WORKERS' COMP. PREMIUMS: DISPARITIES IN PENALTIES FOR IDENTICAL LOSSES

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ABSTRACT: Workers' compensation insurance (WCI) is one of the largest controllable costs for construction contractors. A fixed portion of the WCI standard premium is determined by the individual contractor's company characteristics, including type of work performed, wage rates, and company size. The variable portion of the standard premium reflects the individual contractor's safety record or loss experience. The variable portion is really the sum of a number of surcharges or penalties, one for each actual loss the contractor experiences. This paper examines these penalties in detail. The paper shows that the magnitude of each penalty is based not just on the magnitude of the corresponding actual loss, but also on company characteristics. The result is that different contractors end up paying vastly different penalties for identical actual losses.

INTRODUCTION

Workers' compensation insurance (WCI) is one of the largest controllable costs for construction contractors. Workers' compensation laws are governed by individual states and may vary from state to state, but all employers are required by law to provide some type of WCI for their employees. Some employers self-insure. Others are covered by insurance carried by clients and project owners. However, the vast majority (more than 90% in all industries) of WCI premium dollars come from experience rated plans (*Workers* 1991). The object of experience-rated plans is to recognize "differences between individual insureds. It does this by comparing the experience of individual insureds with the average insured in the same classification, based on individual loss records, which may increase or decrease premium" (*Manual* 1992).

A value called the experience modification rating (EMR) is the mechanism by which an individual insured's safety record is reflected in the premium calculation. Several publications discuss whether or not the EMR is an accurate indicator of a contractor's safety record and whether or not owners should use the EMR in attempting to select a safe contractor [e.g., Levitt and Samelson (1993), Everett and Thompson (1995), Hinze et al. (1995), Jaselskis et al. (1996)].

The owner may be interested in the EMR, but the contractor is probably more interested in how much it pays in workers' compensation premiums. There is a fixed portion of the premium determined strictly by the individual contractor's company characteristics, including type of work performed, wage rates, and company size. There is also a variable portion of the premium that reflects the individual contractor's safety record or loss experience. The variable portion is really the sum of a number of surcharges or penalties, one for each actual loss the contractor experiences.

The objective of this paper is to examine these penalties in detail. It will be shown that the magnitude of each penalty is based not just on the magnitude of the corresponding loss, but also on the company characteristics: type of work performed, wage rates, and company size. The result is that different contractors end up paying vastly different penalties for identical actual losses.

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WCI PREMIUM CALCULATION

For experience rated plans the WCI Standard Premium is based on the formula

$$\text{WCI standard premium} = \text{Manual rate} \times \text{Payroll units} \times \text{EMR} \tag{1}$$

The manual rate is based on the idea that the frequency of losses for a particular type of work is statistically predictable. The National Council on Compensation Insurance (NCCI) describes and assigns a work classification code to each of about 600 work classifications (*Scopes 1991; Classification* 1990). The manual rate gives a rough indication of the risk associated with each work classification. Manual rates vary among work classifications within each state, and also from state to state for each work classification. The construction industry average manual rate for three key crafts (carpenters, ironworkers, and masons) is about $29 per $100 of straight time payroll (Powers 1994). Payroll units are found by dividing an employer's straight time direct labor cost by $100.

The EMR compares an employer's actual losses to its expected losses with a number of adjustments over the three-year period ending one year prior to the date the modification becomes effective.

The EMR is calculated using the formula

$$\text{EMR} = \frac{\text{APL} + B + W \cdot \text{AEL} + (1 - W)\text{EEL}}{\text{EPL} + B + W \cdot \text{EEL} + (1 - W)\text{EEL}} \tag{2}$$

For a detailed description of how the EMR is calculated, the reader is referred to Everett and Thompson (1995). The following briefly describes the terms in the EMR formula.

Actual primary losses (APL) are a measure of the employer's loss frequency. For each actual loss less than or equal to $5,000, the entire amount is used as the actual primary loss. For each loss over $5,000, the primary value is $5,000.

