies and procedures.

"My role was to oversee the entire project. I make sure that the quality representatives stay on top of the inspections. I monitor results through builder surveys, the surveys we have with Del Webb's Contracting Services customer care department, and looking at the results of city inspections." Hank Zolkiewicz, Del Webb's Contracting Services

Job Inspections

Del Webb's Contracting Services crew foremen perform self-inspections of each home, one inspection for each type of framing crew involved in the framing process. Each type of crew has an inspection form that identifies specific checkpoints. In addition, foremen inspect recent quality hotspots to document the effectiveness of quality improvement training.

Del Webb's Contracting Services

Roof Check List

Foreman: _____ Rel. _____ Seq. _____

1. Flush gable nails; 12"centers
2. Check vents & flashing
3. Blocks @ gable walls with +1/2"gap
4. Solid pads under girder with double H25's
5. Sway braces: 45 degrees, 3 nails, 6'apart, H25 @ top plate
6. Fill all holes in all hangers
7. Check for all ceiling backing
8. Line ceiling backing
9. Presssure block all trusses
10. Block vents
11. Firestop all soffits
12. Vent valleys
13. 8 x 8 pop-in's in bay gable 60 series
14. Vent in soffit, kitchen side
15. Check all gable cripples

Foreman Job Inspection Form

If the job passes inspection, the foremen record their observations on the inspection form and present the form to the quality representative.

"We tried to make it as minimal as possible, but there are checklists that we want them to go through to make sure that, before they leave their phase of the job, they have checked it thoroughly and it is ready for the next phase. Some foremen start going through the motions of it without really looking...they tend to resist change and new procedures, but eventually see the value and accept it."
Hank Zolkiewicz, Del Webb's Contracting Services



The foreman signs his or her name on the home in a designated location.

"The foremen have a sense of pride and accountability when they sign their name to a home." Hank Zolkiewicz, Del Webb's Contracting Services

Signing of the home emphasizes accountability. If a problem is detected later, the signature indicates where to go to for assistance without retrieving the job folder.

A quality representative performs a comprehensive inspection of each completed job. The number and type of deficiencies are recorded on the form, then entered into a Microsoft Excel spreadsheet.

"Inspection forms were really enhanced versions of what we already had. And the other change is how we did our toolbox sessions. That was a big, big plus." Hank Zolkiewicz, Del Webb's Contracting Services



Foreman Signing of the Home

When final frame correction items are completed, the area superintendent affixes a signed sticker to the home.

"It forced us to place more accountability on our superintendents and foreman (and) through the organizational structure of the Quality assurance program. It gave us a better means to appraise and evaluate our superintendents and foremen in their annual appraisals." Hank Zolkiewicz, Del Webb's Contracting Services



Job Completion Sticker

Quality Improvement and Training

The Excel spreadsheet is analyzed at least monthly. Summaries list the number of correction items by crew type, defect type, and foreman. The summaries are plotted over time to show trends and are reviewed with the foremen.

"There is a friendly quality competition between our foremen." Hank Zolkiewicz, Del Webb's Contracting Services

When a quality issue appears to be recurring, the quality representative reviews inspection records to evaluate its extent. If frequency or severity warrant, the issue is designated as a quality hotspot.

"It forced us to measure things that we took for granted in our normal operation...how many write-ups we had from the viewpoint of the builder, from the viewpoint of the municipality that we are building in." Hank Zolkiewicz, Del Webb's Contracting Services

Once a problem area is identified as a hotspot, it triggers hotspot training on proper construction procedures according to the type of crew.

Typically, hotspot training takes place every week. The strategy is to improve quality by routinely preventing one new quality issue every week. Starting with the biggest problems, the quality representatives lead the crews to work their way down the list of quality issues.

Training starts during the weekly production meeting when area superintendents review the hotspots and distribute a hotspot training sheet. The area superintendents in turn distribute the hotspot training sheets to crew foremen and review the topic in a jobsite toolbox talk.



The hotspot is not the only topic. There are four training topics in total.

- An OSHA safety topic scheduled as part of an annual plan to reinforce safety procedures.
- A trade abuse topic that discusses work details to help other trades or to prevent difficulties.
- A quality topic scheduled according to an annual plan to reinforce all quality requirements during the course of the year.
- A quality hotspot as discussed above.

"It really helped us in our training program and our apprenticeship programs. Another thing we added to our way of doing business was weekly toolbox sessions. Usually our toolbox meetings are with the foremen and their crew every Friday. We always had it geared to safety. That information was provided by our insurance carriers, one topic for every week of the year.... Now we have enhanced that toolbox session to include quality issues."

