QUALITY BUILT

The Next Generation of Quality Assurance®

A Decade of Construction Inspections

Quality Built, LLC

November 2011

nqa. ISO 9001 Registered

Background

Quality Built, LLC is one of the largest and most respected third-party quality assurance firms in the country. Over the last decade, we have conducted almost 300,000 inspections of homes, condominium units and commercial development projects – we venture to say that is more inspections than any other company in the United States. As we reflect on the data collected by these inspections from a "30,000 foot level" there are some general trends and observations that become very apparent. This article summarizes some of the important trends and themes that we have observed.

The Statistics

Generally

Our observations about construction are based on data collected by Quality Built on 293,803 completed homes, condominiums and commercial development projects built across the United States over a ten (10) year period between January 1, 2000 and December 31, 2010. (See Figure 1; all graphs at the end of this report.) Over this ten (10) year period, our inspectors have inspected and recorded more than 40 million inspection "Checkpoints." Each "Checkpoint" is a specific and discrete measurement and inspection item in the construction process which can be verified as being properly installed, completed or conducted according to applicable building codes, best practices and manufacturers' installation instructions. Essentially, our systems inspect, examine and record each and every defined and specific task in the construction process. In contrast to other inspection companies, all of Quality Built's inspections are included – Checkpoint by Checkpoint – in our proprietary computer software system and data bank enabling us to "mine the data" and produce the general reports and observations set forth in this article. We have a decade of digital construction information for projects and developments of all kinds across the United States so we are in, perhaps, the best position to offer the observations set forth in this article.

Risk Factors

As a part of our inspection process, Quality Built assigns each Checkpoint a "Risk Factor." "Risk Factors" are used to direct inspectors to focus their inspections on the items that provide the greatest risk for each and every construction system and component in the inspection process. Checkpoints with the highest "Risk Factor" such as life-safety systems and related components are assigned a Risk Factor of 5. A Checkpoint with a Risk Factor of 4 focuses on systems and components related to water intrusion. A Risk Factor of 3 focuses on systems and components related to durability. Risk Factors of 1 and 2 focus on cosmetic issues and were not considered as a part of this study.

Risk Dollars

In addition to Risk Factors, Quality Built measures the estimated "Risk Dollars" for each Checkpoint. "Risk Dollars" are the cost to repair the construction deficiencies after construction. (While items identified in the Quality Built inspection process are sometimes construction deficiencies, they sometimes are not "deficient" but a variance from construction "best practices" or applicable building codes. Instead of calling them "deficiencies" we refer to any items identified in our inspections that do not meet the required criteria as anomalies because they represent conditions that vary from what we would consider proper construction.)

> ***"Because of our experience and data bank, we at Quality Built are able to do what no other company can do, and that is: Quantify Quality."***

Quantifying Quality

For over ten years, Quality Built has collected data on acceptable and unacceptable construction practices, measuring Risk Factors and Risk Dollars. We maintain and are able to mine and analyze the greatest volume of construction inspection data in the world. Because of our experience and data bank, Quality Built is able to do what no other company can do and that is: **"Quantify Quality."** This report sets forth some of our observations on Quantifying Quality.

Impact of Third-Party Quality Assurance on Construction Quality

There is no doubt that implementing a comprehensive quality assurance program reduces risk and improves the quality of construction. Prior to 2000, contracting for third-party quality inspections was not the normal operating procedure for builders, particularly residential builders. Quality assurance was one of the many responsibilities of the superintendent and trade contractor foremen. The industry relied upon the knowledge, skills and experience of these men and women rather than providing them with a specific system to identify, report and resolve anomalies.

In 1999, when Quality Built began tracking construction data, the cost or value of the average risk identified was roughly $11,500 per unit with over 25% of unacceptable items (items inspected below standard). With the introduction of Quality Built's systematic approach to quality, the average risk dropped significantly on projects implementing Quality Built's quality assurance and inspection systems; and by 2003, the Risk Dollar exposure dropped below $6,000 per unit with an average of only 5% of unacceptable items.

