Making OSHA Inspections More Effective: Alternatives for Improved Inspection Targeting in the Construction Industry

David Weil

June 2004

© 2004, The Center to Protect Workers' Rights. All rights reserved. This research was made possible by the Center to Protect Workers' Rights (CPWR) as part of a cooperative agreement with the National Institute for Occupational Safety and Health, NIOSH (NIOSH grant CCU317202). The research is solely the responsibility of the authors and does not necessarily represent the official views of NIOSH. CPWR – a research, development, and training arm of the Building and Construction Trades Department, AFL-CIO – is uniquely situated to serve workers, contractors, and the scientific community. A major CPWR activity is to improve safety and health in the U.S. construction industry. CPWR, Suite 1000, 8484 Georgia Ave., Silver Spring, MD 20910, 301-578-8500, www.cpwr.com

Acknowledgments

Funds for this study were provided by a grant from the Center to Protect Workers' Rights (CPWR). I am grateful to Pete Stafford and James Platner of CPWR for their interest in this project, which builds directly on a prior study of OSHA enforcement also supported by CPWR, and to Jane Seegal for her assistance in editing this manuscript. Thanks also to Bruce Swanson, H. Berrien Zettler, and Richard Rinehart of the OSHA Directorate of Construction for their input and access to OSHA personnel, to Joseph DuBois of OSHA's Office of Statistics, and to the OSHA Construction Targeting Task Force for provision of survey data. Dr. William Schriver of the Construction Industry Research and Policy Center at the University of Tennessee generously provided me access to data as well as insight into the Dodge/CRA system. Don Cotchen and Anita Gryan of F.W. Dodge Inc. were extremely helpful in providing information on the Dodge system and feedback on issues in the proposal. Finally, I am grateful to Alison Morantz and Marcus Stanley for comments at early stages of the project and to Nao Valentino for her ongoing research support. The analysis and

Contents

Background

The problem of targeting in construction

Construction job sites are some of the most dangerous workplaces in the United States. In 2002, there were 1,153 deaths from injuries in construction – more than in any other industry – and 163,700 injuries and illnesses involving days away from work[1](Bureau of Labor Statistics 2004a, 2004b). Although the rate of reported injuries fell substantially over the past decade, the rate for construction remains well above that for the private sector as a whole.

Efforts by the U.S. Occupational Safety and Health Administration (OSHA) to improve workplace safety on construction work sites are complicated by features of the construction industry. The construction work site is dynamic by nature: the "manufacturing" process for construction requires the physical transformation of the workplace itself and, therefore, working conditions. Each new phase of a construction project entails different materials, building technologies, work processes, and exposures to external and internal environmental conditions. For example, the risk of falls – one of the major causes of deaths and injuries in construction – alternately increases and declines over the course of a multi-story construction project. On the other hand, in most residential construction, the largest risk from falls occurs during one relatively brief period, during roofing (Nelson and others 1997). As a result, the composition and nature of safety and health risks shift throughout a project.

The set of workers at a site also varies as a project progresses. Crews with different skills and abilities operate at each stage of a project. Management by individual contractors changes over time, also, as different subcontractors arrive at and leave a site, making the role of the prime construction manager particularly decisive, because of its continuity throughout a project. As the levels of skill and experience of workers and managers on a site vary over time, and as tasks shift, worker exposures to safety and health risks change.

These characteristics of the construction work site create a very different safety and health regulatory problem than in a fixed manufacturing location. Yet the underlying regulatory model applied to construction is the same as that applied to factories, banks, or other fixed facilities: sites are selected, inspections conducted, penalties assessed, and follow-up inspections undertaken to ensure abatement. Given the difficulties of ensuring safety at a construction site, however, OSHA recently has been reviewing how it targets enforcement in construction.[2]

This study proposes some alternative methods to improve enforcement by OSHA in the construction industry, with the goal of providing a basis for discussion of future public policy in this area

---

[1]Illnesses make up only about 2% of the figure for construction.

[2] The OSHA Directorate of Construction has commissioned several evaluations of targeting, including the study by Ringen in 1999. In late 2002, the Assistant Secretary of Labor for OSHA, John Henshaw, appointed a Construction Targeting Task Force to study this problem. The author has worked in consultation with Richard Rinehart, chair of the task force, in the present study and has used data generated by their work. The views and recommendations found in this report reflect only my conclusions and not those of the task force or OSHA.

A 1987 audit by the Office of the Inspector General of the U.S. Department of Labor concluded that several OSHA area offices had not come into adequate compliance with the *Barlow's* decision requirements on establishing a neutral and documented system of construction targeting. The Inspector General noted 6 of 8 area offices audited failed to have documented lists of all potential construction sites for the area (U.S. Department of Labor 1987, pp. 45-46). Coinciding with the Inspector General's investigation, OSHA initiated a project to create a computer-based targeting system to be introduced the following year in order to automate the process of selecting projects from a universe of all potential sites.

The targeting procedure created in response to *Barlow's* and the Inspector General report uses construction permitting data collected by F.W. Dodge Inc. and statistical models that predict construction starts and estimated durations to establish the universe of active construction projects for a given geographic area corresponding to each OSHA area office. For each OSHA area office, a list of projects is randomly selected from the estimated universe of active construction projects. The OSHA area office must then inspect contractors and subcontractors on all sites provided on the list during the course of the month (or carried over to the next month if there is insufficient time for completion). In this way *employers* (contractors and subcontractors) are identified on the basis of *project-level* activity. As a by-product of the unique structure of construction, this aosi1 0 TD0d on 3.activity9(ated univf)91s,069TD0.0015 Tdh(consddih78 Tw[(ratio (therfMo
ltadse OSHA ogfdocs ictsatotentionoen egem(nts fe theindunstyd thattem 37(ctiv soem)7.7(e)-076noif)]TJT0.00

str(allaarea offics ex prssend theviewd that theplannded progrrm 3.arm 3.a(e)-05(e.)]TJT(* inspections givAs a pr
the xlisting system 3.a. Oonoeet hnd,s tey

current and detailed file for each listed project with additional information including the location. This information for each area office is posted on an OSHA intranet site. These electronic lists designate the targeted sites for programmed inspections in the next month.[7]

Although the targeting procedure is based at the project level, OSHA enforcement activity in all other respects is focused on the contractor(s) active on each site at the time of an inspection. That is, OSHA personnel record, track, and report on inspection activity on the basis of contractors, rather than projects, inspected. Thus, two projects of equal scale would be counted differently if only one contractor was present at the time of one inspection and eight on another. Because the number of inspections conducted is an important metric for OSHA, both in terms of its internal procedures and its reporting to the White House, Congress, and the public, the incentives for the agency have always pushed toward visiting construction projects with a large number of contractors present.