Actual excess losses (AEL) give an indication of the employer's loss severity history. For each actual loss, the actual excess loss is the difference between the actual loss and the actual primary loss: actual primary loss + actual excess loss = actual loss. For large losses, the actual excess loss is the amount over $5,000, subject to accident limits.

The expected loss for each work classification is calculated by multiplying an expected loss rate (ELR) for that classification by the appropriate payroll units. ELRs are found in tables published by state rating bureaus or private insurers, depending on the state.

The calculation for expected primary losses (EPL) requires a value called the discount ratio or D-ratio. The D-ratio represents that portion of the expected losses that are expected primary losses: D-ratio × expected losses = expected primary losses. Expected excess losses (EEL) is the difference between

expected losses and expected primary losses: expected primary losses + expected excess losses = expected losses. Tables listing the D-ratio for each work classification are published by state rating bureaus or private insurers, depending on the state.

A weighting value (W) determines the percentage of excess losses used in the EMR calculation. It is used to discount both actual excess losses and expected excess losses to give a ratable excess value. State rating bureaus or private insurers publish tables of W values as a function of expected losses.

The ballast value (B) helps stabilize the EMR against large changes from a single loss. Ballast values are published in tables as a function of expected losses by state rating bureaus or private insurers, depending on the state.

Eq. (1) is used to calculate the WCI standard premium. To get the final WCI premium, a number of other factors may be applied to the standard premium. A premium discount accounts for certain costs that do not vary with the size of the policy, giving larger insureds credit for economies of scale in overhead expenses (*Ratemaking* 1989). Some states allow insurers and insureds to agree upon deviations, schedule ratings, expense constants, dividends, and retrospective rating plans in addition to or in lieu of premium discounts (*Workers* 1991). The application of these other factors varies widely from state to state and from insurer to insurer within some states. Generally, these are marketing options that give insurers an opportunity to reward employers with good safety records and to penalize, or at least not reward, employers with poor safety records. If anything, these other factors increase the difference in WCI costs between employers with good safety records and those with poor safety records, but these factors will not be included in the remainder of this paper.

COMPANY CHARACTERISTICS

As shown in (1), the WCI standard premium is a function of manual rate, payroll, and EMR. This can be written as

$$\text{WCI standard premium} = f(\text{Manual rate, Payroll, EMR}) \quad (3)$$

Using the abbreviations of C = work classification, W = wage rate, and H = employee hours, the terms on the right side of (3) can be reduced to

$$\text{Manual rate} = f(C); \quad \text{Payroll} = f(W, H) \quad (4, 5)$$

$$\text{EMR} = f(\text{APL, AEL, B, W, EPL, EEL}) \quad (6)$$

$$\text{APL} = f(\text{Actual losses}); \quad \text{AEL} = f(\text{Actual losses}) \quad (7, 8)$$

$$B = f(\text{Expected losses}) = f(\text{ELR, Payroll}) = f(C, W, H) \quad (9)$$

$$W = f(\text{Expected losses}) = f(\text{ELR, Payroll}) = f(C, W, H) \quad (10)$$

$$\text{EPL} = f(D\text{-ratio, Payroll}) = f(C, W, H) \quad (11)$$

$$\text{EEL} = f(D\text{-ratio, Payroll}) = f(C, W, H) \quad (12)$$

Therefore

$$\text{WCI standard premium} = f(\text{Actual losses}, C, W, H) \quad (13)$$

In other words, knowing the actual losses, work classification, wage rates, and employee hours, the WCI standard premium can be calculated. If it is assumed that the contractor has had no actual losses over the rating period, the minimum possible EMR and WCI standard premium are determined by work classifications, wage rates, and employee hours. In this case, in (2), the APL and AEL would be zero. This minimum standard premium can be regarded as a fixed cost to be insured. This amount is based only on the contractor's company characteristics and will vary from contractor to contractor, but it is independent of any actual losses.