Hank Zolkiewicz, Del Webb's Contracting Services

DEL WEBB CONTRACTING SERVICES, INC WEEKLY TOOLBOX MEETING RECORD

DATE OF MEETING:

5-11-01

MAY 11 2001

GIVEN BY:

Minor Injuries,

SAFETY TOPIC

Vent in Soffit - Kitchen-side

QUALITY TOPIC

Nails in Plumbing

TRADE ABUSE TOPIC

Final Checks + Sign Floor

HOT TOPIC

SIGNATURE OF ATTENDEES

Donaldo Marquez Jr.

Ernesto Moreno

Josue Robles

Victor Lopez

Cortes Villaseñor

Sergio Lopez

Weekly Toolbox Meeting Record

June 2001 hotspot topics are

- tightening of redhead sole plate bolts;
- fire-stop at soffit;
- checking wall plumb of pony walls; and
- final check and signature on floor.

"It identified the inconsistencies that you have when you have a human element involved. It showed us areas we had to focus on a little bit more. I think that is our biggest success of the project." Hank Zolkiewicz, Del Webb's Contracting Services

The quality representative retains records of each toolbox meeting listing the topic of discussion and a list of attendees.



Builder Satisfaction Feedback

The builder supplies monthly superintendent ratings of its framing performance. Survey results are used as topics of discussion in production meetings and to identify areas for improvement.

6.5 Future Plans

The quality system is in operation throughout the Del Webb's Contracting Services organization. The company plans to continue using and refining the system. Feedback from the NAHB Research Center, Inc., certification audits will be used to refine and streamline system operation.

6.6 Contact

Hank Zolkiewicz, manager
Del Webb's Contracting Services
13950 Meeker Blvd.
Sun City West, AZ 85375
623-546-5109



7.0 Schuck and Sons Construction

"We always thought we did a pretty good job, and we know now that we do. This [program] helps us take it to that next level and do it a little better."
Craig Steele, Schuck and Sons Construction Company, Inc.

At Schuck and Sons Construction Company, Inc., implementation of the quality assurance system began in June 1999. The system became fully operational in May 2000.

On February 1, 2001, Schuck and Sons Construction Company, Inc. became one of the first three framing contractors to be certified by the NAHB Research Center, Inc.

7.1 Company Profile

Area Served	Phoenix, Tuscon, and Prescott, Arizona
Type of homes	Single-family homes \$150,000 to more than \$1,000,000
Services	Carpentry contractor Truss plant Lumber yard Door manufacturer
Workforce	500 framing employees and 950 total employees Crews organized by phases of framing
Other	Employee-owned company All crews are company employees In-house truss plant Stick-built construction

7.2 Benefits and Results

The NAHB Research Center, Inc., measured and analyzed business performance before and then one year after implementation of the quality system. The following areas showed significant improvement:

Prevention of Quality Defects

The NAHB Research Center, Inc., measured a 65 percent reduction in the number of quality problems per home during the first year of quality system operation.

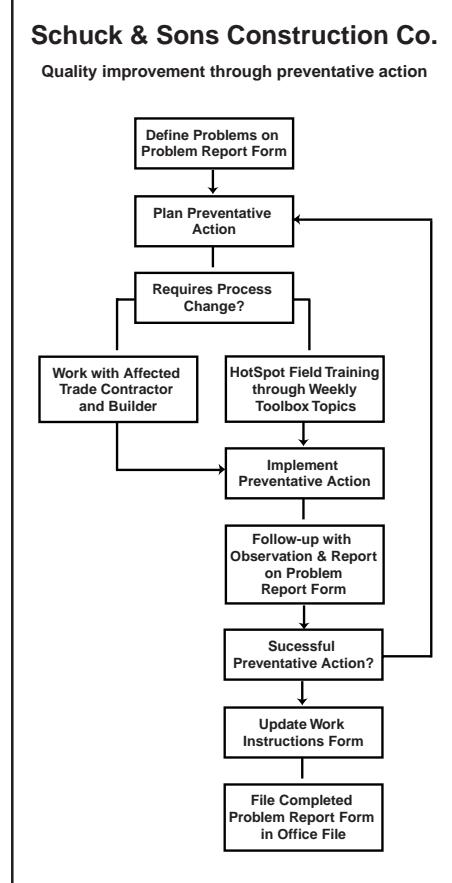
The data is based on job ratings by company area superintendents who perform independent job inspections. They rate the framing quality of every home at one of two levels: meeting expectations or, when problems are encountered, below expectations. Rating data were tabulated in May 2000 through April 2001. During this period, the area superintendents who rated the homes and the rating standards themselves remained unchanged.