In 2004, as the construction boom was beginning, the percentage of unacceptable items stayed close to 5%. However, the Risk Dollars per unit increased by over 50% between 2004 and 2005 and continued to rise in 2006, when it peaked at over $9,000 per unit. (See Figure 2)

The data clearly shows that, by focusing attention on the highest risk items and providing a system to communicate deficiencies and track closure, quality can be sustained during times of expansion and contraction in the market place. However, the analysis of this data raises additional questions, many of which can only be answered when put into the proper context.

How did the percentage of unacceptable items remain stable while risk significantly increased?

As the construction industry began to expand rapidly, less-experienced workers were introduced into the trades and building industry which led to an increase in deficiencies. Build-out times were shortened which meant the time to identify and correct deficiencies prior to covering them also was shortened. Designs became more complicated to respond to consumer demands which, in turn, caused additional system/component integration problems in the field.

So why didn't the percentage of unacceptable items also increase dramatically?

During this same period, builders expanded their quality assurance programs, increasing the average rate of quality assurance inspections from 25% of the units to 100% for both single-family and multi-family units. The scope of inspections was also expanded to include pre-pour foundation stage through exterior wrap stage of construction. The average amount of time spent for quality assurance tasks increased from 1 hour per unit to over 4 hours per unit over the life of the construction cycle. This meant that the number of Checkpoints identified per unit increased from 86.5 per unit (average for years 2000-2003) to 147 per unit (average for years 2004-2007). (See Figure 3) While the percentage of unacceptable items remained near 5%, the number of deficiencies identified increased from 5 high-risk items per unit to 9 high-risk items per unit.

Does eliminating 4 to 9 high-risk items per unit provide an acceptable Return on Investment (ROI)?

It is important to remember that the Quality Built system helps guide and support the inspector or internal quality assurance team to focus on high-risk systems and components. Our data shows that, between 2000 and 2005, the average cost per unacceptable items remained fairly constant with a low of $714 per unacceptable items in 2003 to a high of $976 per unacceptable items in 2008. (Averaging in low cost, easy to repair items would significantly decrease this average.) (See Figure 4)

In 2000, the average cost of third-party quality assurance programs was $175 per unit while the average amount of risk exposure identified was *$11,552 per unit*, bringing builders an outstanding **ROI of 1:66x**. In 2009 the lowest amount of risk was identified at $5,480 per unit and with a quality assurance cost of $300 per unit, builders still earned a very significant **ROI of 1:18x**.

What trends appear to be cyclical?

Work force growth, technical expertise and production trends directly impact the quality of construction. The expansion and contraction of the workforce greatly impacts the quality of construction. If you compare data from credible sources that track labor trends, such as Construction Industry Employment Trends published by Home Performance Resource Center[1] and the Bureau of Labor and Statistics[2] against Quality Built's quality trends, you easily can quantify the impact of expansion and contraction of the labor force on the quality of construction.

Throughout the 1980s and 90s, construction was well known as a high-risk industry with some areas of the nation experiencing construction defect litigation on over 80% of production units. Insurance became difficult to obtain at any cost in many regions. Many changes in the industry, including reorganization of corporate structure to include risk management teams, introduction of wrap insurance policies, changes in various states legislation and the introduction of third- party quality assurance, transformed the industry during the first decade of the 2000s.

Quality Built is proud of its contribution to this effort. As demonstrated by our data, Quality Built's proprietary systems make it possible to quantify quality and to help eliminate risk during the course of construction. However, what is not clearly evidenced without examining trends is the educational value of our systems.

Quality Built provides clients with technical training materials via the Quality Built Information Network (QBIN[3]). The educational presentations provide information on the most common anomalies per system and can be shared with the trade partners. In addition to these formal presentations, the Quality Built system provides support to the superintendent and trade contractors through the methods used to report open items and track closure. Each open item will contain the standard that should be met and will reinforce that standard each time a correction must be made. Additionally, Quality Built provides clients with dynamic reports that show each trade contractor the most common anomalies reported over the past 30 days specific to their work. In the past builders were encouraged to distribute those reports to the trades to use as the basis for training their crews. Builders, with a company culture that embraced quality and programs that promoted continual process improvement, showed measurable improvement over the builders that did not augment the third-party quality assurance inspections with the educational materials.

