

**PLUMBING LICENSING,  
CODE COMPLIANCE,  
AND WORK QUALITY:  
A NATIONAL SURVEY  
OF PROFESSIONAL  
PLUMBING  
INSPECTORS**

**RUSSELL ORMISTON, PHD**

*ALLEGHENY COLLEGE*

**DALE BELMAN, PHD**

*MICHIGAN STATE UNIVERSITY*

**Plumbing Licensing, Code Compliance, and Work Quality:  
A National Survey of Professional Plumbing Inspectors**

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**Russell Ormiston**

Associate Professor, Economics, Allegheny College  
President, Institute for Construction Economic Research

**Dale Belman**

Professor Emeritus, Labor and Industrial Relations, Michigan State University  
Past President, Institute for Construction Economic Research

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## **PREFACE**

*Written by Gerard M. Waites, Esq.*

Americans have long enjoyed safe indoor water quality. This is the result of strong federal laws mandating appropriate standards for water supply sources and public utility infrastructure. It is also due to extremely detailed and intricate plumbing codes that establish necessary industry standards, rules and criteria for both water and wastewater systems installed inside buildings and homes. These codes cover all aspects of indoor plumbing necessary to ensure public health and safety, including specifications for pipe, fixtures, appliances, and other components of our water systems.

Developed by top industry professionals—including engineers and contractors—plumbing codes are adopted and incorporated into state and local plumbing laws because public officials need to rely on the extensive technical knowledge of the industry to make sure these laws work correctly. However, the safety and reliability of our plumbing systems also relies on applicable skill standards established for the plumbers in the field who install and maintain water and wastewater systems.

These standards, which are designed to ensure plumbers have the requisite skills and training and sufficient knowledge of plumbing codes, are usually established via plumbing licensing laws enacted by state and local governments. Further, most jurisdictions have additional laws that require the use of professional plumbing inspectors who monitor and police these systems to ensure they comply with plumbing laws and regulations and applicable industry codes. This study evaluates the use and value of plumbing licensing laws through the perspective of professional plumbing inspectors who have provided their considerable expertise on this issue by voluntarily participating in a national survey.

*Gerard M. Waites, Esq., is a partner with the law firm of O'Donoghue & O'Donoghue LLP in Washington, D.C., where he works in legislative and regulatory affairs in the construction industry, including matters relating to licensing and safety laws and industry code compliance.*

## EXECUTIVE SUMMARY

Occupational licensing requirements are designed to ensure that individuals are sufficiently trained and knowledgeable when working in jobs where professional misjudgment can have dire consequences for the health, well-being, and personal development of other members of society. Within the United States, state licensing requirements are nearly universal in some occupations—such as physicians, lawyers, and teachers—but vary greatly across and within state lines in other vocations. This is especially true when it comes to the construction industry. Despite severe consequences of professional misjudgment—house fires caused by faulty wiring, tainted drinking water caused by plumbing mistakes, carbon monoxide poisoning due to faulty furnace installations, and so on—licensing environments are markedly different across the country, giving rise to questions about the value of licenses in the skilled construction trades.

To address these questions, this study assesses how plumbing licensing laws affect the quality of plumbing work by conducting a national survey of professionals whose job it is to protect public health and safety in this area: plumbing inspectors. Typically equipped with decades of experience in the plumbing trades, state and local inspectors are trusted by their communities to assess the quality of plumbing installations and ensure work meets plumbing code designed to protect indoor water quality and overall public health. The most important takeaways of this study include the following:

- **The findings of this report are based on survey responses from 130 plumbing inspectors in 28 states across the country.** Respondents reported an average of 29.3 years working in the plumbing trades, meaning that the insights offered in this study are based on a collective 3,806 years of experience in the industry.
- **Plumbing inspectors were nearly unanimous in their beliefs that licensing requirements in the plumbing trades: (a) promoted compliance with codes and standards, (b) resulted in a higher quality of work, and (c) led to fewer defects and improperly installed plumbing systems.** Overall, more than 95% of plumbing inspectors across the country endorsed these outcomes, with even higher rates among the most experienced plumbing inspectors surveyed.
- **When asked to identify the biggest problems in the plumbing trades in their jurisdiction, a plurality of inspectors' responses identified the proliferation of work performed by unlicensed plumbers and contractors.** Plumbing inspectors expressed considerable concern about the lack of skill, training, and workmanship among unlicensed plumbers and how it affected the quality of plumbing work they inspected.
- **Ninety-seven percent of plumbing inspectors endorsed a specific licensing requirement(s) as effective in promoting code compliance and overall quality of work.** There was additionally widespread support for licensing requirements of both contractors and plumbers.

The national survey relied upon for this study also queried inspectors' views on numerous other issues affecting the plumbing trades in the United States. A qualitative assessment of inspectors' biggest concerns about the plumbing trades in their jurisdiction uncovered a litany of problems when it came to ensuring quality work, code compliance and public health and safety. This included:

- The failure of many contractors, plumbers, and homeowners to obtain the necessary permits before installing plumbing systems and the subsequently poor quality of workmanship on these projects that puts the public's health and safety at risk.
- The lack of consequences for contractors and workers who do plumbing work without a license, install systems without permits, and complete work that is not compliant with local plumbing code.
- There are shortages of skilled plumbers and capable inspectors in the industry; the latter is attributed to the lack of incentives for experienced plumbers to transition into the role of a local plumbing inspector.