Each actual loss results in an increase in the EMR and the WCI standard premium for each of three years, starting in the second year after the actual loss occurs. For example, an actual loss that occurs in 1995 will affect the contractor's EMR and WCI standard premium in 1997, 1998, and 1999. It is important to note that an actual loss does not affect a contractor's EMR or ECI standard premium in the year the actual loss occurs. The amount of the increase varies from contractor to contractor based on the actual loss, but also on the contractor's company characteristics.

INCREASE IN WCI DUE TO SINGLE ACTUAL LOSS

This section of the paper will explore the relationships between a contractor's company characteristics (i.e., work classifications, wage rates, and employee hours) and the magnitude of the increase in the WCI standard premium for a single actual loss.

A hypothetical contractor A is selected as an example. Contractor A employs only plumbers at $8.00 per hour. The total employee hours worked annually is 20,000, or about 10 full time employees. Given this information, the minimum WCI standard premium (i.e., no actual losses) can be determined.

All values required for the EMR calculation in the examples to follow are taken from *Workers' Compensation Insurance, Michigan Version, Agent's Manual* (1995). For the examples that follow it is assumed that company characteristics remain constant over time, so that the increase in WCI standard premium due to an actual loss is equal in all three years affected by the actual loss. In reality, the values required for the EMR vary from year to year and from state to state, and a company's characteristics may change over time.

The solid line in Fig. 1 shows the increase in WCI standard premium over three years due to a single actual loss versus the amount of the actual loss. This is not the total WCI standard premium—only the marginal increase due to a single loss. This paper focuses on the marginal increase in the WCI standard premium because that is the part over which the contractor has control. The fixed amount is based on company characteristics and has nothing to do with actual safety performance. The issue of the fixed amount and the marginal increases will be discussed later in more detail.

From Fig. 1 it can be seen that the increase in WCI standard premiums is a linear function of the actual loss with a change in slope at an actual loss of $5,000. The reason for the change in slope is the split of each actual loss into actual primary loss and actual excess loss. The actual excess loss (the amount

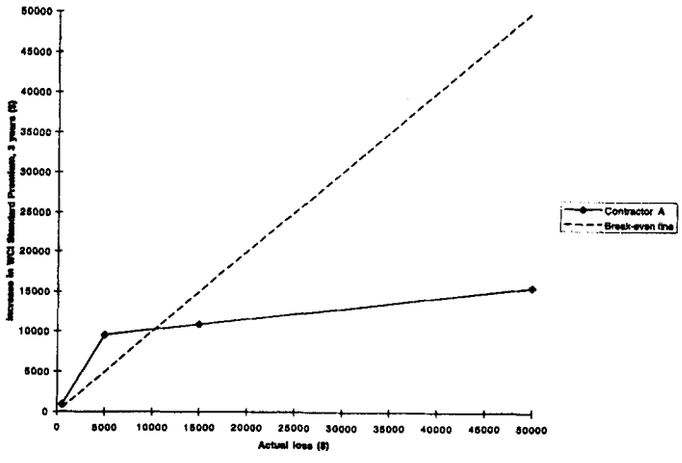

FIG. 1. Total Increase in WCI Standard Premium over 3 Years due to Single Loss versus Actual Loss, Contractor A (Work Classification: Plumbers; Wage Rate: $8.00 per Hour; Employee Hours: 20,000 per Year)

above $5,000) is discounted by the *W*-value, which is always less than unity, resulting in a lower slope.

The dashed line in Fig. 1 shows the "break-even" line where the increase in WCI standard premium is equal to the actual loss. For small actual losses (below about $10,000), Contractor A pays more in penalties than the amount of the actual loss. For example, an actual loss of $5,000 will result in a penalty of $9,580 in additional WCI standard premiums over a three-year period. For a relatively large loss of $50,000, the increase is $15,615. In this case there is a large penalty for a small loss and relatively small penalty for a large loss.