As early as 2004, Quality Built saw increases in the average production rates and shortened build-out times. The boom officially began in 2005 and ended in January of 2008. The corresponding employment surge is represented on Figure 5. This data, provided by the Home Performance Resource Center, is consistent with the growth in units inspected by Quality Built between 2004 and 2007. (See Figure 6) All of the data from multiple sources further evidences the fact that, as production levels dropped and build-out times were extended, the Risk Dollars identified and corrected during the course of construction dropped back to "pre-bubble" levels. This clearly is a reflection of the level of technical expertise and construction experience deployed in the current market.

> ***"Quality Built's proprietary systems made it possible to quantify quality and to help eliminate risk during the course of construction."***

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1 Construction Industry Employment Trends, Home Performance Resource Center, www.hprcenter.org, January 2011.
2 The 2000-10 Job Outlook in Brief, Occupational Outlook Quarterly, Bureau of Labor Statistics, www.bls.gov, Spring 2002.
3 The Checkpoint qualitative measurement, its risk value and risk rating are proprietary to Quality Built and are protected under U.S. Copyright and U.S. Patents-pending laws.

As the market returns, new inexperienced workers will be introduced into the construction industry. The Bureau of Labor and Statistics predicts that the construction industry will provide average to faster-than-average employment opportunities in the construction field, based on the following factors: (1) the need to replace workers who leave these occupations permanently, (2) the strenuous work, and minimal training requirements for entry, resulting in high turnover positions and (3) the shortage in training programs[4].

These very factors are cited by Roger Dunstan & Jennifer Swenson in "Construction Defect Litigation and the Condominium Market" in 1999 as factors contributing to the significant levels of construction defect litigation in the 80s and 90s[5]. Other factors cited create an eerie sense of déjà vu when discussing today's real estate market and risk management. In order to avoid repeating the past, it will be important for builders to preserve and promote their technical expertise to maintain the current levels of quality. This can be accomplished easily by builders through an internal quality assurance program and by using the latest technology.

Has Quality Built identified any quality trends specific to projects that employed a statistical sampling protocol?

Analysis of past construction defect litigation cases has firmly established that most defects are project-wide, meaning anomalies found in one unit typically are found "across the board" in all like units. Therefore, it is logical to conclude that, if a large enough statistical sampling is evaluated, the information obtained could be used to correct and or prevent anomalies in other units. A large percentage of projects contracted with Quality Built to provide inspections on a statistical sampling basis of inspections ranging from 25% to 75% of the projects' units.

Prior to 2008, Quality Built would provide inspections on different systems within random units. Some units may or may not have inspections. Inspected units would not include all systems and components that would occur over several units (4 units for a 25% sampling, 2 units for a 50% sampling, etc.). Anomalies would be reported as open items to the superintendent in a written or electronic format to correct. Corrections for items tagged by Quality Built were further tracked. Additional reports were provided via the Quality Built Information Network (QBIN) for superintendents to inspect alternate units. Other builders would implement a protocol to distribute to trade contractors to implement their own internal quality assurance programs. In these instances, the trade contractors may have been responsible for verifying anomalies identified by Quality Built and ensuring they were not replicated in uninspected units. Data was not collected for units inspected by the builder or trade contractors.

In order to determine if any quality trends could be identified related to the effectiveness of statistical sampling protocols, Quality Built charted 100 units that received requests for data and/or documentation. Out of the 100 units, 85 requests were for data in units not inspected by Quality Built. Fifteen requests were for units in which Quality Built did perform some data collection. Nine requests provided the data specific to the request, while 6 of the requests were related to systems and components not inspected by Quality Built. While the exact causes and extent of increased requests for data/documentation for units not inspected by Quality Built is unknown, it does support the theory that builders did not implement and/or monitor processes to ensure that all units were inspected.

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4 The 2000-10 Job Outlook in Brief, Occupational Outlook Quarterly, Bureau of Labor Statistics, www.bls.gov, Spring 2002.
5 Construction Defect Litigation and the Condominium Market, Dunstan, Roger and Swenson, Jennifer, CRM Note, Vol. 6, No. 7, www.library.ca.gov, November 1999.