Finally, the survey provided insight into other current areas of interest in the plumbing trades. First, the results highlighted the relative frequency of common areas of code noncompliance discovered on inspections, with inadequate pipe hangers or supports identified as the most frequent concern. Second, the results highlighted that 18% of plumbing inspectors have identified new or different issues surrounding indoor water quality in their jurisdictions within the last five years. Finally, 50% of inspectors whose jurisdictions have adopted virtual inspections consider them to be effective in promoting code compliance. The survey also uncovered what will likely be significant pushback against the increased use of virtual inspections, as only 11% of inspectors in jurisdictions without virtual options consider them to be effective in promoting compliance.

While this study investigated many areas of interest within the American plumbing industry, the primary conclusion reached in this analysis is that plumbing inspectors—who typically have decades of experience in the trade—are nearly universal in their belief that licensing regulations improve plumbing quality and code compliance. This has direct consequences for public health and safety. Unqualified and unlicensed plumbers and contractors are more likely to incorrectly install plumbing systems. This can lead to tainted drinking water, leaks, and water damage that affects the structural soundness of our homes, schools, and workplaces. As a result, the authors encourage public policy debate over licensing in the construction trades to deeply consider the perspectives of plumbing inspectors—who are trusted by their state and local governments to protect their communities' health and safety—and their near unanimous belief in the importance of licensing requirements in promoting better plumbing work in their jurisdictions.

## **Plumbing Licensing, Code Compliance, and Work Quality: A National Survey of Professional Plumbing Inspectors**

*Russell Ormiston*  
Allegheny College

*Dale Belman*  
Michigan State University

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### **INTRODUCTION**

Why do we inherently trust that airline pilots will get us to our destination safely? Why do we trust our doctor to offer sound medical advice? Why do we trust teachers with our children's education? In these situations, misjudgment can have dire consequences for the health, well-being and development of ourselves and our families. And yet we put our trust in these professionals every day, often without us having sufficient knowledge to properly evaluate their capabilities. Occupational licensing is central to this trust, as it assures us that our pilots, doctors, and teachers are sufficiently trained and meet federal, state, or local standards designed to ensure public health and safety.

The need for occupational licensing may seem intuitive for pilots and physicians, but what about for plumbers, electricians, and others in the skilled construction trades? Similar to other listed occupations, professional misjudgment in the skilled trades can also have dire consequences: improperly installed plumbing can lead to tainted drinking water, faulty wiring can lead to a house fire, and an incorrectly installed furnace can lead to carbon monoxide poisoning. But unlike pilots and physicians, licensing in the skilled construction trades varies greatly across—and often within—states. For example, some jurisdictions require that only licensed plumbers can install a plumbing system; other jurisdictions have little to no restrictions at all.

This study investigates the effects of occupational licensing on plumbing quality by surveying those who would know best: plumbing inspectors. Typically drawn from the ranks of experienced and capable plumbers, inspectors are trusted by state and local governments to monitor and enforce plumbing codes that protect the health and safety of our communities. On a daily basis, inspectors apply their expertise to evaluate plumbing quality and identify potential threats resulting from improperly installed systems. In sum, it is their business to know what would best promote code compliance and public health in the plumbing trades.

Using a national survey, this report reflects the insights of plumbing inspectors on the value of occupational licensing, common defects in plumbing installations, perceived changes in water quality, the viability of remote inspections, and other issues affecting the plumbing trades. Inspectors from all over the country responded, offering perspective from every region and vastly differing licensing environments in the United States. It is hoped that the collective wisdom of these state and local officials will provide valuable perspective to inform public policy and regulatory debates surrounding the future of the plumbing industry.

## **METHODOLOGY**

The foundation of this study is a national survey of plumbing inspectors; a copy of the survey instrument is provided in the Appendix. The survey consists of questions in six categories: (a) personal information, (b) an assessment of plumbing quality and common installation problems in their jurisdiction, (c) a description of licensing in their jurisdiction, (d) their personal perspectives on licensing in the plumbing trades, (e) an assessment of water quality issues in their area, and (f) their views on the effectiveness of remote inspections. The survey was administered electronically by a member of the research team via Qualtrics, a leading survey software program. Respondents were offered a \$25 Amazon gift card for completing the survey.

The survey was administered in three waves. First, the research team engaged in an exhaustive internet search to identify government-employed plumbing inspectors whose email address was provided on their respective state and local government's web site; this resulted in a list of 660 inspectors and their contact information. This first step was important as it offered significant geographical diversity in the initial sample. After accounting for "bounced" emails—due to outdated and inaccurate addresses and servers that refused to accept emails from Qualtrics—this resulted in 597 successful invitations sent to prospective respondents; respondents were also provided two follow-up emails. Of those invitations, 32 completed the survey, for a response rate of 5.4%. In the second wave, the research team contacted 11 state and regional plumbing inspectors associations for help in distributing the survey to their members; one state association provided assistance, enabling an additional six responses. Finally, the research team asked our contacts in the construction industry to reach out to their associates in state plumbing inspectors associations for assistance in more widely distributing the survey; this personal nudge resulted in an additional 92 responses.