"One of the main hurdles in the home building industry is the number of times that people have to go back and do rework, and we fall into that category, too. This program has reduced that dramatically." Craig Steele, Schuck and Sons Construction Company, Inc.

Improved Productivity

Despite regional carpenter labor wage increases, contract pricing on renewed bids and profitability remained at current levels.

In comparison, the most recent U.S. Department of Labor¹² cost data for carpenter labor increased by more than 12 percent.



¹² U.S. Department of Labor, National Occupational Employment and Wage Statistics. Arizona carpenter mean hour rates 1999 and 1998.



Builder Satisfaction

Builder satisfaction survey ratings from Schuck and Sons Construction Company, Inc.'s largest client, Del Webb's Contracting Services Sun City Grand, have improved to 100 percent. Each of the builder's field superintendents provides monthly satisfaction ratings at three levels: falls short of, meets, or exceeds expectations.

CONTRACT ADMINISTRATION - CONTRACTOR EVALUATION

Trade Contractor Name: Schuck Date: March 01

This survey gauges how well our Contractors have met Del Webb's expectations during the last month. Please indicate your response to the following questions by checking the appropriate box. If you check "Failed to meet expectations" for any of the questions, you MUST include an explanation for your rating in the comments section below each question. This section can also be used for any positive comments you may have.

Please complete the following sentences: (check only one response)

1. Overall Satisfaction and Communication

Exceeded expectations Met expectations Fell Short of expectations

Comments: _____

2. Requests for Pricing: Pricing is returned in a timely manner and is consistent/fair.

Exceeded expectations Met expectations Fell Short of expectations

Comments: _____

3. Follow-Through: Calls are returned and requested documentation is completed in a prompt manner.

Exceeded expectations Met expectations Fell Short of expectations

Comments: _____

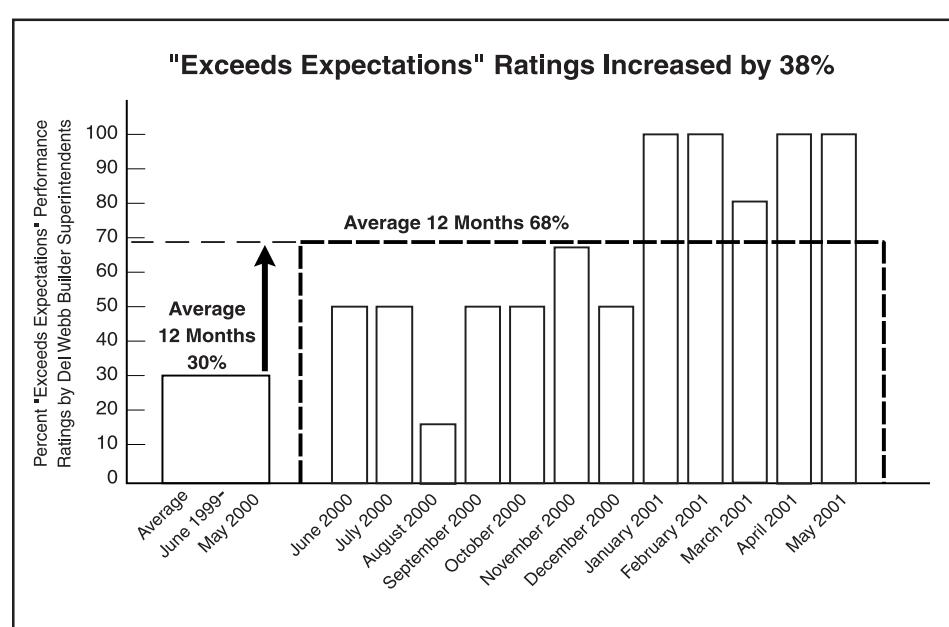
4. Process Improvement: Contractor routinely suggests and upon request, displays a genuine eagerness to improve products and processes.

Exceeded expectations Met expectations Fell Short of expectations

Comments: _____

Builder Satisfaction Survey

In 1999, less than 50 percent of the ratings were at the "exceed" level. Ratings trends improved during the implementation period. Ratings are now at the 100 percent "exceeds" level.