Thus, area offices can provide CRA with project characteristics (called "deletion criteria") that limit the universe from which random sites are selected. The most common form of these is specifying a minimum project size (measured in dollar value) for inclusion in the list. In order to maximize the number of contractors inspected during a visit to a site, area offices tend to pre-specify that only larger construction sites are included in the sampling universe.[8] Because most area and regional OSHA offices provide minimum dollar volumes in their deletion criteria, the resulting lists are biased toward larger projects. Because of this emphasis on larger work sites, OSHA enforcement for programmed inspection tends to be skewed toward monitoring the safety and health activities of large construction contractors and subcontractors, with annual revenues well above $5 million.

The effects of current targeting procedures

The targeting procedure developed in response to *Barlow's,* which was biased toward large sites, made sense in OSHA's first few decades of operation when it was reasonable for the agency to try to move as many contractors as possible toward compliance in a world of widespread noncompliance with newly promulgated safety and health standards. Studies of the effects of OSHA inspections in the early period of regulation show a high level of responsiveness to enforcement and therefore the rationality of an approach focused on larger employers (Bartel and Thomas 1985; Scholz and Gray 1990; Gray and Mendeloff 2001; Jones and Gray 1991; Stanley 2000; Weil 1996, 2001).

A previous study by this author investigated the effects of OSHA enforcement on safety and health among the large contractors typically selected through the Dodge/CRA targeting procedure.

[7] *Barlow's* does not apply to all OSHA inspection activity in construction. Only programmed inspection activity is germane, rather than inspections initiated by a complaint, death or major accident, or by inspector referral. Planned programmed activity is governed by a systematic and neutral selection procedure that usually falls into one of two categories – scheduled inspection using the Dodge/CRA system or a national or local emphasis program where a different procedure has been developed that is directed at a particular problem (falls) or sector (bridges).

[8] The universe of potential targets can be modified by general criteria selected by the area office, although offices are obligated to then inspect all those randomly selected from that list in order to comply with the *Barlow*'s standards (as interpreted by OSHA practice).

The tendency for larger projects to have better safety and health performance can be vividly seen in comparisons of the incidence of violations of a subset of core OSHA standards relating to physical hazards between the sample of major national contractors inspected by OSHA and all other construction inspections conducted during this period (fig. 1). Large national contractors had a lower percentage of inspections with violations compared to inspections conducted at all other construction establishments. In 1993, for instance, while 51% of the inspections of large national contractors found at least one violation, almost 69% of the inspections conducted at all other construction establishments found violations.[9] The percentage of inspections with serious violations shows a

[9]The percentage of all inspections where any violation was cited is used as a broad measure of compliance in these comparisons. Figure 1 includes violations of any OSHA standard for both groups, including but not limited to the subset of standards used in the rest of the 2001 Weil study for examining compliance. Serious violations of standards include those classified as "serious," "willful," or "repeat" by inspectors.

[10] Compliance is defined here as not violating any of a set of 100 core OSHA standards associated with physical hazards. The methodology and results are discussed in detail in Weil 2001.

[11] Compliance is measured in figure 3 in two ways: the lower line measures compliance as a contractor not violating a key OSHA standard – regardless of severity; the upper line measures compliance as a contractor not being cited for a serious violation of standards.

imply also that contractors cannot make the changes required to come in full compliance with standards, despite repeat inspections, because the changes would require responses of other parties at the construction site, including those involved in overall project management activities.

Ringen (1999) discovered related problems in his study of OSHA enforcement targeting procedures:

> There is a tradeoff between neutrality and inspection effectiveness as measured in terms of violations and penalties. The planned programmed inspections, based on neutral selection of inspection targets, are bound to produce "less inspection bang" than the unprogrammed inspections that are based on cause.(pp. iii-iv)

Ringen focused on the fact that inspections triggered by worker complaints or death/accident investigations are more likely to result in violations than any programmed procedure not directly linked to potential problems.

The view of targeting performance from OSHA area offices

In spring 2003, the OSHA Targeting Task Force undertook a survey of federal OSHA offices regarding targeting practices. The survey was distributed to all federal area offices and to California, which has a state OSHA plan. The task force received 69 responses, including some from 3 regional offices and 4 federal area offices in state plan states. Eleven of the responses from the California agency, CalOSHA, were not included in the analysis, however, because of systemic differences between the California system and others. The OSHA Targeting Task Force provided the survey data for review for this study.

The area offices responding to the survey reported widespread use of the Dodge/CRA system. Eighteen (31%) of 58 area offices responded that they use the Dodge/CRA system exclusively, and 34 (58%) reported using it for "some" scheduled inspections. Only 6 (11%) reported that they do not use the Dodge system at all.[12] Thirty-three of the area offices (57% of respondents) have done some form of in-house training; 23 (40%) are self-taught or have received no training. Only 2 (3%) have had formal training by CRA, although 44 (75%) indicated an interest in receiving training on the system.

Although the vast majority of area offices seems to be drawing on Dodge/CRA lists either partially or exclusively, the survey also identified significant use of local emphasis programs (LEPs) that target construction sites on the basis of specific construction safety and health problems defined at the regional or local level, such as fall protection. In general, these programs were more favorably rated in terms of perceived performance by OSHA staff than those based on Dodge/CRA, although this could arise in part from the fact that the LEPs are devised and implemented by the survey respondents.

The overall evaluation of the targeting system arising from the survey is generally similar to that reported by Ringen in his interviews with area office staff in 1999, with the problems and limitations cited by survey respondents. Perhaps not surprisingly, given its nature, the Dodge/CRA system receives its best marks regarding identification of sites with a large number of employers (fig. 4).

[12] Of the 40 using an alternative system – either in part or in lieu of Dodge – more than half, 23, say the alternative system is very useful.

The problem of the Dodge/CRA system most commonly cited by survey respondents concerned the level of construction activity found on

[13] CRA has undertaken a series of studies and revisions of techniques to forecast construction starts since the beginning of its contract with OSHA and the Department of Labor. These include studies and modification of procedures in 1989, 1992 and 1997. *See* Schriver (1997) for a discussion of the most recent analysis of estimation of construction starts.

the risks faced by workers. Enforcement targeting should therefore shift from its current focus on the contractor and instead be oriented to the construction project (site level).

- **Focus on prospective risk to workers:** Enforcement policy should be based on the *prospective* risks facing workers on construction sites. Because risks arise from the interaction of multiple contractors and workforces, one cannot rely on a single contractor's past injury rates to predict future safety and health performance on a project.
- **Consider efficacy in choosing inspection targets:** Enforcement policy should consider the chance that OSHA intervention will change the choices made by contractors individually and collectively. This includes taking into account whether other mechanisms outside of enforcement might be more effective in improving safety and health performance of certain contractors or on certain types of projects.

The reality of course is that OSHA is not starting with a blank slate, but is bound by legal, organizational, and practical constraints. The key question is, Can a system be devised that incorporates the three principles, but still conforms to the requirements of *Barlow's* and the reality that the Dodge/CRA system remains the most comprehensive source of information about construction activity?