This process yielded a total of 130 completed surveys by plumbing inspectors. Surveyed inspectors had, on average, 29.3 years of experience in the plumbing industry and 12.4 years of service as plumbing inspectors; across the entire sample, this equates to a combined 3,806 years of experience in the plumbing industry including 1,616 years as plumbing inspectors. Of these, 90% reported as being licensed as a plumbing inspector, 84% were formerly licensed plumbers, and 46% identified themselves as being the chief plumbing inspector in their jurisdiction. Finally, 90% of inspectors are employed exclusively with their state or local government, 8% hold dual roles with a government agency and within the private sector, and 2% are employed exclusively in the private sector or are self-employed.



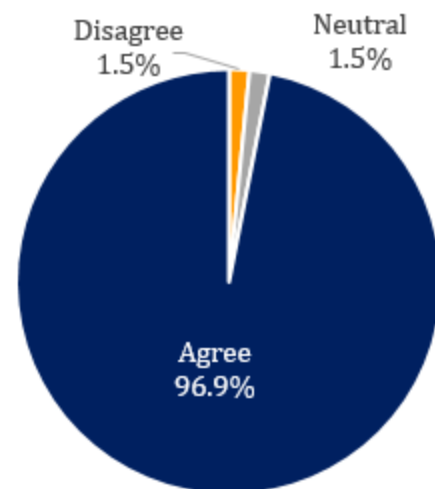




Addressing each of these individually, Figure 2 reflects that 97% of plumbing inspectors agreed or strongly agreed with the statement “plumbing licensing requirements promote compliance with plumbing codes and standards.” This includes 98% of experienced inspectors (5+ years) and 98% of chief inspectors. Within jurisdictions that require journeyworkers to have a plumbing licenses, 97% of inspectors agree that licenses promote compliance; across all types of jurisdictions, rates of agreement were typically over 95%. Finally, inspectors who are most intimately familiar with the licensing process—those who were once licensed plumbers—were 100% in agreement that licensing promoted compliance with plumbing codes and standards.

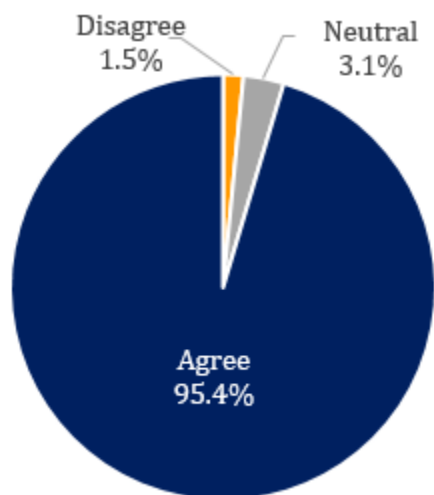
The response in Figure 2 is especially valuable given the importance of plumbing codes and standards. When queried about, 98% of inspectors agreed that codes were necessary to ensure public health; this included 92% of the sample that *strongly* agreed. In sum, just two of 130 inspectors felt that plumbing codes were not important to protect public health, further supporting the position that anything that promotes code compliance—such as licensing—better serves a community’s well-being.

**Figure 2.** “Plumbing licensing requirements promote compliance with plumbing codes and standards.”



Note: Strongly Agree (82.3%), Agree (14.6%), Neutral (1.5%), Disagree (0.0%), Strongly Disagree (1.5%)

**Figure 3.** “Plumbing licensing requirements generally promote a higher quality of work.”



Note: Strongly Agree (73.8%), Agree (21.5%), Neutral (3.1%), Disagree (0.0%), Strongly Disagree (1.5%)

Figure 3 demonstrates that 95% of inspectors agreed with the statement that licensing requirements improved the quality of work in the plumbing industry. Rates among the most senior inspectors were even higher, as 97% of experienced inspectors (5+ years) agreed with that statement; rates among chief inspectors were consistent (95%) with the overall response. For inspectors operating within jurisdictions that require journeyworkers to have a plumbing license, 97% reported that licenses improved the quality of work; across all types of jurisdictions, rates of agreement were well over 90% and often much higher. Of inspectors who were once licensed plumbers, 99% concurred that licenses improved the quality of work.

As further confirmation of the relationship between licensing and better plumbing outcomes, Figure 4 (*next page*) reflects that 95% of inspectors agreed that plumbing licenses resulted in fewer defects and improperly installed systems. Senior inspectors (5+ years) agreed at a rate of 95%, with 92% of chief inspectors agreed with that statement. Within

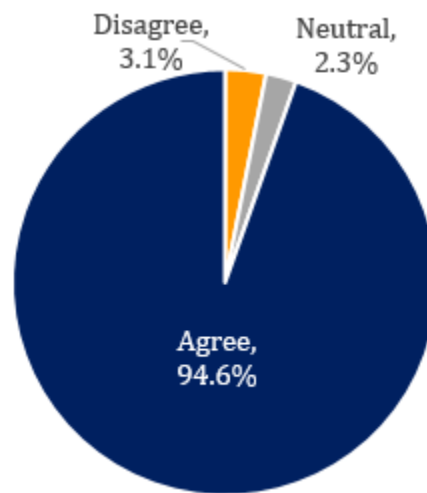
jurisdictions that require journeymen to be licensed, the rate of agreement among inspectors was 96%. Among inspectors who were once licensed plumbers, 97% agreed that licenses reduced defects and improper installations.