In 2008, the lack of documentation in all units, combined with the inability of Quality Built to provide definitive statistics on builder performance or the quantitative impact on their efforts, led to the release of QB Builder Link®[6]. Since 2008, 262 projects with 12,606 units have implemented an internal quality assurance program that identifies specific systems and components that must be inspected and photographed in every unit. Data is collected primarily by the superintendent, or other builder representative, and monitored through third-party auditing. Auditing includes a monthly review to verify data collection is progressing as expected, required checkpoints are being answered, and photos are of good quality and are representative of the checkpoints and quarterly site visits with which they are associated. During the quarterly site visits, the Quality Built Field Consultant collects data using the same tasks and checkpoints utilized by the builder. Quality Built then performs a comparative analysis and provides feedback to the builder's management team.

Preliminary analyses of these projects show similar levels of risk being identified by internal quality assurance as by their third-party counterparts. The percentage of unacceptable items identified is 4% to 5%, with an average of $890 per unacceptable. (See Figure 7) Additionally, these projects show significantly shorter cycle times for obtaining closure. Since QBBL projects have the tasks and checkpoints aligned with the project's schedule, it is presumed that the reduced cycle times are attributed to two factors: (1) the ability to inspect items at the optimum time and (2) the ability to report open items directly to the trade representative responsible for correcting the anomaly.

Where can the industry improve the most in the coming years?

Builders will need to integrate technology into the building process. Rugged and semi-rugged field computers are now cost effective tools that bring accountability, transparency and collaboration to the construction process and Quality Built makes extensive use of such equipment.

"Builders will need to integrate technology into the building process."

The trend towards focusing more on internal quality assurance versus relying on third-party inspections will continue. However, the data fully supports placing emphasis on the process and the management tools to oversee the process, as opposed to placing emphasis on retaining a third party to collect the data. An effective process will:

1. Identify the standards based upon the project's plans, applicable codes, specific products and materials and best building practices
2. Provide a method to report anomalies and track closure of all open items
3. Have outside auditing to verify internal results
4. Create a comprehensive documentation file for each unit

The escalation in construction defect litigation has compounded problems for builders in recent years causing a greater need for improved document retention policies. The historical number of failed builders, bankrupt trade partners and/or the loss of company employees responsible for maintaining records has exacerbated the problem. All risk partners have an interest in accurate and accessible record retention. Builders will need to focus on developing record retention policies that require all documents to be preserved in a digital format and saved in multiple locations.

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6 QB Builder Link® (QBBL), Quality Built's newest proprietary program offers the country's leading software and IT platform to bring transparency and accountability to construction and development projects ensuring qualified, consistent and accurate performance and results. QBBL helps guide and support an integration of third-party quality assurance with internal quality assurance programs whereby promoting consistent data and documentation in all units on a project.

Conclusions:

Quality Built's systematic approach to quality in construction has significantly improved the quality of construction and continues to provide information used for continual improvement. Quality Assurance programs historically have been adjusted in response to industry conditions. The data clearly shows that focusing attention on the highest risk items and providing a system to communicate the deficiency and track closure quality can be sustained even during times of expansion and contraction in the market place.

Well-executed internal Quality Assurance programs, supported by third-party audits, can result in better quality and can greatly support builders in instilling a culture of quality, transparency and accountability. Statistical sampling protocols are not as effective as protocols that require inspections in every unit and provide documentation for every unit.

The conclusion should be obvious that a well-designed and well-executed quality assurance program is not a cost or inconvenience, but a very profitable tool for builders to reduce risks, minimize defects and inefficiencies, improve quality and, perhaps most importantly, enhance profitability. With a substantial ROI (**from 1:66x to 1:18x**), it seems rather clear that all builders should implement a quality assurance program such as Quality Built's.

About Quality Built

Quality Built is a risk management firm providing inspections and quality assurance services to the nation's homebuilders and commercial developers. Electronic information is collected via proprietary computer software programs developed for the construction industry by Quality Built.

Quality Built has earned a highly coveted certification from the International Standards Organization (ISO 9001:2008) for our Quality Management System. Supported by the largest companies and governments in 161 countries, ISO is the only worldwide organization responsible for setting international industry standards, which ensures that Quality Built's field data collection process meets the highest level of accuracy and that the results derived are consistent and certifiable.