Data used for this section

This section, Targeting Alternatives, draws on a unique data set created by the OSHA Office of Statistics for analysis by William Schriver, the director of CRA (*see* Schriver 2003). The data set combines information from the F.W. Dodge system regarding project-level characteristics (used for assembling targeting lists) and from OSHA's Integrated Management Information System (IMIS) on inspections of companies operating on those projects.

IMIS contains the complete histories for all inspections undertaken by OSHA in federal and state-plan states since 1987 (and since the early 1970s for federal programs and some state-plan states). IMIS data are kept on a contractor-, rather than project-level, basis, making analysis of project-level information difficult. Fortunately, in 1999 OSHA started to append the Dodge project identification number on each file, making it possible to link all contractors inspected at a given site. [14]

The analysis presented here pulled IMIS inspection records for fiscal years 1999-2001, where Dodge numbers were provided.[15] The IMIS records were then matched with a file from the Dodge records kept by OSHA. Thus, the data linked information on the overall site inspection (such as, violations found and number of contractors inspected) with project-level information from Dodge, including value of the project, end-use type, and characteristics of

[14] Prior to the incorporation of Dodge project IDs, the only way to group contractors together on a common site was to use other identifiers in the IMIS system – address, zip codes, dates – to link the contractor files back to a common project location. This method was both extremely time consuming and prone to errors, for example because a single construction site might be listed under multiple street addresses.

[15] Unfortunately the Dodge project identification number is not yet uniformly provided in IMIS. Some inspection files might not include the Dodge number because the inspection was non-programmed (that is, triggered by a complaint, accident, or referral). In other cases, OSHA personnel might not have provided the data for programmed activities. I was not provided with an estimate of the number of contractor records that were excluded from the sample because of a missing Dodge identifier, nor characteristics of the excluded records.

construction. A total of 9,312 projects was identified by this approach and used in the data analysis that follows.[16] To my knowledge, this represents the first comprehensive data set to provide this merged Dodge/CRA/IMIS information.

The projects analyzed were large, with an average value of $7.1 million (table 1). That average masks the scale of many of the projects inspected by OSHA, with almost 10% of the projects having a value above $15 million and the largest project in the sample an estimated value of $373 million. In contrast, less than 5% of the projects had a value below $500,000. By region, the average value of projects ranged from a low of about $5.0 million in region 10 to a high of $8.5 million in region 1 (table 2).

The number of contractors inspected on projects varied widely in the sample. The average number of contractors on a project was 1.4, with the largest number of contractors inspected at a single site at 26. Only one contractor was inspected at 74% of the projects (table 3). A considerable percentage of this group might reflect cases where inspection records did not contain Dodge record identifiers and could therefore not be linked to a project for the analysis. However, the cases where there was only one contractor inspected per project may also reflect the ongoing problem of accurately predicting peak construction activity at sites (identified in the OSHA Targeting Task Force survey as a major problem).[17]

Project-level targeting

A project-level focus for OSHA activity makes sense given the central role that coordination plays on most construction sites. A construction project of any size requires synchronization between many separate business enterprises and workers, with varied responsibilities, skills, and roles. It is therefore not surprising that the industrial organization and industrial relations/human resource systems in construction are extremely complex, as well as decentralized (*see* Dunlop 1961 for a classic discussion of this issue).

Organization of the sector has changed with the transition from the use of general contractors to construction managers (fig. 6) to coordinate projects. Driving the construction project are owners who are the end users, public or private players interested in putting up a structure(s). The owners' interest might be extremely short term – as in the case of developers seeking to build and then lease or sell a building – or longer term, as in the case of private companies building for their own use or government organizations providing some type of public good (for instance, a federal office building housing many different agencies).

The owner, in turn, typically hires a firm to coordinate construction. Historically, this

[16] The results presented here represent my own analysis of the data and all conclusions are solely my own and not intended to represent those of William Schriver, CRA, or OSHA.

[17] Unfortunately, it is impossible, given the present data, to estimate the portion of cases involving a failure to match Dodge identifiers with IMIS records from the case where only one contractor was inspected on a project. However, comparing construction industry classifications (SIC code) of contractors receiving inspections on projects with only one contractor inspected versus multiple contractors inspected provides a glimpse into the prevalence of the problem of timing on construction sites. If the projects where only one contractor has been inspected represent a case where the Dodge/CRA system led an inspector to a site too early or too late in the construction cycle, one would expect those sites to have a relatively high prevalence of subcontractors rather than general contractors at the time of the single inspection. A review of 250 records in the data set found that 38% of projects with only one contractor inspected consisted of employers classified as subcontractors versus 22% for projects where multiple contractors were inspected.

role was filled by a general contractor (GC) who served two functions: managing the construction project and being the direct employer of the occupations that tend to remain throughout a construction project (the “basic trades,” laborers, carpenters, and operating engineers). The general contractor would be responsible also for overseeing and coordinating the work of subcontractors associated with specialty trades, such as electrical, plumbing, sheet metal, roofing, and other contractors. The larger and/or more complex the project, the more subcontractors typically would be on a job.

More recently, the construction manager (CM) has emerged, often replacing the GC in its traditional role.[18] A construction manager works for the owner/developer, and coordinates with architects and engineers. Unlike the general contractor, however, a construction manager does not directly employ workers on the site. Instead, the construction manager contracts basic trades, for instance, much in the same way as it employs specialty trades.

Whether a project is led by a GC or a CM, the construction coordinator is critical in determining project costs, financing, pace, delays, and completion dates. Because each of these outcomes affects project safety and health, project-level characteristics should be considered when fashioning OSHA policies. For example, a CM managing the construction of a commercial office space for developers may have high incentives to complete the building quickly so that the

[18] See Weil 2003 for a more detailed discussion of these changes in industry structure and their implications.

[19] The Dodge system uses a more-detailed system of classification consisting of 109 individual project types. To simplify this system, I have followed a project end-use classification system developed by Schriver in his recent analysis that aggregates these into the 36 categories listed in table 4.

Risk-based targeting

What is the proper measure of risk for construction?

The notion of targeting construction projects on the basis of risk seems self-evident: If a construction site has a higher potential level of injuries and deaths than another, one would want to direct OSHA enforcement there. OSHA has over the years drawn on this notion generally in targeting industries (including construction) with higher reported injury and illness rates. Various efforts have also been made to do so at the establishment level within industries, particularly in the manufacturing sector (GAO 2002).[20]

Once again, construction has turned out to be a more difficult area in which to apply targeting principles. For risk-based targeting, because any given construction site has a finite length of operation, it is difficult to assign it an overall injury rate (unless it is of a sufficient scale and duration that such a rate could be calculated). Even if one wanted to track the injury and illness experience at the project level, one difficulty is in establishing what party should be linked to this information: the end user (owner/developer) or the GC/CM (*see* fig 6)? Administratively, even if one could resolve this dilemma, the reality is that injury and illness rates computed by the Bureau of Labor Statistics for construction are based on contractor-level information.