Many states or insurers set accident limits, or maximum amounts to be used for actual losses in the EMR calculation. For example, the per claim accident limit for the Michigan Accident Fund in 1995 was $91,500 (*Workers'* 1995). If the horizontal axis in Fig. 1 were extended, the slope of the plot would be zero for all actual losses above $91,500, and all those actual losses would suffer the same penalty.

Fig. 1 concerns a single contractor with its particular set of company characteristics. To explore the effect of different company characteristics, sensitivity analyses will be performed by varying work classifications, wage rates, and hours worked. In the following it is assumed that each contractor employs workers in a single work classification and that company characteristics remain constant over time.

Work Classifications

In (1), the most obvious effect of different work classifications is different manual rates. The manual rate for steel erection workers (47.80) is much higher than the manual rate for plumbers (8.85). However, there is more to the difference in work classification than just manual rates. Different work classifications also have different ELRs and *D*-ratios, which affect expected losses that determine the *W*-value and the ballast value. Work classifications with higher manual rates also have higher ELRs that make the denominator of the EMR fraction larger, partially offsetting the higher manual rate. Thus higher manual rates are partially offset by a lower EMR.

To determine the effect of different work classifications, plots of increase in WCI standard premium versus actual losses were developed for steel erection workers (classification code 5057), roofers (5551), carpenters (5213), masons (5022), excavation operators (6217), and plumbers (5183). The wage rate is held at $8.00 per hour and the employee hours are held at 20,000. These plots are shown in Fig. 2. The bottom curve (plumbers) is identical to the curve for Contractor A in Fig. 1. All of the plots exhibit the change in slope at an actual loss of $5,000 for the reasons described previously. The dashed line is the break-even line.

From Fig. 2 it can be seen that the penalty for identical actual losses varies considerably for different work classifications, but not as dramatically as the difference in manual rates. For the employer of steel erection workers, an actual loss of $5,000 results in a penalty of $15,006 in increased WCI standard premiums, compared to the plumbing contractor whose penalty is $9,580. For a $50,000 loss, the contractor employing steel erection workers pays a $29,862 penalty while a contractor employing plumbers pays "only" $15,615.

Wage Rate

In the calculation of WCI standard premiums [(1)] and EMR [(2)] total payroll is used. Payroll is the product of wage rate and employee hours, but in this paper, wage rates and employee hours are treated separately to demonstrate the effect of each.

The wage rate obviously affects the payroll value used in the WCI standard premium calculation in (1). However, the wage rate also affects the expected primary losses, expected excess losses, *W*-value, and ballast value, so the overall effect is not so obvious. To determine the effect of different wage rates, plots of increase in WCI standard premium versus actual losses were developed for wage rates of $8.00, $10.00, $15.00, $20.00, and $25.00 per hour. In this case, the work classification is plumbers and employee hours are held at 20,000 per year. These plots are shown in Fig. 3. The bottom curve ($8.00 per hour) is identical to the curve for Contractor A in Fig. 1. The dashed line is the break-even line.

From Fig. 3, it can be seen that there a difference in penalty for identical actual losses to plumbers who are paid different wages, but the range is relatively small compared to the range seen in Fig. 2 for different work classifications. For example, the contractor paying $25.00 per hour will pay an additional $22,711 premium for a $50,000 loss while the contractor paying $8.00 per hour will pay $15,615. Again, this figure shows only the marginal increase in WCI standard premium and not the total standard premium.