Performance Evaluation



Workforce Development

Low workforce turnover is an indication of high employee satisfaction. Throughout the study period, turnover of field superintendents has been less than 5 percent. One foreman was hired in the last two years to replace a foreman who left the company. There has been no turnover among the six field superintendents. Schuck and Son Construction Company, Inc. management attributes the low turnover rates to improved levels of job satisfaction.

"We have an in-house apprenticeship program. Some of the information for the program comes from the [quality hot-spot] training for the certified framer program we've incorporated into our apprenticeship training program." Craig Steele, Schuck and Sons Construction Company, Inc.

Schuck and Son Construction Company, Inc. reports that in-house training of field personnel has increased substantially during the study period. The increased activity can be attributed primarily to institutionalizing hotspot training about construction details on a routine basis two to four times every month.

"I found the one thing that we took for granted was that new employees said they had a [skill] level. We just took it at face value until they worked for a while and then they didn't have that level. This gave us a means to track where they really are and improve on their ability. This gives you some tools to say he's probably going to make a good employee, but he's a little deficient in this area. You provide him with the training, and, in most cases, he becomes a good employee. They appreciate the training." Craig Steele, Schuck and Sons Construction Company, Inc.

7.3 Implementation of the Quality System

Before implementation of the quality assurance system, Schuck and Son Construction Company, Inc. was already performing many of the activities required by the system. Therefore, during the study period, implementation focused on formalizing activities, performing them on a regular basis, and documenting results.

"We're always looking for things to make us better at what we do...but there's a little bit of tweaking that we needed to do to bring us to another level and this [Quality assurance program] did that." Craig Steele, Schuck and Sons Construction Company, Inc.

To establish the quality assurance system, the general superintendent, the vice president of operations, and the NAHB Research Center, Inc., collaborated to provide details required by the quality plan.



Appointment of the Quality Representative

The general superintendent had been performing many of the quality representative duties as part of his normal job. The company president formalized the role through a memorandum appointing him as the quality representative with specific quality responsibilities and authority.

The quality representative in turn assumed responsibility for the quality of field operations and served as chief decision maker on field quality issues. The most significant change in his responsibilities was the requirement to tabulate field inspection data.

"The quality representative collects the data from the field and enters it into the computer, so he's got some additional duties. Right now it is handwritten on paper forms and then entered into the computer database. We're currently in the process of developing...paperless electronic inspections and downloading [data] that way."
Craig Steele, Schuck and Sons Construction Company, Inc.

Schuck & Sons Quality

Schuck & Sons Construction is committed to providing our customers with the best quality products and workmanship. We are continually looking for ways to improve the services we provide by staying on the cutting edge of technology, material advancements, and construction process improvements. In so doing, our customers benefit in the form of on-time deliveries, quality construction, reduced cycle times, fewer service requests, and confidence in the structural and aesthetic integrity of their homes. Our customers can offer their homebuyers the assurance that their home is framed and trimmed using the latest materials and methods for lasting durability and value.

Schuck & Sons Construction has been instrumental in bringing ISO 9000 standards to the homebuilding industry. Our Quality Representative, Doug Hassinger, is responsible for managing and administering the company's Quality Plan. His duties are to ensure that the materials and construction procedures we use adhere to strict quality guidelines set forth by senior management in accordance with ISO 9000 standards and all applicable codes and builder specifications.

A handwritten signature of Craig Steele.

Craig Steele
President and CEO
Schuck & Sons Construction

Quality Representative Appointment Letter



Schuck & Sons Construction Company

Quality Statement

Our company is committed to the workmanship quality, performance, and durability of the constructed product. To this end, we pledge:

- Compliance with applicable regulations, safety requirements, construction codes, and good workmanship practices.
- Contract requirements will be fulfilled in their entirety
- All crews will work under the direction of an on-site qualified Crew Leader
- QA system policies and procedures will be followed at all times
- Continual improvement toward the prevention of defects

Quality Responsibilities

Quality is everyone's responsibility. All employees have a personal responsibility to:

- Use only approved materials and related construction procedures.
- Never use defective or damaged materials or equipment.
- Prevent and/or report potential quality and safety problems.
- Stop work in the affected area if continuing work in that area may be unsafe, adversely affect quality results, or cover-up a defect.

The Crew Leaders have additional responsibilities to ensure that:

- Employees are capable of performing assigned tasks.
- Work activities comply with approved materials.
- Only approved materials and equipment are used.
- Job inspection records accurately record job activity.
- Each job meets good workmanship practices, contract, code, regulatory, and quality system requirements.
- The builder is notified of any unresolved nonconformance remaining at the completion of the job.