Other questions from the survey further support the relationship between licensing requirements and better plumbing outcomes. First, 90% of inspectors agreed that plumbing licensing helped ensure that plumbing systems are properly maintained by preventing problems before they occurred; considering that 6% of the sample was neutral on this question, only 4% expressed disagreement. Second, 96% of plumbing inspectors agreed that completion of apprenticeship programs promoted compliance with codes and standards; this included 71% of the sample that “strongly” agreed.

While plumbing inspectors are nearly unanimous that licensing requirements improve plumbing outcomes, Table 1 (next page) highlights which requirements that they consider most effective. Consistent with answers above, 97% of inspectors identified at least one of six policy options as effective in promoting higher quality work and code compliance.

However, inspectors expressed less unanimity when it came to the most effective requirements as each policy option received support from between 65% and 80% of inspectors. Nevertheless, it is revealing that over 90% of inspectors chose at least one requirement of journeymen and one of contractors, implying that the most effective policy option from the perspective of plumbing inspectors is one that features requirements of both the workers on the front end and the contractors on the back end.

**Figure 4.** “Plumbing licensing requirements result in fewer defects and improperly installed systems.”



Note: Strongly Agree (82.3%), Agree (14.6%), Neutral (1.5%), Disagree (0.0%), Strongly Disagree (1.5%)

**Table 1. Opinion of Plumbing Inspectors on which Requirements are Effective in Ensuring Quality of Work and Stricter Code Compliance**

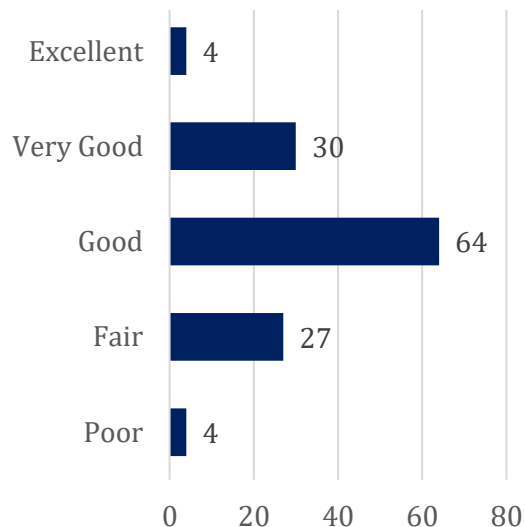
% Listed	Licensing Type
Contractors	
72%	Companies must have a plumbing contractor license
65%	Companies are required to employ at least one licensed master plumber
Journeyworkers	
77%	Each journeyman plumber is required to have a plumber's license
77%	Each journeyman plumber is required to have completed an apprenticeship
77%	Each journeyman plumber is required to pass a written exam
79%	Each journeyman plumber is required to have a minimum amount of experience (in hours or years)
Overall	
97%	At least one licensing requirement selected
91%	At least one licensing requirement of journeyworkers selected
92%	At least one licensing requirement of companies selected

In addition to asking inspectors their perspectives on the value of licensing, this study also queried these plumbing professionals about which parties are most likely to violate local or state regulations by installing plumbing work without having the necessary license to do so. Among inspectors in jurisdictions that require contractors to be licensed, 87% of inspectors have uncovered work performed by companies who were not in compliance with local licensing regulations. This surpassed the number of inspectors who had discovered work performed by unlicensed journeyworkers, as 72% of inspectors acknowledged to finding work installed by plumbers without the required license (among locales that require workers to be licensed). Finally, among inspectors that address residential plumbing work, 63% discovered unlicensed work installed by a homeowner.

### Quality of Work

Beyond issues of licensing, the results of the survey provided considerable insight into the plumbing environment in the United States. This included multiple questions on the quality of work and frequency of code violations. Figure 5 presents the distribution of plumbing inspectors' evaluations of the overall quality of work in their jurisdiction. While recognizing that these terms are subjective, the results show a clear plurality considering plumbing quality to be "good" with nearly equal numbers above and below that evaluation. This pattern was consistent across regions of the country, as there were negligible statistical differences in the average rating of plumbing quality between the Northeast, Midwest, South and West when using a five-point scale to weight this distribution ( $F=0.44$ ,  $p=0.73$ ).

**Figure 5. Distribution of Inspectors' Evaluation of Quality of Work in their Jurisdiction**



In terms of the frequency of code violations, 40% of inspectors reported finding them "often" with an additional 56% suggesting violations occur "sometimes"; the remainder reported them "rarely" or "never." In terms of the seriousness of violations, a majority of inspectors (57%) said they "sometimes" represent potential threats to public safety; an additional 15% said they were "often" threats.

Table 2 (*next page*) summarizes the frequency of 17 common installation problems discovered during plumbing inspections. Relying on a four-point scale to estimate the frequency of defective installation (4=often, 1=never), the results highlight that inadequate pipe hangers or supports represents the most frequent defect found during an inspection, with an average score of 3.09 with 29% of inspectors identifying that as being found "often" during their work. Failures by building owners to conduct necessary testing represents the second-most frequent installation problem, with a frequency score of 2.91 with 22% of inspectors saying this occurs often. Overall, more than 10% of inspectors said that 12 of the 17 installation problems were often discovered during plumbing inspections.