Employee Hours

Employee hours are an indication of company size. Clearly employee hours affects the payroll value used in the WCI standard premium calculation. However, employee hours also af-

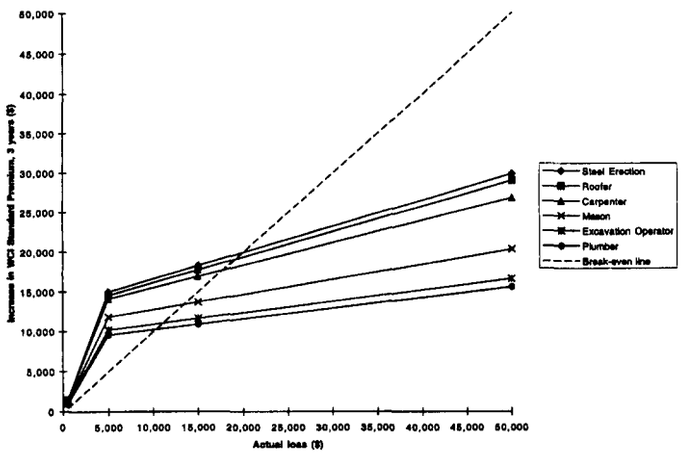

FIG. 2. Total Increase in WCI Standard Premium over 3 Years due to Single Loss versus Actual Loss Comparing Different Work Classifications (Wage Rate: $8.00 per Hour; Employee Hours: 20,000 per Year)

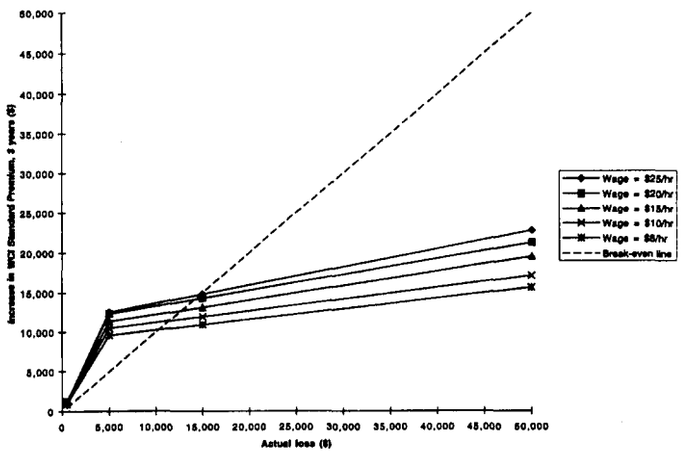

FIG. 3. Total Increase in WCI Standard Premium over 3 Years due to Single Loss versus Actual Loss Comparing Different Wage Rates (Work Classification: Plumbers; Employee Hours: 20,000 per Year)

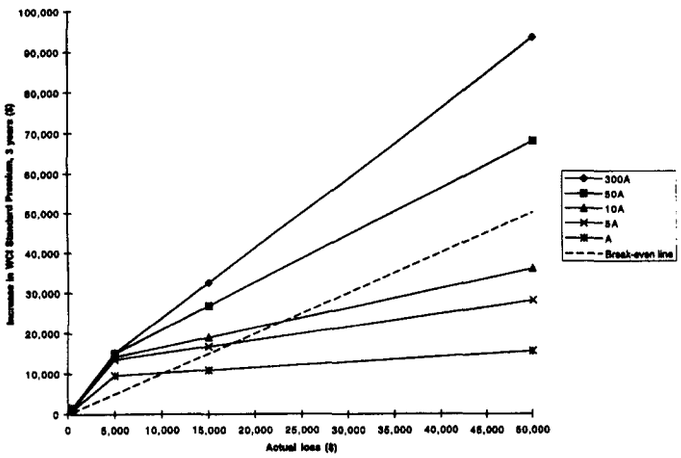

FIG. 4. Total Increase in WCI Standard Premium over 3 Years due to Single Loss versus Actual Loss Comparing Different Employee Hours (Work Classification: Plumbers; Wage Rate: $8.00 per Hour)