Craig Steele,
President/CEO

3-15-00
Date

Doug Hassinger,
Quality Representative

3-15-00
Date

Quality Policy

The vice president of operations crafted a company quality policy that was ratified by the senior management team and signed by the president. The quality policy articulates the importance of quality to the organization and defines the quality responsibilities of all employees.

The company president reviewed the quality policy with employees at a series of production meetings and field talks. Poster-sized copies of the quality policy were framed and posted in the company offices. Articles in the quarterly company newsletter reinforced the quality message.



List of Qualified Crew Foremen

Foremen and superintendents are formally qualified to lead and/or inspect specific types of field crews. A foreman's evaluation form identified 12 criteria ranging from jobsite safety and framing techniques to quality standards.

FOREMAN'S EVALUATION FORM				
FOREMAN'S NAME _____	DATE _____			
	KNOWLEDGE	PROFICIENCY	EXPERIENCE	TRAINING REQ'D
1) JOBSITE SAFETY				
2) BLUEPRINT READING				
3) MATERIAL USAGE				
4) HARDWARE APPLICATION				
5) ACCEPTED FRAMING TECHNIQUES				
6) UNDERSTANDING LOCAL FRAMING CODES/THEIR APPLICATION				
7) UNDERSTANDING TRADE NEEDS				
8) UNDERSTANDING QUALITY STANDARDS				
9) KNOWING BUILDER'S REQUIREMENTS				
10) BASIC STRUCTURAL RULES OF FRAMING				
11) UNDERSTANDING OF COMPANY POLICY				
12) PROPER USE OF EQUIPMENT & TOOLS				
ADDITIONAL TRAINING ANY RATING UNDER 85% REFER TO PROGRAM FOR ADDITIONAL TRAINING FORM & CORRESPONDING # _____				

Foreman's Evaluation Form

Related to foreman qualifications is a required training program. The quality representative checks boxes on a form when the foreman completes training modules.

TRAINING PROGRAM ON FOLLOWING CATEGORIES	
FOREMAN'S NAME _____	DATE OF TRAINING _____
<input type="checkbox"/> HARDWARE REVIEW APPROPRIATE SECTIONS IN CURRENT SIMPSON BOOK VIEW ANY HELPFUL PICTURES ON APPLICATIONS WALK ANY HOUSE THAT WOULD DEFINE PROBLEM AREAS DISCUSS PROPER HARDWARE APPLICATION AND CODE NAILING	
<input type="checkbox"/> PLUMB, LEVEL & LINE REVIEW QUALITY MANUAL STANDARDS ON FOLLOWING AREAS: FRAMING PERFORMANCE GUIDELINES ON: WALLS BEING PLUMB ALL OPENINGS PLUMB & LEVEL (GLASS BLOCK, WINDOW, WRAPPED) SQUARE WRAPPED OPENINGS & WINDOW OPENINGS STANDARDS ON CEILING STRAIGHTNESS	
<input type="checkbox"/> HOUSEKEEPING REVIEW SAFETY ISSUES CONSIDER OSHA STANDARDS AND BUILDER'S REQUIREMENTS REVIEW WHAT NEEDS TO BE DONE WITH BRACE MATERIAL	
<input type="checkbox"/> MATERIAL USAGE REVIEW GRADE OF MATERIAL TO USE FOR DIFFERENT APPLICATIONS CONSIDER BLUEPRINTS ON STUD, TRIMMER DESIGNATION REVIEW WHY HEADER SIZES ARE IMPORTANT CONSIDER HOW TO KEEP FASCIA STRAIGHT WITH APPROPRIATE MATERIAL TRUSS STORAGE AND HANDLING	
<input type="checkbox"/> SAFETY REVIEW COMPANY POLICIES REVIEW SAFETY PROCEDURES VIEW COMPANY'S SAFETY VIDEO CONSIDER MANUFACTURER'S INSTRUCTIONS FOR SAFE EQUIPMENT USAGE CONDUCT A SAFETY MEETING USING AN APPROPRIATE ITEM FROM COMPANY 12 WEEK TAILGATE SAFETY MEETING PROGRAM	
<input type="checkbox"/> ATTACHMENT/INSTALLATION REVIEW NAILING SCHEDULE FOR SHEAR WALL NAILING REVIEW UBC & SCHUCK STANDARDS ON NAILING CONSIDER WHY A GAP IS NECESSARY ON OSB SHEATHING	

Foreman's Training Evaluation



When a foreman meets all criteria for a specific crew type, the individual's name is entered on the foreman qualification list.