**Table 2. Frequency of Common Plumbing Installation Problems Discovered During Inspections (4=often, 3=sometimes, 2=rarely, 1=never)**

Frequency Score	Inspectors: % "Often"	Plumbing Installation Problem
3.09	29.1%	Pipe hangers or supports inadequate.
2.91	22.3%	Failure by building owner to ensure that required system testing is performed (including testing for backflow devices).
2.85	18.8%	Lack of cleanouts accessibility in piping systems.
2.80	11.6%	Products requiring maintenance installed in inaccessible locations.
2.80	10.9%	Misuse of products, materials, and devices.
2.78	18.1%	Weakening of structure due to excessive cutting, notching or boring.
2.75	17.4%	Improper gas pipe sizing or gas pipe installation problems.
2.75	14.7%	Installation of products that are not approved by the plumbing code or authority having jurisdiction.
2.74	14.7%	Temperature pressure relief valves or discharge piping improperly installed.
2.74	12.6%	Improper grading of draining or venting systems.
2.72	10.6%	Gas appliances not properly vented or installed.
2.61	14.3%	Improperly calculating the supply and water distribution line sizes.
2.57	9.4%	Improper venting practices (i.e., allowing sewer gases to enter the occupied space).
2.43	7.8%	No protection when dissimilar pipe materials are joined together potentially resulting in in electrolysis.
2.40	6.3%	Improperly installed or otherwise defective backflow devices.
2.25	4.7%	Unprotected cross-connections in contaminated/polluted water entering the potable water supply.
2.12	0.8%	Under-sizing the sewage or waste system.

### Water Quality

Concerns over aging, lead-based plumbing systems and recent anecdotal reports of Legionnaires' disease led this survey to query plumbing inspectors for their insight on water quality issues. In response, 18% of respondents acknowledged that they have witnessed new or different problems affecting indoor water quality over the last five years. While sample sizes are too small to detect statistically significant differences across regions ( $F=0.54$ ,

p=0.65), it is notable that 22% of inspectors in Midwest reported concerns while just 11% of inspectors in the South identified such issues. Further, it is slightly troubling that among the most experienced inspectors (those with 10+ years on the job), 25% of respondents acknowledged new of different water quality problems in the last five years; further, 24% of chief inspectors offer the same conclusion.

Any focus on changes within the last five years may overlook that threats to water quality have been persistent for much longer. The survey results reflect plumbing inspectors' deep concern for this issue. While nearly every inspector identified plumbing codes and standards as important to ensure plumbing health, 43% of inspectors suggested that codes needed to be revised to include requirements for regular testing and sampling of indoor water quality. Rates among the chief inspectors and those with 10+ years of experience roughly matched the overall proportion who concurred with this belief.

### *Virtual Inspections*

For a variety of reasons, a number of jurisdictions have increasingly allowed virtual inspections of plumbing systems. This connects customers with inspectors via a video call in which the latter can evaluate plumbing work via a webcam. While this survey offers no insight as to the pace of adoption since the start of the pandemic, responses indicate that 35% of inspectors were working in jurisdictions that allowed virtual inspections as of Spring 2022. There is a marked difference in the adoption of virtual inspections by regions as 78% of inspectors in the West work in jurisdictions in which they are allowed; in contrast, rates of adoptions are below 30% in the rest of the country. While it is reminded that the survey has a relatively small sample from the West (n=23) that may skew the estimated national rate of adoption, it is revealing that 100% of inspectors in Montana (n=10) and 67% of inspectors in the three states along the Pacific Coast (n=9) acknowledged the use of virtual inspections. Whether this regional difference is a fluky result of small samples or actually reflects differences in the regional adoption of such technology requires additional research.

While the adoption of virtual inspections may be increasing, many inspectors are skeptical of their effectiveness in replacing in-person inspections as only 25% considered virtual inspections to be effective in promoting code compliance. However, 50% of inspectors with experience with virtual inspections believed they were effective; in contrast, just 11% of inspectors in jurisdictions without this option believed it to be effective. This sizeable difference of opinion with regards to the acceptance of new technology is to be expected, as it mirrors larger societal trends between those who have and have not adopted new technological advancements.