This would suggest focusing risk information at the employer (contractor) level and measuring injury performance over a number of different projects. For example, many contractors (particularly larger and older contractors) have workers' compensation experience modification rates based on their past injury experience that are used to calculate workers' compensation premiums. In principle, experience modification rates could be used as a predictor of future behavior on new sites.

Several problems immediately arise around collecting contractor-level information about injury rates. Administratively, experience modification rates collected for construction employers are notoriously problematic for several reasons. First, workers' compensation systems in general tend to be imperfectly experience rated, making injury rate estimates at the high and low ends unreliable (Thomason, Schmidle, and Burton 2001). This problem is exacerbated in construction. Second, many states have separate workers' compensation structures dealing with the peculiarities of construction; those structures place employers in larger risk pools, making assessment of company-level injury-rates impossible. Third, because of the high expense of workers' compensation premiums in construction, misclassification of workers and misreporting into workers' compensation remains a widespread problem (GAO 1989, 1996, Planmatics 2000).[21]

[20] The GAO (2002) indicates that, even in manufacturing, there have been a number of difficulties in implementing enforcement procedures that draw on establishment-level injury data for targeting.

[21] Other studies point to a related problem of relying on administrative information involving self-reporting of injury-related outcome. Ruser and Smith (1988) found consistent evidence that inspection targeting based on firm-reported injury rates (the "record check" method used by OSHA during the Reagan administration) not surprisingly leads firms to under-report injuries. This means that any system relied on for risk information must draw on data where the incentives to understate risk are low or kept in check by countervailing procedures.

Even if one could wave a magic wand and obtain accurate injury-rate information for contractors, it is still not clear that this would provide the best prospective measure. One reason is the differing interactions of contractors with one another and with the GC/CM and project owner on a given project. Anecdotal information suggests that one construction company can act differently on two separate projects. Once again, the complexity of construction project

[22] There are other explanations for these results as well. One is that they reflect the phenomenon known as "regression to the mean" that arises in statistical processes involving sampling. An observation that is significantly above the mean in one period will tend to fall back toward the mean subsequently. Another explanation offered by Ruser for his findings is the presence of unobservable characteristics associated with injury rates. The more one knows these correlates, the better the characteristic is as a targeting instrument. The flip side is that studies like Ruser's indicate that the "hidden" covariates may be hard to find, particularly *a priori.*

Methodology

[24] For example, one problem in this analysis is the large number of projects where only one contractor has been identified as having had an OSHA inspection. Because we cannot assess how often other contractors were not linked to the site because of a failure to include the Dodge identification number in the IMIS file, it is not possible to estimate how representative the sample used here is of the population of project types. We discuss this problem further below.

[25] The estimates are based on a Tobit regression model. A Tobit model is used for estimation purposes because of the large number of projects where there were zero violations cited by OSHA. Because the value of the

information on the association of end-use type and violation rates, as well as other project characteristics, can be used as tools to redirect targeting efforts toward particular sectors, led by past history of the associations.

Other potential project factors might be associated with violation rates in future analyses, once merged samples like the one used here have been assembled and analyzed. One factor of particular potential use is the association between certain project managers (GCs and CMs) and end users (public or private) in a region and violation rates. It is possible in principle to create project-level variables for ownership type or project managers in a region (for example, classifying public projects by the type of bidding procedure used to allot work or private users by whether a project was intended for their own use or for resale/leasing) and gauge their relation with violation rates. Or, it might be possible in certain regions to even capture the relation between a particularly dominant end user or project manager and violation rates on projects owned or managed by that party. Given the importance of coordination, examining these relationships could provide further insight into prospective project risks, based on past experience, and would rely on data already captured in the Dodge and IMIS systems.

Efficacy-based targeting

The final targeting principle focuses on the willingness of contractors to change behavior once they have been targeted for inspection. Measures that capture regulatory efficacy address the question that, once a problem has been identified in an industry or with an employer, exactly how much resistance would OSHA face in trying to solve it?

As discussed above (page 6), there is evidence that many of the large, nationally based contractors targeted by the existing system appear 12saltes1 eors to change behavnd ur3wf65 TD0.0fs dis(8Cw efficacy. Because a project owner, GC, or CM can set the overall tone and incentive structure on a construction site, finding out more about their responsiveness to OSHA interventions specifically and the factors that influence their decisions more generally is key to trying to reduce site-level risks. Just as one needs to characterize the overall level of risk by project type, as illustrated above, one similarly needs to develop a better understanding of the relation between project and project-manager characteristics and responsiveness to regulatory pressure and other instruments of intervention.

A final class of employers should be cited in crafting efficacy-based targeting systems. A 2003 *New York Times/Frontline* series profiling widespread, pervasive, and willful violations of OSHA standards, as well as other workplace and environmental regulations, by McWane Inc.– a major producer of industrial pipe – which highlighted the existence of U.S. firms that continue to flaunt even basic workplace protections and whose behavior will change only given protracted and intense pressure from regulators.[27] In response to the McWane revelations, OSHA has instituted new policies (including the construction sector) seeking to identify such extreme cases and bring significant regulatory pressure on them. A final aspect of an efficacy-based targeting policy would be to explicitly incorporate information on the presence of bad offenders into targeting protocols (*see* below).

Targeting Inside and Outside the Existing System

Alternatives using an amended Dodge/CRA system

Any realistic modification to the existing targeting system must do so with the recognition that the Dodge/CRA universe will remain the starting point for the foreseeable future. As a result, any procedure for targeting must draw on information that can be found *prior to* identification of projects for inspection and using criteria that could be identified using project-level fields available in the Dodge system.

The previous sections imply that, by combining historic information from IMIS with information on projects from the Dodge system, there are ways to identify factors related to overall construction management, risk exposure, and efficacy of inspections that could move the system away from its present focus on project scale. This might be achieved by modifying OSHA's current system in four ways.

Project-type targeting. OSHA could undertake region-based analyses based on data collected over the preceding 2 to 3 years that would associate different end-use types with violation rates of key OSHA standards (using a framework similar to the foregoing analysis). The OSHA analysis would be used to identify a subset of project types in a given region that have had higher rates of violations than others for the past few years. We illustrate this type of analysis using regression results for regions 2 and 3 (table 6). The analysis shows both project characteristics that are commonly associated with violation rates (such as, the significant and

[27] *See* PBS *Frontline,* A Dangerous Business, January 2003 (www.pbs.org/wgbh/pages/frontline/shows/workplace/). *See also* David Barstow and Lowell Bergman, At a Texas Foundry, An Indifference to Life, *The New York Times*, January 8, 2003, p. A1, www.nytimes.com.