version 2. May 30, 2000

FOREMAN QUALIFICATION LIST

NAME	LAYOUT	EXTERIOR FRAMING	TRUSS/ROOF SET/FRAMING	INTERIOR FRAMING	EXTERIOR
					TRIM
PHIL K	APPRVD	APPRVD	N/A	N/A	N/A
JOSE C	APPRVD	APPRVD	N/A	APPRVD	APPRVD
JAMES D	APPRVD	APPRVD	N/A	APPRVD	APPRVD
DANIEL T	N/A	APPRVD	N/A	N/A	APPRVD
THURMAN B	N/A	N/A	APPRVD	N/A	APPRVD
RAPHAEL B	APPRVD	APPRVD	APPRVD	APPRVD	APPRVD
CHESTER D	N/A	N/A	APPRVD	N/A	APPRVD
ORLANDO P	N/A	N/A	APPRVD	N/A	APPRVD
LEONARD B	N/A	APPRVD	N/A	APPRVD	APPRVD
DERRICK H	APPRVD	APPRVD	N/A	APPRVD	APPRVD
ROBBIE M	APPRVD	APPRVD	APPRVD	APPRVD	APPRVD
GEORGE P	APPRVD	APPRVD	APPRVD	APPRVD	APPRVD

Foreman Qualification List

SCHUCK & SONS APPROVED MATERIAL LIST

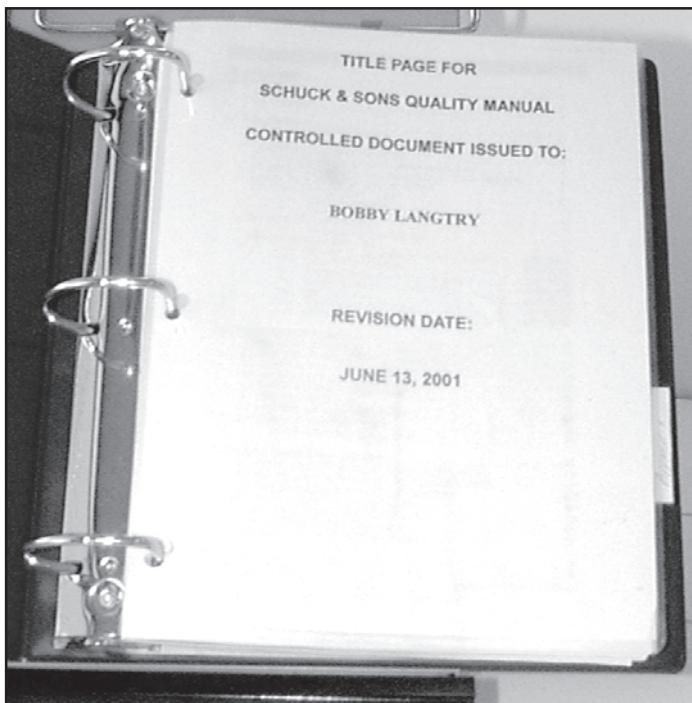
MATERIAL/EQUIPMENT	COMPANY REQUIREMENT	APPROVED USE/PLACEMENT
Nail gun	Stantech sequential fire	Nail gun must not be modified
Skilsaw (circular saw)	Skilsaw make	Skilsaw must not be modified. Follow manufacturer's instructions.
Hammer	Must be in good condition	Select hammer of choice
Ladder	Type 1A 300 lbs. Non-conductive Fiberglass extra heavy duty. OSHA Approved ANSI A14.5	Use as needed
Hardhat	Type I class E ANSI Z89.1-1997	Worn at all times
Safety glasses	ANSI Z94.3/Z87.1	Worn at all times
Footwear	Hard soled footwear. Sneakers may be worn by roof sheathers	Worn at all times
Measuring tape	25 ft. minimum length	Use as needed
Level	4-ft. minimum length	Must be check for accuracy
Portable electric generator	GFI circuit Grounded 3-conductor electrical cord	Use as needed when temp. Not available
Gas	Metal gas can with flame arrestor	As needed for portable generators, compressors
Electrical extension cord	3-conductor	As needed for power tools. Only minor repairs To outer casing with shrink sleeving permitted.
Nails	Nominal .131 in. shank or larger	General use for fastening 2x dimensional lumber As required for hardware application
Blocking	Utility grade lumber or better	For sheathing, wall backing and standard practice