### *Other Plumbing Problems*

The final question of the survey asked inspectors to identify the biggest problems facing the plumbing industry in their jurisdiction. Despite it being an open-ended question, some clear and dominant themes emerged. Most prominently, it appears that the top frustration of plumbing inspectors is the prevalence of unlicensed workers installing plumbing in their jurisdiction. While the improper installations of homeowners and unlicensed contractors

were mentioned, a much more substantial portion of respondents expressed concern about the proliferation of work performed by unlicensed plumbers. In essence, there were approximately 20 responses that represented variations of the same theme when asked to identify the biggest problem in the plumbing field in their jurisdiction:<sup>1</sup>

*Untrained and unlicensed plumbers.*

--Illinois inspector

*Unlicensed plumbers on a job site.*

--Texas inspector

*Unlicensed plumbers in the field doing work.*

--New Jersey inspector

*Unlicensed individuals working or helping homeowners.*

--Tennessee inspector

*Unlicensed practices from landlords or homeowners who attempt to do the work themselves without knowledge.*

--Maine inspector

*Unpermitted work installed by unlicensed plumbers.*

--Texas inspector

*Unlicensed plumbers installing. Performing plumbing without permits.*

--Illinois inspector

*Unlicensed contractors and unpermitted work.*

--Texas inspector

It is important to highlight that all but one of the quotes above came from experienced inspectors, each with at least 20 years in the plumbing trades; this underscores the extent of the problem. But as highlighted in the last three quotes, the work of unlicensed plumbers was often—but not always—connected to another commonly-cited problem: unpermitted work:

*Contractors doing work without taking out the proper permits and not having inspections conducted. It increases the possibility of harming the public's health and safety.*

--New Jersey inspector

*Occasionally, I see some scary installations when inspecting but I have real concern for the plumbing installations done without permits that never get inspected.*

--California inspector

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<sup>1</sup> Quotes featured in this study are lightly edited to correct typos and misspellings.



*Work being done incorrectly without permits.*

--Pennsylvania inspector

While permitting is a noted problem, the distress over the prevalence of unlicensed plumbers was more frequently intertwined with other commonly-cited concerns: a lack of training and poor workmanship. While these issues were frequently identified by plumbing inspectors, four responses offered considerably more detail:

*The installation of plumbing systems by unqualified persons. They don't know or understand basic plumbing code or proper installation guidelines due to lack of training and experience.*

--California inspector

*Too many plumbers train in one phase of the trade and never develop a complete overall knowledge of the trade.*

--Texas inspector

*I feel that a lot of plumbers—whether they are journey level or apprentice—get put into a single area of plumbing. Examples are someone who only installs water, DWV, lay out, drill out, etc. This hurts the overall performance and knowledge needed to master this difficult trade.*

--Washington inspector

*Workmanship and quality of work and knowing what they are supposed to do.*

--New Jersey inspector

As highlighted in the first response, the failure of plumbers and contractors to know—and adhere to—local plumbing codes was also a consistent theme in the results, as highlighted by the following responses:

*Lack of code knowledge and installation techniques.*

--Michigan inspector

*Poor quality of work by the plumbing companies, and lack of knowledge of the current codes.*

--Florida inspector

*I would love it if you made a code section that reads (that simply saying) "it will work"... does not meet minimum code requirements.*

--Kansas inspector

*Local contractors feel that they are above the plumbing code.*

--Midwest region inspector

*Knowledge of the code. Most plumbers take the test to get their license and then never look at the book again. Continuing education is required, but just because you are there doesn't mean you are learning/paying attention*

--Kansas inspector

While results presented earlier in this study highlighted that inspectors are nearly unanimous in their appreciation for plumbing codes and standards as a means to ensure public health and safety, a number of plumbing inspectors offered critiques of the codes themselves. A Kansas inspector voiced concern that having two code systems led to confusion among contractors, an Illinois inspector was frustrated that their state code was revised without the input of field professionals, and a Washington inspector highlighted that schools and hospitals should be held to higher standards. Finally, a Montana inspector expressed deep concern about how recently-adopted stricter code in their state was increasing the price of new homes and effectively helping to price poor people out of home ownership.

Critiques of codes aside, inspectors also highlighted their frustration in the enforcement of their jurisdiction's standards for either code compliance or licensing requirements:

*No fines are issued for license, permit, or workmanship infractions. There is no consequence for doing anything wrong.*

--Montana inspector

*Lack of consequences and or penalties for those who practice plumbing without a plumber's license and or knowledge of plumbing.*

--Illinois inspector

*Unlicensed persons performing plumbing work with little ability to enforce the plumbing license law in my state. The lack of state and local inspectors to keep up.*

--Texas inspector

*Lack of licensing enforcement.*

--Illinois inspector

While much of the expressed concern over enforcement and code compliance focused on the actions of unlicensed contractors and workers, two inspectors also singled out the role of builders in undermining enforcement in their jurisdictions:

*The biggest problem facing the building industry are the builders. The builders associations undermining license and code requirements for the sake of larger profits which ultimately places the consumer on the short end of that stick.*

--Southeast region inspector

*Builders trying to get rid of the license requirement for plumbing.*

--Southeast region inspector

Inspectors' frustrations with restrictions on their ability to enforce the law is buttressed by other concerns about sufficiently incentivizing experienced plumbers to transition into a role as an inspector. The author's conversation with an Ohio plumbing inspector during the development of the study noted the potential downgrade in pay that may be dissuading some from transitioning into government work, and that may be one cause of what some see as a shortage of capable inspectors:

*There is a lack of interest from individuals with plumbing knowledge and experience wanting to transition to plumbing inspection.*

--California inspector

*Plumbing inspectors... need to be compensated more.*

--Massachusetts inspector

*Not having enough inspectors.*

--Illinois inspector

*Lack of certified inspection professionals.*

--Ohio inspector

*Smaller jurisdictions do not hire trade experienced inspectors and rely only of certs. This hurts the inspection process as these people while well intentioned lack the years of knowledge to perform proper inspections.*