28

Alternatives outside of the Dodge/CRA system

There are several additional ways to change the targeting system to better attain the principles of targeting described at the outset. As these methods involve the use of systems outside of Dodge/CRA, they are probably not feasible in the short term. Nonetheless they should be considered as alternative procedures to Dodge/CRA (or as adjuncts to that system) in the longer term.

Targeting of residential housing

Starts of single-family homes reached 1.27 million in 2001, amounting to a total value of $206 billion (Joint Center for Housing Studies 2002). The scale and extent of the residential housing sector and OSHA's historic lack of attention to it have been an area of concern in and out of the agency. An effort mediated by the late John T. Dunlop and involving OSHA, the National Association of Home Builders, and the Building and Construction Trades Dept, AFL-CIO,

How might OSHA design pilot studies that could assess the performance of different methods of

---

[29] Even in medical research, conducting true double-blind clinical trials has proven difficult, partly because of the costs involved and because of ethical controversy regarding random assignment of individuals to control and treatment groups.

[30]There are many examples of using randomized experiments to test social programs. Examples include welfare-to-work and job subsidy efforts (such as, Dubin and Rivers 1993; Katz, Kling, and Liebman 2001; Bloom, Hill and Riccio 2003), job training (LaLonde 1986; Bloom and others 1997), and educational vouchers (Howell and Peterson 2004).

A proposed experimental design for evaluating targeting

[31] It is likely that area offices that responded to the Construction Targeting Task Force survey were more interested in the targeting issue (as shown by their willingness to fill out the survey) and therefore more likely to use the existing system.

Depending on the number of area offices and the length of the pilot efforts, the study could use a number of combinations of targeting criteria (discussed earlier).

- Project-focused targeting, based on area- or regional office experience
- Size-based targeting (weighting larger projects less than medium and smaller projects)
- General contractor-based targeting, based on prior GC/CM performance
- Worst-offender targeting (worst-case GC/CM and contractor behavior).

It seems unlikely, however, that there would be enough area offices resources to test all relevant combinations. An alternative would be to select "bundles" of alternative targeting methods as treatments. For example:

- Project-type targeting: Combine project-weighted targeting and size-based targeting
- Project-type and management targeting: Combine all four criteria in compiling lists.
- GC/CM-focused targeting: Combine "worst offender" and GC/CM performance targeting

Other treatment groups

The other type of treatment would use methods for selecting projects outside of the present Dodge/CRA system. One set of treatments are some local emphasis programs already under way that target on the basis of specific sectors (such as, residential), contractors, or types of problems (for instance, falls). The LEPs chosen for the pilot evaluation might be established rather than newly instigated LEPs in participating area offices. By using LEPs that have already been in place for some time, the pilot evaluation would capture effects related to the protocol rather than start-up or learning-curve effects.

[32] As noted, targeting based on project phase is the most speculative form of targeting at this time and would require further evaluation of both the relationship between worker risks and construction phase by project type as well as refinement of CRA estimation methods of project completion. As a result, this type of targeting effort might not be tractable in the near term, but could be tested at some future time using similar procedures.

most directly influenced by OSHA. One way to do this would be to measure project-level compliance with a similar subset of OSHA safety and health standards most closely related to physical hazards and injuries and to occupational illnesses that were discussed in regard to risk-based targeting (above). Rather than measuring the incidence of injuries, the outcome measure of interest would be the average incidence of violations of key standards on representative projects in a given area.[33]

Creating this measure to gauge the performance of alternative methods of targeting would require two components. First, a sample of representative construction projects would need to be identified, separately from the construction targeting protocols. These would be sites selected to gauge the level of safety and health risk at a representative cross-section for the area

ow(e c n a i l

[33] This is related to the approach taken to measuring the impact of construction inspections retrospectively in my prior studies of OSHA enforcement (Weil 2000, 2001).

[34] Contractors found in violations of the Fair Labor Standards Act during these inspections are still subjected to penalties and additional follow-up by Wage and Hour. However, the inspection-based surveys are administered and tracked separately from the main enforcement program (Wage and Hour Division 2001).

In those cases where the treatment consists of inspections focused on particular sectors (such as, residential), treatment and control-group measures would be taken for a representative rather than injury and illness rates. The experiment would require a firm commitment from those

References

Bartel, Anne and L. Thomas. 1985. Direct and Indirect Effects of Regulation: A New Look at OSHA's Impact. *Journal of Law and Economics*, 28:1-25.

Bloom, Howard, Carolyn Hill, and James Riccio. 2003. Linking Program Implementation and Effectiveness: Lessons from a Pooled Sample of Welfare-to-Work Experiments. *Journal of Policy Analysis and Management*. 22(4): 551-75.

Bloom, Howard, Larry L. Orr, Stephen H. Bell, George Cave, Fred Doolittle, Winston Lin, Johannes Bos. 1997. The Benefits and Cost of JTPA Title II-A Programs. *Journal of Human Resources*, 32(3): 549-76.

Boniface, David. 1995. *Experiment Design and Statistical Methods for Behavioral and Social Research*. London: Chapman & Hall.

Bureau of Labor Statistics. 2004a. Fatal Occupational Injuries by Industry and Event or Exposure, 2001. Census of Fatal Occupational Injuries, reported at www.osha-gov.

——. 2004b. Occupational Illness and Injury Rates by Industry, United States, reported at www.bls.gov.

Construction Resources Analysis. 1997. Estimating Construction Duration. Draft Final Report to the Office of Statistics, Occupational Safety and Health Administration.

Cook, Thomas and Donald Campbell. 1979. Quasi-Experimentation: Design and Analysis Issues for Field Settings. Boston, MA: Houghton-Mifflin.

Coulton, Kent. 2003. *Housing in the Twenty-first Century: Achieving Common Ground*. Cambridge, MA: Wertheim Publication Series/Harvard University Press.

Dubin, Jeffrey and Douglas Rivers. 1993. Experimental Estimates of the Impact of Wages Subsidies. *Journal of Econometrics*, 56(2): 219-42.

Dunlop, John T. 1961. The Industrial Relations System in Construction. In: Arnold Weber, ed., *The Structure of Collective Bargaining*. Chicago, IL: University of Chicago Press.

GAO, U.S. General Accounting Office. 1989. *Tax Administration: Information Returns Can be Used to Identify Employers Who Misclassify Workers*. GAO/GGD-89-107.

——. 1996. *Tax Administration: Issues in Classifying Workers as Employees or Independent Contractors.* GAO/T-GGD-96-130.

——. 2002. *Workplace Safety and Health: OSHA Can Strengthen Enforcement Through Improved Program Management.* GAO-03-45.

Gray, Wayne and John Mendeloff. 2001. The Changing Effects of OSHA Inspections Over Time: A Review of Three Data Sets from 1979 to 1998. Manuscript, University of Pittsburgh, August.