Approved Materials List



FRAMING PERFORMANCE GUIDELINES CON'T		
WALL, STUD SPACING	WALL STUD SPACING VARIATION AS MEASURED FROM CORNER	1/2 IN. SCHUCK & SONS
WALL, PLACEMENT	WALL PLACEMENT VARIATION FROM DRAWING AS MEASURED FROM CORNER	1/2 IN. SCHUCK & SONS
WALL, DIMENSIONS	WALL DIMENSION VARIATION FROM DRAWING AS MEASURED FROM CORNER	1/2 IN. SCHUCK & SONS
WALL, OPENING PLACEMENT	WALL OPENING PLACEMENT VARIATION FROM DRAWING AS MEASURED FROM CORNER	1/2 IN. SCHUCK & SONS
WALL, OPENING DIMENSIONS	WALL OPENING DIMENSION VARIATION FROM DRAWING	1/2 IN. SCHUCK & SONS
WALL, PLUMB	WALL PLUMBNESS	1/4 IN. PER 8 FT. DEL WEBB 1/4 IN. FLOOR TO CEILING/AZ REGISTRAR
WALL, BOW	WALL BOW IN THE HORIZONTAL AND VERTICAL DIRECTION	1/4 IN. PER 8 FT. BOTH DIRECTIONS FOR NON-CABINET WALLS, 1/8 IN. PER 8 FT. BOTH DIRECTIONS FOR CABINET WALLS DEL WEBB
WALL, SQUARE	WALL SQUARENESS	1/4 IN. DEVIATION IN THE DIAGONAL OF 6-8-10 PER AZ. REGISTRAR
WALL, TOP PLATE LEVEL	WALL TOP PLATE LEVEL	1/4 IN. PER 10 FT. DEL WEBB
WALL, OPENINGS PLUMB	WALL OPENINGS PLUMB	1/8 PER 8 FT. DEL WEBB
WALL, OPENING TWIST	WALL OPENING TWIST	1/8 IN. PER 5 FT. DEL WEBB
WINDOW, SILL LEVEL	WINDOW SILL LEVEL	1/2 IN. PER 8 FT. DEL WEBB
WINDOW OPENING DIMENSION	WINDOW OPENING DIMENSION VARIATION	1/4 IN. SCHUCK & SONS
WINDOW OPENING PLUMB	WINDOW OPENING PLUMB AT TRIMMERS	1/8 IN. PER 8 FT. DEL WEBB
WINDOW OPENING, PLACEMENT	WINDOW OPENING PLACEMENT VARIATION FROM DRAWING AS MEASURED FROM CORNER	1/2 IN. SCHUCK & SONS
WINDOW OPENING, TWIST	WINDOW OPENING TWIST AT TRIMMERS	1/8 IN. PER 5 FT. DEL WEBB
WINDOW SILL, TWIST	WINDOW SILL TWIST	1/8 IN. PER 8 FT. DEL WEBB
WINDOW, HEADER LEVEL	WINDOW HEADER LEVEL	1/8 IN. PER 8 FT. DEL WEBB

Framing Performance Guidelines



Schuck Quality Manual

Regulatory Requirements

The quality manual references the applicable sections of the 1997 Uniform Building Code and Arizona state warranty regulations.

Workmanship Performance Tolerances

Schuck and Sons Construction Company, Inc. established internal standards for workmanship tolerances. If builder specifications do not supersede the tolerances, the tolerances serve as default specifications.

Quality Manual

The above items were assembled into the "Schuck & Sons Quality Manual." The manual closely follows the *Quality Assurance System for Wood Framing Contractors*.¹⁴

¹⁴ NAHB Research Center, Inc., *Quality Assurance System for Wood Framing Contractors* (NAHBRC, 2000), Upper Marlboro, MD; 800-638-8556.