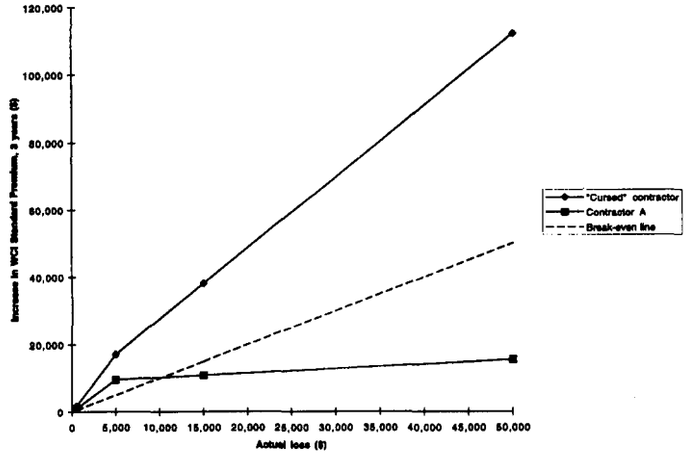

FIG. 5. Total Increase in WCI Standard Premium over 3 Years due to Single Loss versus Actual Loss Comparing Cursed Contractor and Contractor A

fect the expected primary loses, expected excess losses, *W*-value, and ballast value, so the overall effect is less clear. To determine the effect of different numbers of employee hours, plots of the increase in WCI standard premium versus actual losses were developed for different size contractors. The hypothetical Contractor A had 20,000 employee hours annually, or about 10 full time workers. Hypothetical contractors 5A, 10A, 50A, and 300A are 5, 10, 50, and 300 times as large as A, respectively.

In this case, the work classification is plumbers and the wage rate is held at $8.00 per hour. The plots are shown in Fig. 4. The bottom curve (Contractor A) is identical to the curve for Contractor A in Fig. 1.

The impact of company size is astonishing. A larger contractor (more employee hours) will pay much more for an identical actual loss than a smaller contractor when wage rate and work classification are similar. For example, for a $50,000 loss, Contractor 300A pays a penalty of $93,195—about six times as much as Contractor A pays ($15,615). It can also be seen that Contractor 50A and Contractor 300A always pay more in penalties than the amount of the actual loss (at least for the range of actual losses shown in the figure). That is one reason why large contractors may consider self-insurance. For very large losses well beyond the right end of the chart, the accident limit takes effect and the increase in standard premium curve does eventually intersect the break-even line.

Rounding of EMR

EMR values are typically rounded to two decimal places. For very large contractors, a single actual loss may change the EMR only in the third or fourth decimal place. After rounding, there may be no change in the EMR and therefore the WCI standard premium. For example, an actual loss, even a large one, might increase the EMR from 0.8200 to 0.8210, but when rounded it is 0.82 either way, and there would be no change in the WCI standard premium. In this case, the plot of the increase in WCI standard premium versus actual losses would have a slope of zero.

On the other hand, an equally small actual loss could change the EMR. For example, the actual loss might increase the EMR from 0.8245 to 0.8255, but the rounded values would change from 0.82 to 0.83. A difference of 0.01 in the EMR may seem small, but when multiplied by a multimillion dollar payroll and high manual rate, the difference in the WCI standard premium is very large indeed. In this case, the plot of the increase in WCI standard premium versus actual losses would have a slope ten times larger than if the EMR had not been rounded.

For this reason, all calculations have carried the EMR value out to many decimal places. In any case, very large contractors are likely to have many actual losses. Any one actual loss by itself might not change the EMR, but collectively, the actual losses would nullify the rounding problem.

The "Cursed" Contractor

Differences in the penalty for an actual loss were evident in each of the three analyses given previously. When the three company characteristics are considered together, the profile of the "cursed" contractor appears: a large contractor paying high wages performing work in classifications with high manual rates.

This cursed contractor will pay much higher penalties for actual losses than a smaller contractor paying low wages performing work in classifications with low manual rates. Fig. 5 compares the cursed contractor (steel erection workers; $25.00 per hour wages; 6,000,000 employee hours) to Contractor A (plumbers; $8.00 per hour wages; 20,000 employee hours). For a $5,000 actual loss the cursed contractor pays a penalty of $17,024 and pays $112,021 for a $50,000 actual loss.