The information set forth in this report is a summary of analyzed data released for public review. Additional releases will include regional data surveys, state-by-state, and breakdowns of risk per system and component. Additional information is available to Quality Built clients and to the builder insurance industry upon request. Contact a Quality Built Representative at customerservice@qualitybuilt.com or by calling 1-800-547-5125.

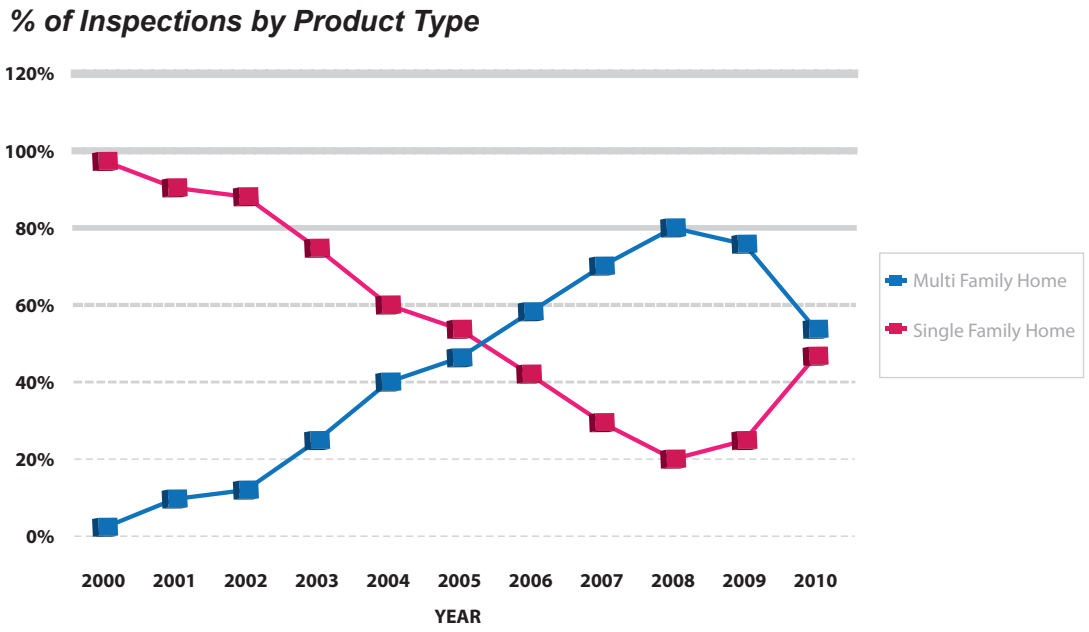

Figure 1: This graph represents the percentage of units by product type.