7.4 Operation of the Quality System

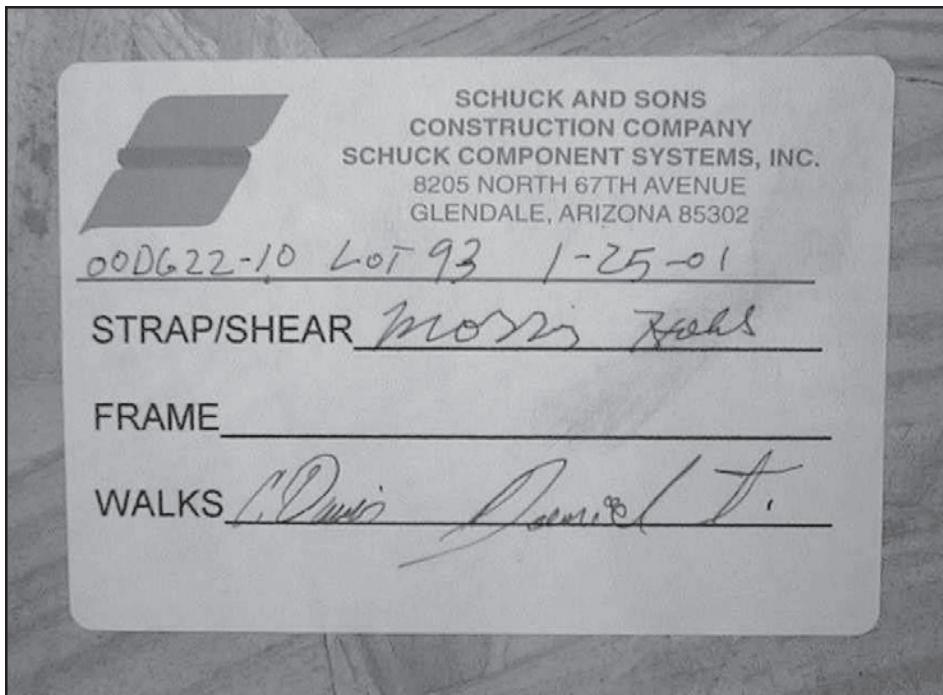
The quality assurance system became fully operational in May 2000 as verified by an internal quality system review. In August 2000, the NAHB Research Center, Inc., performed a full-day certification audit of quality records, interviewed employees, and verified jobsite Quality assurance policies and procedures. On February 1, 2001, Schuck and Sons Construction Company, Inc. became one of the first three framing contractors to be certified by the NAHB Research Center, Inc.

[There was] resistance to begin with, a lot of resistance for two reasons. One, it was more paperwork and most of the time they don't like paperwork. And the other thing is there was an accountability trail. And when people are held accountable, the first thing they think of is there's going to be retribution or something like that. We didn't want them to feel that this was a tool for punishment or retribution; we wanted it to be viewed as a tool to make their job easier and to reduce the amount of rework that they would have to do and make them better at what they do. It took a while to get that point across, but now it is readily accepted." Craig Steele, Schuck and Sons Construction Company, Inc.

Job Inspections

Schuck and Sons Construction Company, Inc. area superintendents perform inspections on each home, rating each phase of the framing process. Scores indicate the number of quality issues that need correction. The scores are recorded on an inspection form.

"There weren't many changes, not for the field personnel. It did not change the way that they did things; it just gave them kind of a path to make sure that they were doing everything that they were supposed to do." Craig Steele, Schuck and Sons Construction Company, Inc.



Final Inspection Sticker

When the final inspection is completed, an area superintendent affixes a signed sticker to the home.

Completed inspection reports are submitted to the company quality representative. Inspection ratings for each job are entered into a computer database. The quality representative created the database and input form.

Quality Improvement and Training

Every month, a series of computer inspection reports show quality data and trends for each phase of construction and for each foreman. The quality representative identifies quality hotspots that trigger training of the appropriate field personnel. Typically, one type of crew undergoes hotspot training every week. Training rotates among the five crew types.

Training starts during the weekly production meeting when area superintendents review the hotspots and distribute a hotspot training sheet to crew foremen and review the topic in a jobsite toolbox talk.

"Through our data collection, we are able to pinpoint errors and then focus our training where it's needed most. This creates a continuing education and improvement cycle, which ultimately results in reducing callbacks." Frank Serpa, Schuck and Sons Construction Company, Inc.

Recent hotspot training topics include:

- sway brace spacing at gables;
- shear placement per option plans;
- shear transfer—interpretation of details; and
- tightening redheads.



Builder Satisfaction Surveys

Before implementation of the quality system, some builders supplied unsolicited satisfaction ratings. Now, a builder satisfaction survey is sent to every builder. Returned surveys are used as topics of discussion and to identify improvement areas.

7.5 Future Plans

Shuck and Sons Construction Company, Inc. is expanding implementation of the quality system to nonframing business operations.

"We're taking [the quality system] from our framing operation into our plant because we have truss assemblers and door assemblers and lumber handlers. We're using the same principles on our own and taking it into the plant." Craig Steele, Schuck and Sons Construction Company, Inc.

BUILDER SATISFACTION SURVEY																																																															
DATE _____	BUILDER _____	REVIEWER _____	LOCATION _____																																																												
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Builder Satisfaction Survey

7.6 Contact

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