Howell, William O., and Paul Peterson. Uses of Theory in Randomized Field Trials. *American Behavioral Scientist* 47(5): 699-717.

Joint Center for Housing Studies. 2002. *The State of the Nation's Housing, 2002.* Cambridge, MA: Joint Center for Housing Studies of Harvard University.

Jones, Carol, and Wayne Gray. 1991. Longitudinal Patterns of Compliance with Occupational Safety and Health Administration Health and Safety Regulations in the Manufacturing Sector. *The Journal of Human Resources,* 36: 623-53.

Katz, Lawrence, Jeffrey Kling, and Jeffrey Liebman. 2001. Moving to Opportunity in Boston: Early Results of a Randomized Mobility Experiment. Quarterly Journal of Economics 116(2): 607-54.

LaLonde, R. 1986. Evaluating the Econometric Evaluation of Training Programs with Experimental Data. *American Economic Review* 76(3): 604-20.

Meridian Research. 1992. *Review of the Coverage Issues Related to the Universe Field Used by OSHA for Construction Targeting.* Washington, DC: Report to OSHA, Office of Statistics.

Morantz, Alison. 2001. Assessing the Impact of Regulatory Devolution: The Case of OSHA Enforcement. Manuscript, Harvard University.

Nelson, Nancy, Joel Kaufman, John Kalat, and Barbara Silverstein. 1997. Falls in Construction: Injury Rates for OSHA-Inspected Employers Before and After Citation for Violating the Washington State Fall Protection Standard. *American Journal of Industrial Medicine,* 31: 296-302.

OSHA, Occupational Safety and Health Administration, U.S. Department of Labor. 1993. *The 100 Most Frequently Cited OSHA Constructions Standards in 1991: A Guide for the Abatement of the Top 25 Associated Physical Hazards*. Washington, D.C.

Perrow, Charles. 1999. *Normal accidents : living with high-risk technologies* : with a new afterword and a postscript on the Y2K problem. Princeton, NJ: Princeton University Press. nt o.

to Risk Assessment. *Journal of Risk and Uncertainty*, 3: 283-305.

Figure 1: Percentage of inspections with violations of OSHA standards

Percent of OSHA Inspections with Any Violations of OSHA Standards:
Large national contractor sample vs. all other construction inspections, 1987-1993

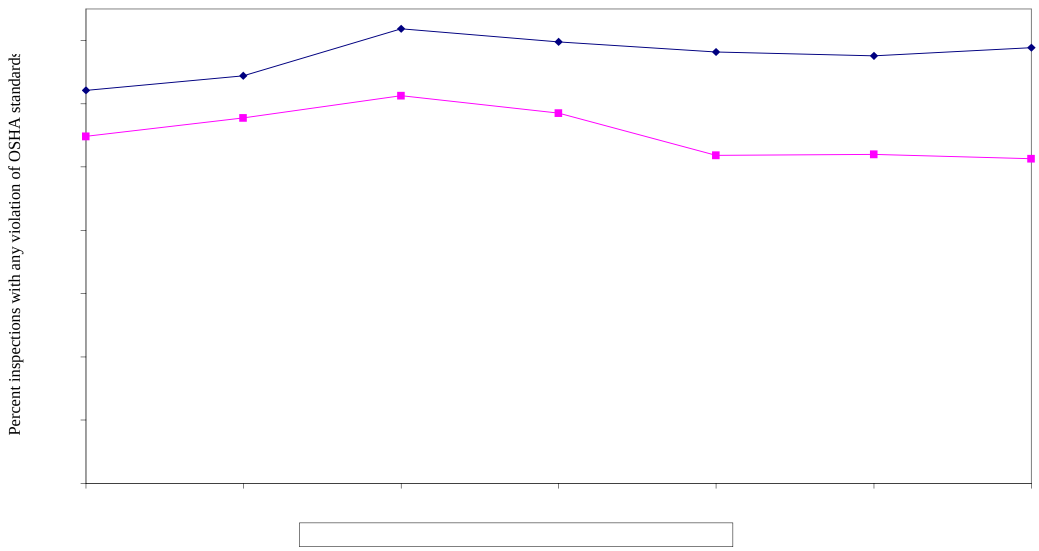
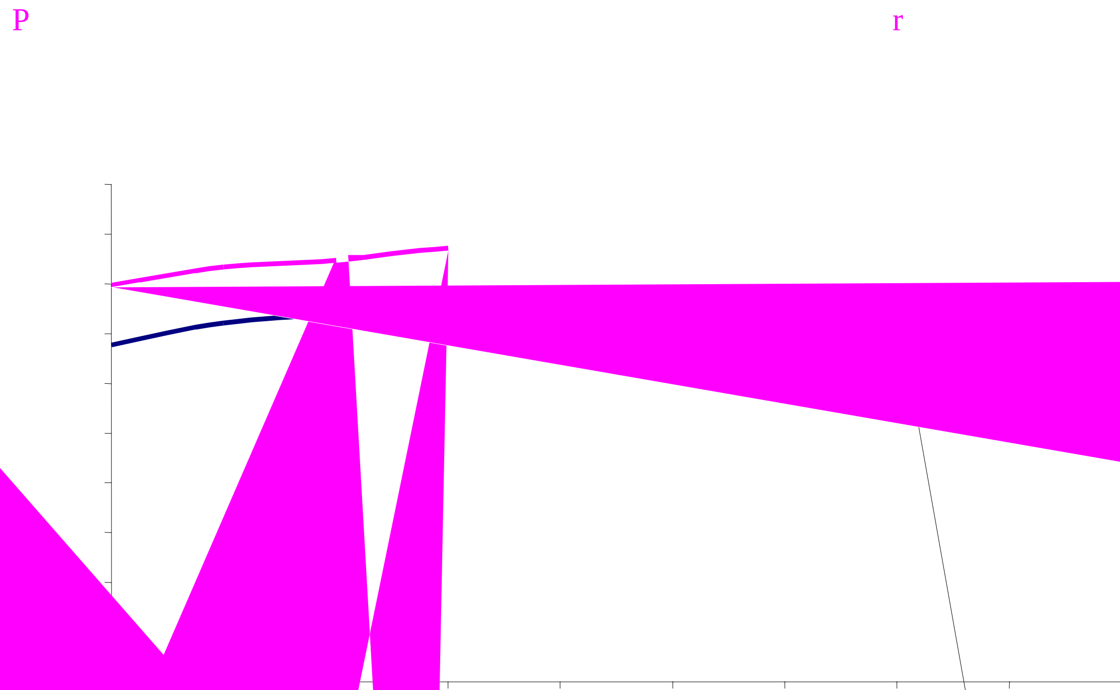
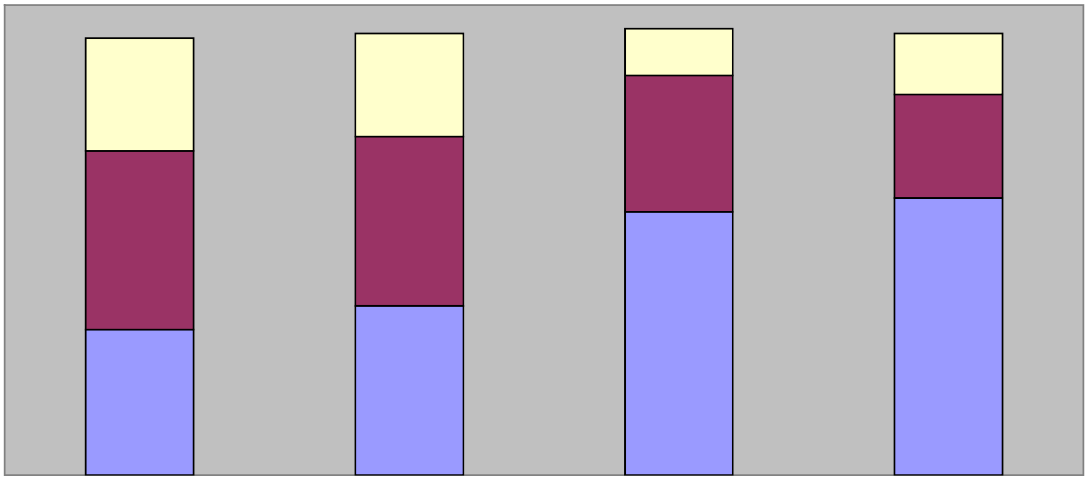