Total WCI Standard Premiums versus Penalties

The analyses given focused on the penalty or marginal increase in WCI standard premiums resulting from a single actual loss. To put the magnitude of the penalty in perspective, it will now be compared to the fixed portion of the standard premium. Fig. 6 shows a plot of the fixed portion of one year's WCI standard premium plus the entire three-year penalty for a single actual loss versus the actual loss. Plots are shown for the same six work classifications shown in Fig. 2: steel erection workers, roofers, carpenters, masons, excavation operators, and plumbers. Wages are held constant at $8.00 per hour and employee hours are held at 20,000 per year.

Fig. 6 should be interpreted with care. It was decided to present the data in this format because it relates the total penalty to the amount most likely to be meaningful to contractors, the annual premium, but the penalty is actually spread out over three years. Fig. 6 can also be interpreted as the total standard premium for one year based on one actual loss of the same amount for each of the three years in the rating period.

For each contractor, the fixed portion of the WCI standard premium can be found where the appropriate curve intersects the vertical axis. It can be seen that the fixed amount varies

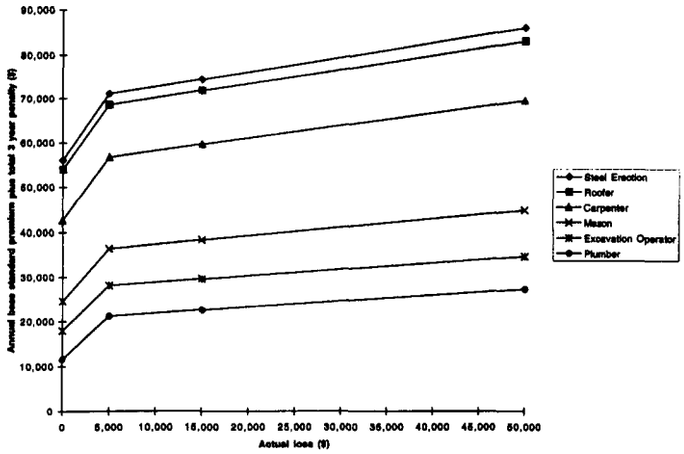

FIG. 6. Relationship of Total Penalty and Base Standard Premium versus Actual Loss for Different Work Classifications (Wage Rate: $8.00 per Hour; Employee Hours: 20,000 per Year)

considerably. The marginal increase in WCI standard premium for a single actual loss, taken from Fig. 2, is added to the fixed amount to get the total.

From this figure it can be seen that the penalty for a single actual loss is a significant fraction of the annual premium, although the penalty gets paid over three years. To expand upon the examples used earlier, a contractor employing plumbers at $8.00 per hours for 20,000 employee hours per year would pay $11,637 in base standard premium (no actual losses). A single $5,000 loss would result in a penalty of $9,580—about 82% of the annual base premium. For the employer of steel erection workers, the penalty for a single $5,000 loss is $15,006, or about 27% of the annual base of $56,107. Compared to the plumbing contractor, the steel erection contractor pays a larger absolute penalty, but it is a smaller percentage of the annual base standard premium.

The cumulative effect of several actual losses, each with its own marginal increase, becomes extremely expensive. It does not take very many actual losses to make the penalties exceed the base premium.

Plots similar to Fig. 6 could be developed for differences in wage rates and employee hours but have been omitted to avoid beating the subject to death.

ANALYSIS

Charging Losses to Responsible Projects and Management

One of the objectives of WCI is to encourage employer interest in safety and rehabilitation through an appropriate experience rating mechanism ("Workers'" 1991). The idea that contractors with poor safety records should be penalized and that contractors with good safety records should be rewarded seems logical.

However, this paper has shown that the penalty in additional WCI standard premiums for actual losses varies tremendously from contractor to contractor for reasons that have nothing to do with safety records. The type of work performed, the wage rates paid, and the size of the company all affect the magnitude of the penalty. The paper has also shown that in many cases, the penalty far exceeds that amount of the actual loss.