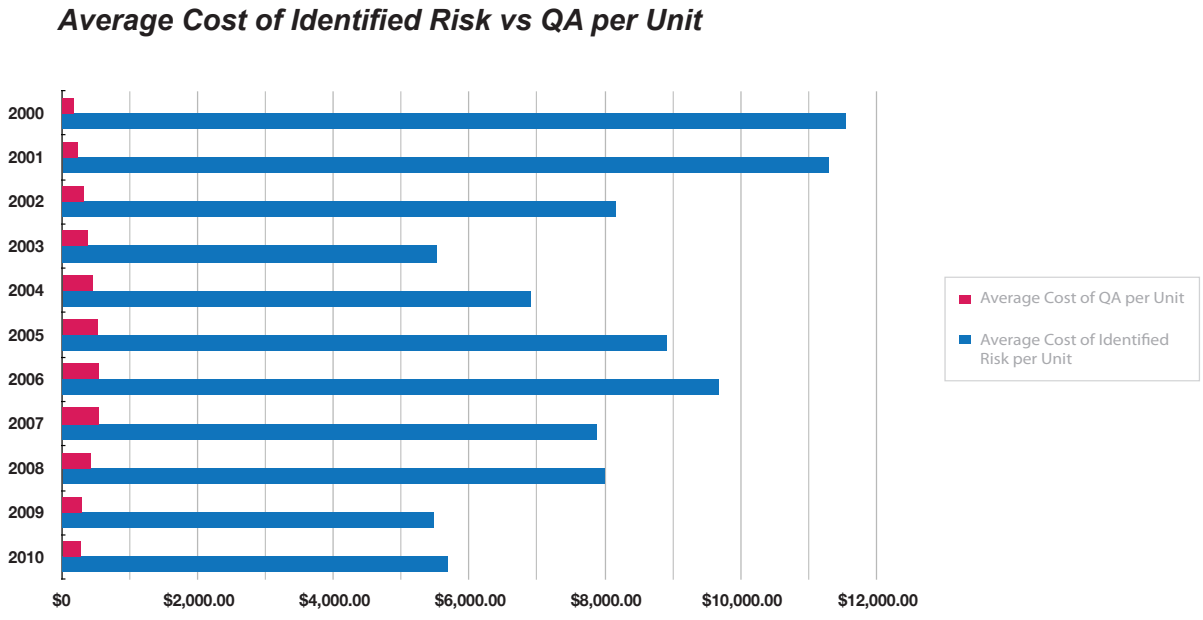

Figure 2: The cost of third-party Quality Assurance provides a significant return on investment to builders. The average cost of identified risk is based on the cost to repair unacceptable items identified by Quality Built post construction versus the cost of third- party inspections on a per unit average.

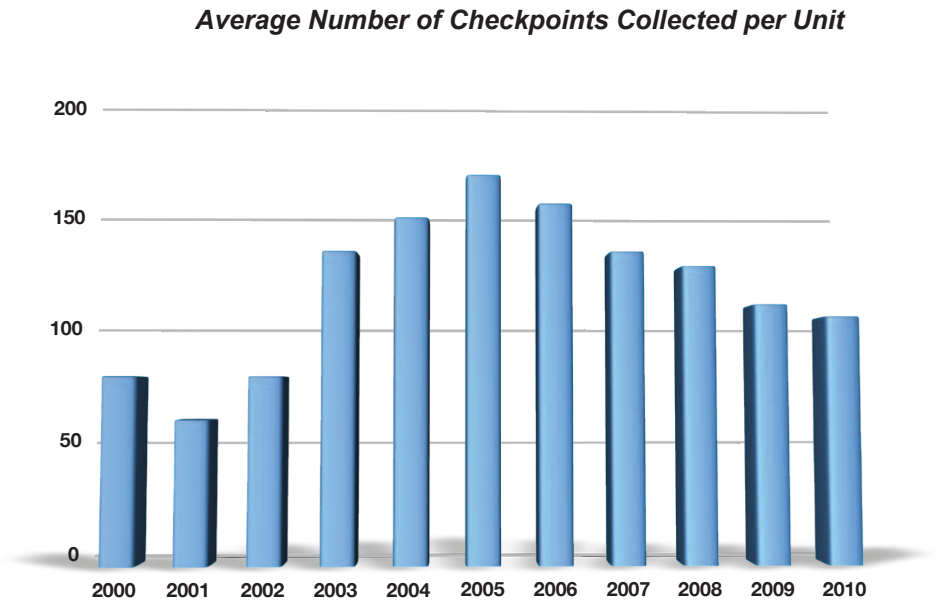

Figure 3: This graph illustrates the average number of Checkpoints collected on a per unit basis. This number includes both acceptable and unacceptable items.