Figure 3: Effects of recent contractor-level inspections on predicted compliance with key construction safety and health standards, 1987-93



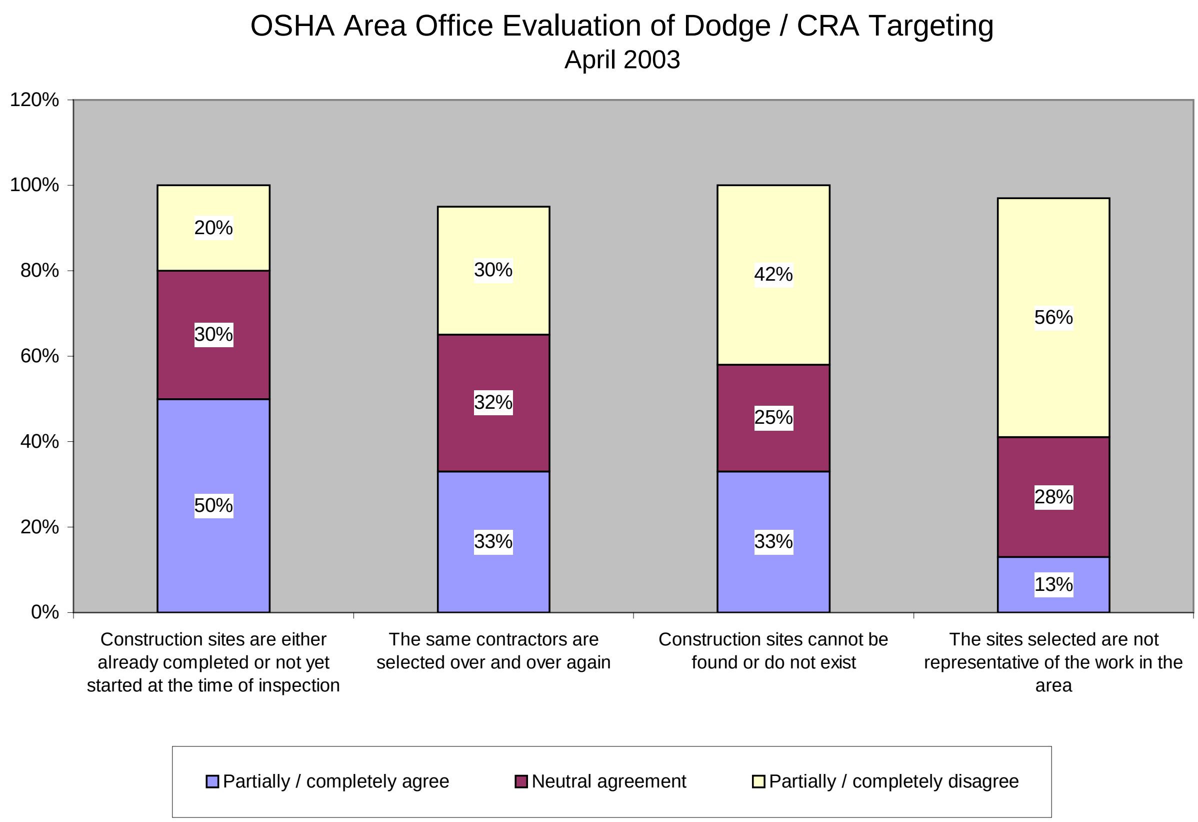
s violation of any key OSHA standard; serious compliance
r any key OSHA standard.
Weil 2001.

Figure 4: Evaluation of Dodge/CRA Targeting Methods



Note: Percentages do not add up to 100 where some respondents answered “not applicable” or were unable to answer a question.
Source: OSHA Targeting Task Force survey of area offices, April 2003; data provided to the author by permission of OSHA.

Figure 5: Cited Problems of Dodge/CRA Targeting Methods



Note: Percentages do not add up to 100, because some respondents answered “not applicable” or were unable to answer a question.
Source: OSHA Construction Targeting Task Force survey of area offices, April 2003; data provided to the author by permission of OSHA.

Figure 6: Organization of construction projects—General contractor versus construction manager