--Washington inspector

Concerns among inspectors about worker shortages were not limited to their own role. In fact, another dominant theme in the survey responses is that inspectors are very concerned about the lack of sufficiently trained plumbers in their jurisdiction and the lack of interest in the trade shown by younger generations. Loosely defined, concerns about a dearth of qualified and capable plumbers in their region—and the lack of presumed interest among young workers—was the third-most cited problem identified by inspectors, with references to the problem from coast-to-coast:

*Not enough young people interested in the trades.*

--Oregon inspector

*Lack of quality young people becoming plumbers.*

--Virginia inspector

*Lack of young people in the trades, lack of vocational training in our high schools. Shortage of people interested in working trades.*

--Michigan inspector

*Lack of interest of young people in the plumbing trade.*

--Ohio inspector

*The lack of qualified people performing the work.*

--New Jersey inspector

*Lack of competent trade persons coming up, and they don't seem to stay with any one employer very long.*

--Kansas inspector

## **CONCLUSION**

This study investigates the effects of licensing on plumbing quality and public safety and health via a national survey of the people who can best address this question: plumbing inspectors. Typically equipped with decades of experience in the plumbing trades, inspectors' entire profession is geared towards understanding what best promotes code compliance and ensures public health and safety in our homes, institutions, and workplaces. This suggests that the insights offered by these experts—who are trusted by their state and local communities to ensure public health—should be valued in public policy conversations about the future of the plumbing industry in the United States.

The perspectives of plumbing inspectors all largely point to a consistent conclusion: occupational licensing improves plumbing quality and code compliance, thereby better ensuring public health and safety. Plumbing inspectors from all regions of the country were nearly unanimous in this belief, with more than 95% agreeing that licensing promoted code compliance, led to an increased quality of work, and resulted in fewer defects and improper installations. The importance of licensing was further supported by the qualitative data, as “unlicensed plumbers”—often lacking in skills, training, and workmanship—were identified in respondents' comments when asked to name the biggest problem in the plumbing industry in their jurisdiction.

This study also contributes to the larger dialogue about the present and future of the plumbing industry beyond the issue of licensing. Through a quantitative analysis of survey results, this study provides insight on the most common problems found during plumbing inspections, highlighted a slight uptick in the observation of new threats to water quality, and offered perspective on inspectors' skepticism surrounding virtual inspections. Finally, an open-ended question revealed some of the key challenges currently facing the industry; in addition to the problem of unlicensed and untrained workers, this included unpermitted work, a lack of code knowledge among some workers and contractors, challenges recruiting experienced plumbers to become inspectors, the lack of enforcement capabilities, and difficulties in persuading young people into the trades.

## **About the Authors**

*Russell Ormiston, Allegheny College*

Dr. Ormiston is an associate professor of economics at Allegheny College and the current president of the Institute for Construction Economic Research (ICERES). Dr. Ormiston has co-authored book chapters on workplace conditions in the residential construction industry and academic articles and public policy papers on the economic and social impacts of worker misclassification, prevailing wage laws and project labor agreements.

*Dale Belman, Michigan State University*

Dr. Belman represents one of the nation's leading academic economists on labor issues in the construction industry. Professor Emeritus in the School of Labor Relations and Human Resources at Michigan State University, Dr. Belman is the founder and former president of ICERES. During his esteemed academic career, Dr. Belman has written scores of journal articles and book chapters on labor and employment issues and has frequently testified on these concerns in federal and state legislative proceedings.

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## **Supporting Organizations**

*Institute for Construction Economic Research (ICERES)*

<http://icer.es.org/>

The construction industry and its stakeholders face pressing long-term issues regarding workforce sustainability, safety, productivity, and integration of technology. The Institute for Construction Economic Research (ICERES) is a non-profit organization that supports high quality research with the goal of finding and disseminating pragmatic solutions to these and other construction issues. ICERES undertakes non-partisan research on issues facing the industry, collaborating with existing construction researchers, and attracting new investigators into the field of construction research. The Institute also works to develop a network of researchers with ongoing programs on construction issues. In addition to its work in supporting research, the Institute disseminates this research with a working paper series, a web presence, and conferences.

## **APPENDIX: SURVEY INSTRUMENT**

*Note: Survey was administered via Qualtrics.*

### **Screener Question (If answer yes, respondent gets access to survey; if no, they exit)**

1.) Do you perform inspection services on plumbing systems? (Yes/No)

### **Personal Experience and Qualifications**

2.) In your role as a plumbing inspector, who is your employer?

- a. Government agency
- b. Private company / Self-Employed
- c. Both

3.) Identify the jurisdiction in which you conduct most of your inspections of plumbing systems (*e.g.*, state, county, city, township). (fill-in-the-blank for city/township/county; drop-down menu for state)

4.) How many years have you been a plumbing inspector? (fill-in-the-blank)

5.) Are you licensed as a plumbing inspector? (Yes/No)

6.) Are you considered the chief plumbing inspector in your jurisdiction? (Yes/No)

7.) How many years have you worked in the plumbing trade as a plumber, plumbing apprentice, plumbing inspector, chief inspector, or other related occupation? (fill-in-the-blank)

8.) Do you inspect plumbing for the following types of work?