Contractors who understand how their WCI costs are determined will have incentive to reduce their actual losses. Because of the way the EMR is calculated, actual losses do not affect a contractor's WCI standard premiums until two, three, and four years after the actual loss occurs. By the time the contractor pays the penalty for an actual loss, it is likely that the project on which the loss occurred has been completed and the books closed. Most contractors end up burying their WCI costs in overhead distributed over all current projects rather than charging the penalty to the project or project manager responsible.

Some contractors use accident cost accounting to immediately charge the estimated cost of an actual loss against the individual project and management involved. This technique brings the issues of accident costs and accident prevention to the attention of all concerned (Oglesby et al. 1989). However, this obviously requires an estimate of the cost of the actual loss that may not be finalized for several years. For this reason, Robinson (1979) developed a set of costs of typical construction accidents from insurance company records.

Estimates such as these may accurately reflect the amount the insurance carrier pays to and on behalf of the injured employee, but they do not reflect how much the contractor will end up repaying the insurance carrier in penalties. From the point of view of the contractor, it may make more sense to charge the project and project management involved an estimate of the WCI penalty rather than an estimate of the actual loss. In some cases the penalty will be more than the actual loss, and in other cases the penalty will be less. The appropriate penalty can be estimated from charts such as those in the figures.

Are Differences in Penalties Fair?

The large differences in penalties for different contractors for similar losses raises the question of fairness and possible biases in the WCI system. Work classifications with high manual rates already pay more for their minimum WCI standard premium than work classifications with low manual rates. Is it fair that the penalty for an actual loss above and beyond the base premium should also be higher, or is this negated by the fact that, as a percentage of the base premium, the penalty is lower?

Some contractors argue that basing WCI standard premiums on payroll will produce very different insurance costs for contractors that perform the same type of work and have the same type of risks. "It is an argument we have been making for 15 years now that the higher wage-paying employer has been subsidizing the lower wage-paying employer," said a director of the National Association of Reinforcing Steel Contractors (Grogan 1991). In Fig. 3 it can be seen that the higher wage-paying employer does indeed pay a larger penalty for an actual loss than a lower wage-paying contractor, but the difference is relatively small compared to the differences for work classifications and employee hours. Is this fair?

The largest disparity comes when comparing employee hours. Larger contractors have lower minimum EMRs than smaller contractors (Hinze et al. 1995) and therefore have lower minimum standard premiums per employee hour. However, larger contractors pay much higher penalties for actual losses than smaller contractors. This method of determining the WCI standard premium places more risk on larger contractors. Smaller contractors have less risk and less control over their WCI costs but are protected from being wiped out from a single loss. Is this philosophy justified or fair?

Direct and Indirect Costs of Accidents

The actual losses used in calculating the penalties above and beyond the minimum WCI standard premium include only the benefits paid by the WCI carrier to and on behalf of the injured employee. These costs, sometimes called the direct costs of accidents, are only the tip of the iceberg. As expensive as the direct costs may be, there are many other so-called indirect costs that may far exceed the direct costs. Some of them are

loss of productivity, disrupted schedules, administrative time, training replacements, wages for time not worked, clean up and repair, third party claims, equipment damage, lower morale, and loss of motivation. The indirect costs of accidents may range from one to twenty times the direct cost but are often difficult to quantify (Hinze and Applegate 1991; "Improving" 1982; Oglesby et al. 1989; Everett and Frank 1996). No attempt has been made to include these indirect costs in the calculations, but they would be in addition to the penalties described in this paper.

CONCLUSION

Workers' compensation insurance is an expensive and complicated part of the construction business. This paper has shown some of the disparities in how much a contractor ends up paying for accidents and injuries to its employees based on company characteristics including work classification, wage rates, and employee hours. The writers hope that by shedding light on how much accidents really costs, contractors will have more incentive to improve their safety performance.

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