General contractor coordination

Construction manager coordination

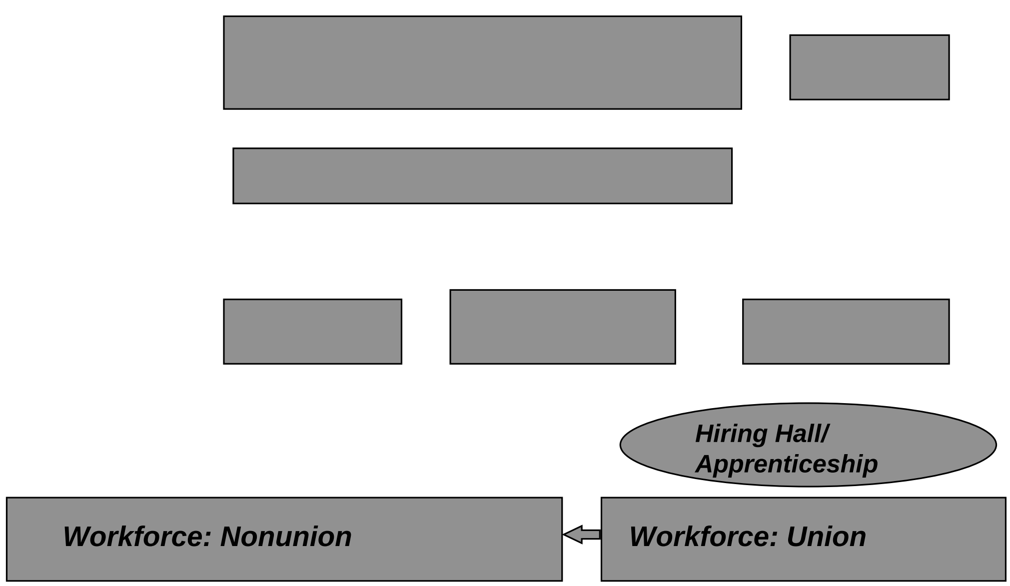
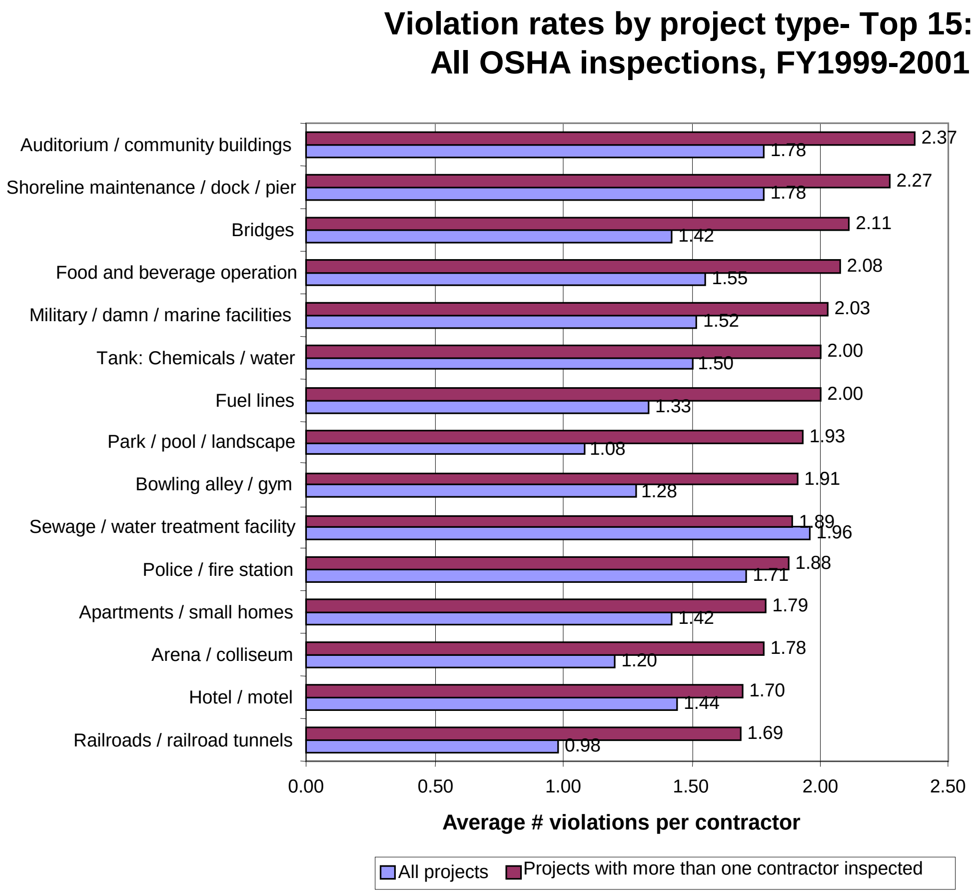


Figure 7: Top 15 violation rates per contractor by major project type



N= 9,312 projects.
Source: Analysis by the author of OSHA IMIS data at the project level; based on data provided by William Schriver, June 2003.

Figure 8: Bottom 15 violation rates per contractor by major project type

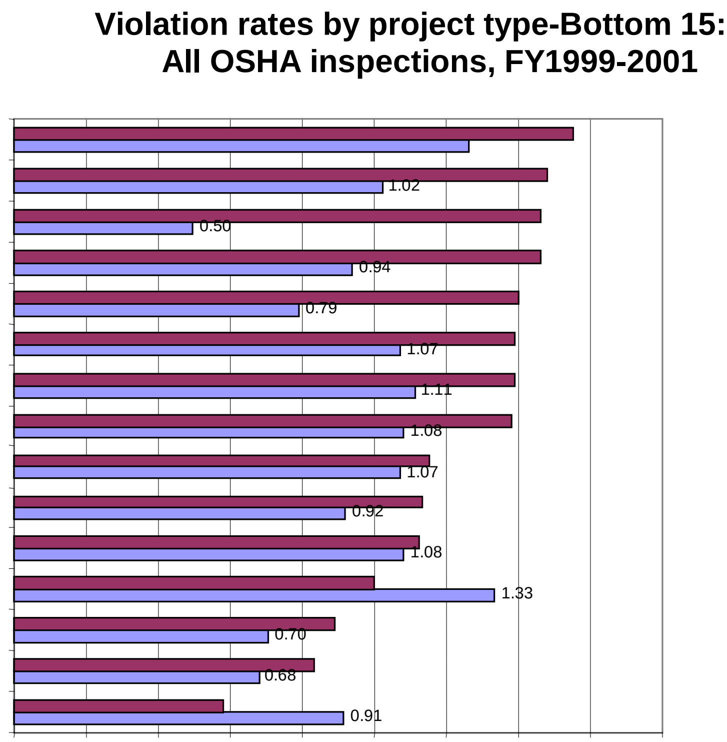


Table 1: Project characteristics in Dodge/OSHA IMIS combined sample, FY1999-2001

Variable	Mean (average)	Standard Deviation	Minimum	Maximum
Value of project ($ 000s)	7121.9	15889.7	50	373,070
Number of contractors on project	1.68	1.63	1	26
Number of stories of project	1.43	2.04	0	40
Total violations cited on project	2.28	4.14	0	83
Average number of violations per contractor per project	1.27	1.88	0	34

N=9,312 projects.
Source: Analysis by the author of OSHA IMIS data at the project level; based on data provided by William Schriver, June 2003.

Table 2: Value of projects by region, Dodge/OSHA IMIS combined sample, FY1999-2001

OSHA Region	Number of observations	Mean ($000s)	Standard Deviation	Maximum ($000s)
Region 1	501	8506.244	17601.08	260,000
Region 2	1518	6637.01	13746.43	373,070
Region 3	2278	7416.783	15532.1	260,000
Region 4	1272	8061.035	17189.93	290,000

Table 6: Violation rate correlates with project characteristics and types with high violation rates: Region 2 vs. Region 3, FY1999-2001

	Region 2	*Region 3*