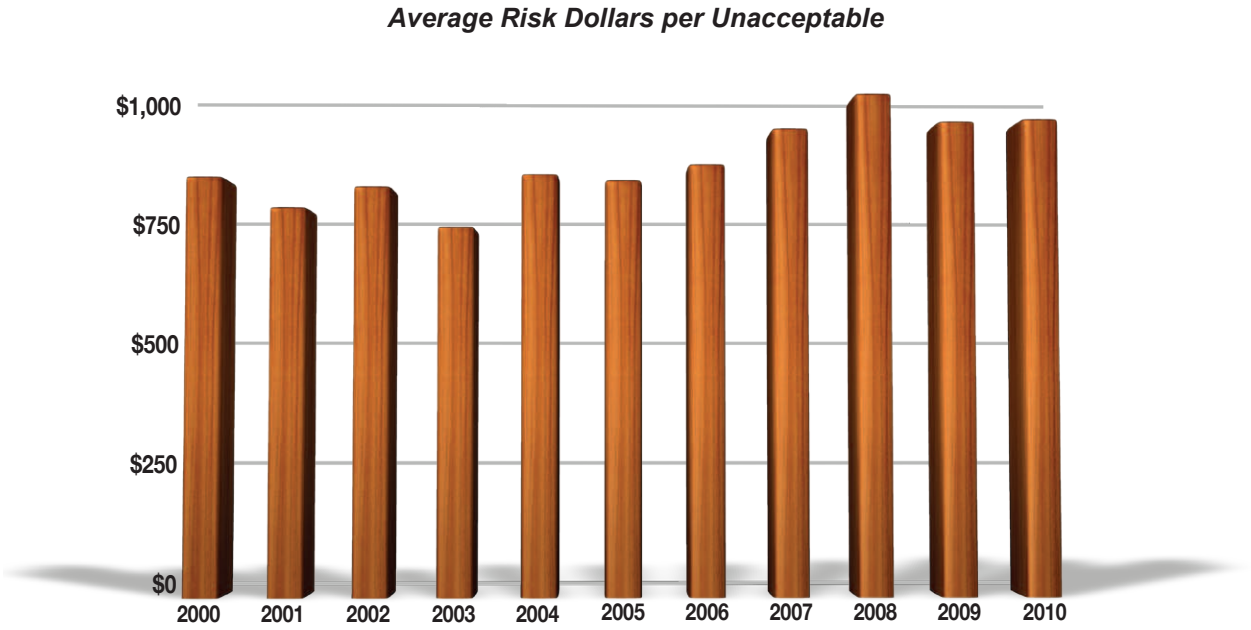

Figure 4: Risk Dollars represent the cost to repair an identified anomaly in one location and do not include consequential damage, personal injury, mold abatement, claims costs, legal and/or expert investigation costs and indirect losses.

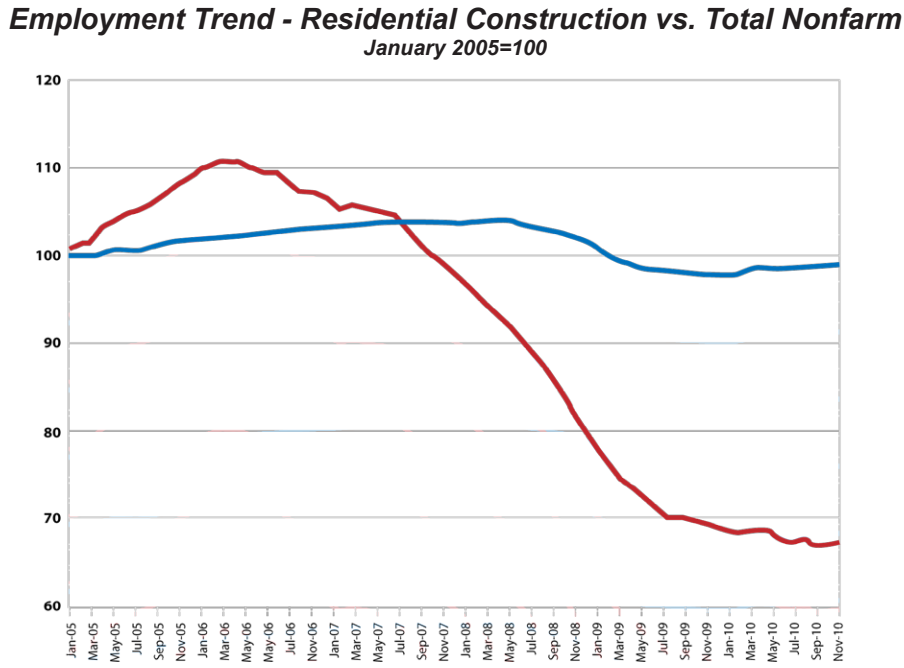

Figure 5: Data provided by the Home Performance Resource Center, www.hprcenter.org, January 2011