- a. (Yes/No) Residential work
- b. (Yes/No) Commercial work
- c. (Yes/No) Institutional work (*e.g.*, hospitals, schools, public buildings)
- d. (Yes/No) Industrial work

### **Plumbing Systems: Quality of Work**

9.) How often do you find work that is not in compliance with the requirements of plumbing laws, codes or standards in your jurisdiction? (4=Often, 3=Sometimes, 2=Rarely, 1=Never)

10.) How often do issues of noncompliance of plumbing code requirements result in potential public safety threats? (4=Often, 3=Sometimes, 2=Rarely, 1=Never)

- 11.) How would you describe the overall quality of work on the plumbing system that you inspect? (5=Excellent, 4=Very Good, 3=Good, 2=Fair, 1=Poor)
- 12.) Please indicate how often the following plumbing installation problems were found during your inspections over the past 12 months. (4=Often, 3=Sometimes, 2=Rarely, 1=Never, 0=Not Applicable)
- a. Improperly installed or otherwise defective backflow devices.
  - b. Unprotected cross-connections in contaminated/polluted water entering the potable water supply.
  - c. Improper gas pipe sizing or gas pipe installation problems.
  - d. Improperly calculating the supply and water distribution line sizes.
  - e. Under-sizing the sewage or waste system.
  - f. Installation of products that are not approved by the plumbing code or authority having jurisdiction.
  - g. Misuse of products, materials, and devices.
  - h. Products requiring maintenance installed in inaccessible locations.
  - i. Improper venting practices (i.e., allowing sewer gases to enter the occupied space).
  - j. No protection when dissimilar pipe materials are joined together potentially resulting in in electrolysis.
  - k. Pipe hangers or supports inadequate.
  - l. Lack of cleanouts accessibility in piping systems.
  - m. Improper grading of draining or venting systems.
  - n. Temperature pressure relief valves or discharge piping improperly installed.
  - o. Weakening of structure due to excessive cutting, notching or boring.
  - p. Gas appliances not properly vented or installed.
  - q. Failure by building owner to ensure that required system testing is performed (including testing for backflow devices).

**Licensing in Your Jurisdiction**

- 13.) Which of the following is required to install or otherwise work on a plumbing system in your jurisdiction? Choose all that apply. (check boxes)
- a. Companies must have a plumbing contractor license.
  - b. Companies are required to employ at least one licensed master plumber.
  - c. Each journeyman plumber is required to have a plumber's license.
  - d. Each journeyman plumber is required to have a specialty license or certification in backflow prevention.
  - e. Each journeyman plumber is required to have completed an apprenticeship.
  - f. Each journeyman plumber is required to pass a written exam.
  - g. Each journeyman plumber is required to have a minimum amount of experience (in hours or years).
  - h. There are no requirements of plumbers or plumbing companies.



- 14.) Does your local jurisdiction have licensing laws in place that are stricter than state laws?
- Yes
  - No
  - Not applicable / I work for the state government
- 15.) If you have found work performed in violation of applicable licensing requirements, indicate the type of such unlicensed work. Choose all that apply.
- Work performed by homeowners
  - Work performed by unlicensed contractors
  - Work performed by unlicensed journeymen
  - I have never found work in violation of my jurisdiction's licensing requirements
  - My jurisdiction does not have licensing requirements

### **Perspectives on Plumbing Licensing**

- 16.) In your opinion, which licensing requirements are effective in ensuring the quality of plumbing work and stricter code compliance? Choose all that apply. (check boxes)
- Companies must have a plumbing contractor license.
  - Companies are required to employ at least one licensed master plumber.
  - Each journeyman plumber is required to have a plumber's license.
  - Each journeyman plumber is required to have completed an apprenticeship.
  - Each journeyman plumber is required to pass a written exam.
  - Each journeyman plumber is required to have a minimum amount of experience (in hours or years).
  - None of these options are effective in promoting quality workmanship or stricter code compliance.
- 17.) Please indicate whether you agree or disagree with the following statements. (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree)
- Plumbing codes and standards are necessary to ensure public health and safety.
  - Plumbing licensing requirements promote compliance with plumbing codes and standards.
  - Plumbing licensing requirements result in fewer defects and improperly installed systems.
  - Plumbing licensing requirements generally promote a higher quality of work in the plumbing industry.
  - Plumbing licensing requirements help ensure that plumbing systems are properly maintained by preventing problems before they occur.
  - Requirements that plumbers complete an apprenticeship promote compliance with plumbing codes and standards.

### **Additional Issues & Future Trends**

- 18.) Have you witnessed an increase in new or different problems affecting indoor water quality in systems that you have inspected over the past five years (e.g., legionella, lead, or other contaminants)? (Yes/No)
- 19.) Do you see the need to revise plumbing codes and standards to require regular testing and sampling of indoor water quality? (Yes/No)
- 20.) Does the jurisdiction in which you are employed permit the use of remote virtual inspections? (Yes/No)
- 21.) Do you think that remote virtual inspections are effective in promoting compliance with requirements of plumbing laws, codes and standards? (Yes/No)
- 22.) What are the biggest problems facing the plumbing industry in your jurisdiction?  
(paragraph text)