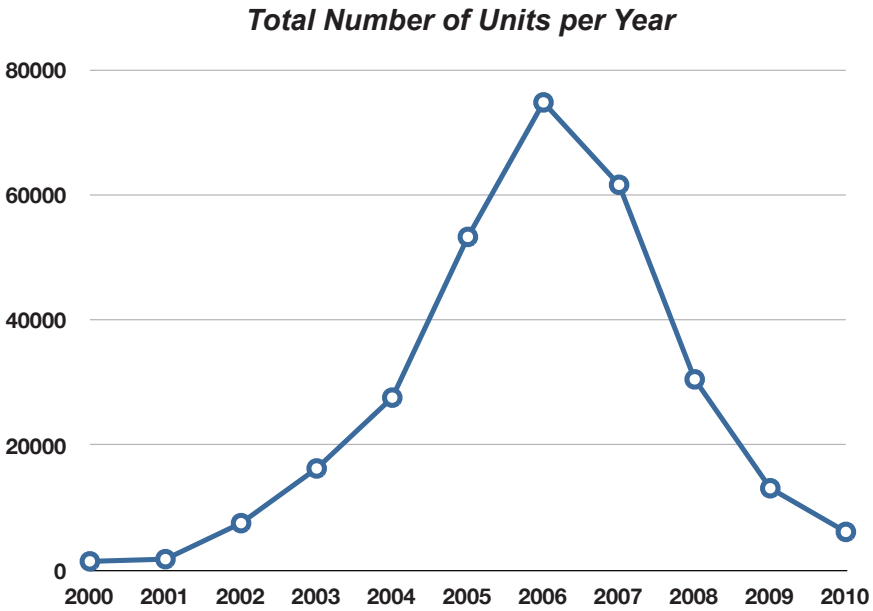

Figure 6: This graph reports the number of single-family homes/multi-family units inspected by Quality Built per year. Homes/units are counted only in the year in which data was first collected, even if data collection continued into another calendar year. If Quality Built reported the number of contracted units, this number would be significantly higher.

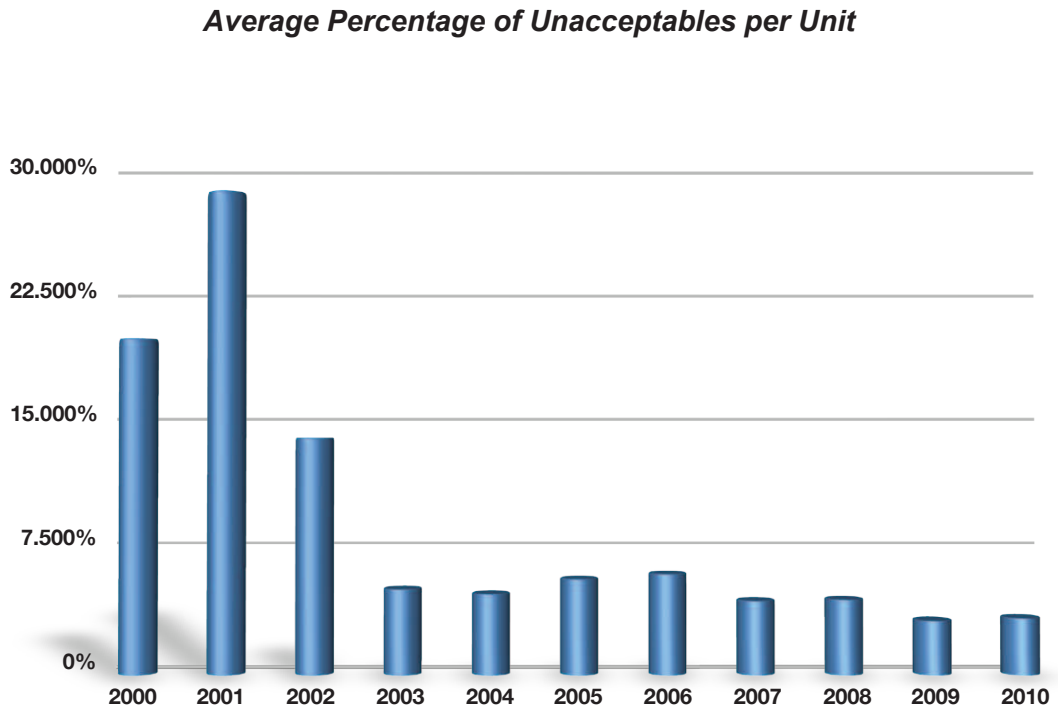

Figure 7: The percentage of unacceptables represents the percentage of anomalies in relationship to the overall number of Checkpoints inspected per unit.

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