A Methodology for Pricing and Reserving for Claim Expenses in Workers Compensation

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This paper will describe a new methodology for determining a reserve for unallocated claim expenses. While the discussion will focus on workers compensation claims, the methodology is equally applicable to other lines of business. This paper will describe both a methodology to determine the reserve for all claims (including IBNR claims) as well as a procedure to determine the reserve for claims reported to date (excluding IBNR claims).

This is an important issue for workers compensation because the length of time for which workers compensation claims remain open, i.e., the duration, has been increasing over the last several years. As duration increases, so does the expense of handling the claim for the remainder of the claim's life.

Self-insurance and large deductible plans have become a commonplace means of financing risk. However, few self-insureds handle their own claims. The expense of handling claims is one of which risk managers are increasingly aware. As insurance companies and third party administrators are under tremendous pressure to cut expenses, the need to know the total cost for handling claims becomes increasingly important. Companies that understand the cost of handling claims will be more successful in reducing costs.

It is no longer acceptable for companies to estimate unallocated loss adjustment expense (ULAE) and, in particular, claim expense reserves by using paid to paid ratios. The paid to paid methodology assumes that claims incur expense only when initially opened and when closed. While this may not be an unreasonable assumption for claims from short-tailed lines, this is definitely not true for liability claims. Moreover, the paid to paid ratio itself is subject to distortion when a company is growing or shrinking or when a line of business is in "transition", as was the case for workers compensation throughout the early 1990s as many large customers moved to deductible policies or towards self-insurance.

Automated work measurement is one way of estimating the expense of handling various types of claims. Moreover, there are differing levels of work effort necessary for claims in the first 30 days than on claims that have been open for, say, five years. These differences will be discussed.

Building upon the techniques presented in this paper, a methodology for pricing claims-handling services which is applicable to third party administrators or insurance companies will be discussed. The implications of pricing claims-handling services on a handle-to-conclusion basis versus pricing claims-handling services on a limited time handling basis will be discussed.

Finally, the paper will discuss a methodology for tracking the duration so that the rate of claim closing can be monitored. This, in turn, will allow for targets to be set. Departments that are interested in implementing new techniques for driving down

the duration can use the monitoring techniques to determine if their new claim-closing techniques are successful or not.

A Methodology for Pricing and Reserving for Claim Expenses in Workers Compensation

This paper will describe a methodology for setting an unallocated loss adjustment expense (ULAE) reserve. The method is straightforward and it opens the door to several related issues, specifically, a claim department's monitoring of closing claims and the pricing of claims service. Although this methodology is applicable to any line of business, this discussion and the examples that follow will focus on workers compensation and, in particular, on lost time claims.

A **DEFINITIONS** section is included as an appendix.

Description of Reserve Methodology

The reserve methodology in its simplest form is outlined below. Additional complexities will be introduced after the initial explanation of the methodology. The steps are, as follows:

- produce created and closed claim count triangles and make loss development factor (LDF) selections;
- use the LDFs to project ultimate claims;
- calculate the projected open claims;
- estimate the number of open claims during a quarter;
- calculate the reserve for each year by multiplying the number of open claims by the outstanding cost per claim.

Each of these steps will be discussed further.

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Produce created and closed claim count triangles and make loss development factor (LDF) selections. These triangles should have quarterly evaluations. Ideally, the created claim counts and the closed claim counts will be net of both canceled claims and claims closed with no payment. Either accident year, report year, or policy year triangles may be used, but I prefer the report year version because the accompanying statistics are more useful. Later in the paper, I will discuss some of these statistics, e.g., the number of months claims will remain open.

Use the LDFs to project ultimate claims. Since the example uses report year claims, the ultimate number of claims is identical to the claims reported after twelve months. However, because there are reopenings and also re-assignment of initially medical only claims to lost time claims (and vice versa), the number of report year claims could change after the end of the report year.

With accident year data, one could use either closed claims, created claims, or a combination of these to project the ultimate number of claims.

Calculate the projected open claims. There are at least two methods that could be used to calculate the projected open claims. The first would be to "fill in" the bottom of each of the created and closed triangles, i.e., use the LDFs from step one above, to estimate the future created claims and use a similar procedure to estimate the future closed claims. Taking the difference of the projected created and the projected closed claims provides the projected open claims. In my experience, this

can lead to some unreasonable results, e.g., more than 10% of claims remaining open after ten years for a line where this is not reasonable, which necessitates re-selection and re-re-selection and so on, of the LDFs.

My preferred method for projecting the open claims is to calculate another triangle which is the ratio of the (actual) open claims to the ultimate claims. By selecting the percentage of open claims at each evaluation and then applying this percentage to the ultimate number of claims for each year, one derives the projected number of open claims. This is illustrated in Exhibit 2.

Estimate the number of inforce claims during a quarter. One way of estimating the number of inforce claims during a quarter is to average the number of open claims at the beginning and end of a quarter as shown in Exhibit 3.

Calculate the reserve for each year by multiplying the number of open claims by the outstanding cost per claim. Multiplying the average number of open claims in each quarter by the outstanding cost per claim per quarter gives the cost of handling claims in that particular quarter. Note that this produces the incremental cost per quarter as shown in Exhibit 4. Summing all of these costs after a particular point in time, e.g., four quarters, results in the reserve for claim expenses as of the fourth quarter *only for claims open through ten years* as shown in Exhibit 4.

The example shown assumes that the outstanding claim expense per quarter is $150 in 1995 dollars. This is not meant to be a true standard that will apply to any

company nor should it be construed to be my company's standard. Future expenses are assumed to increase at 4% per year; one could use other assumptions. Note that the present value of the reserve could be calculated by using $150 consistently for as long as claims are expected to remain open.

One way of determining the outstanding cost per claim would be an automated work measurement study within the claim department. Such a study would determine *standards* rather than dollar amounts since many costs are inflation sensitive. For example, one may determine that a typical workers compensation claim requires fifteen hours to settle (which could be then translated into a cost using the most current hourly rates) rather than saying it costs $700.

Of course, the reserve calculated in Exhibit 4 covers only the expense in the first ten years the claims are open because the triangles used in the example end at ten years. Since there are claims remaining open after ten years, and there will likely be claims open for as many as forty years (or more), the reserve must be adjusted to account for the claims open after ten years.

The assumption to be used in calculating this "tail" reserve is that any workers compensation claim still open after ten years is a tabular claim for which benefits will be paid for the claimant's or the survivor's lifetime. Note that ten years is used in this example only and it is not meant to be a standard. For example, if one has data through fifteen or twenty years then one could make the same assumption.

One can obtain historical information as to the age of the claimant or survivor ten years after the claim is reported (for report year statistics) or ten years after the claim occurs (for accident year statistics). Additionally, an assumption must be made as to the average age at death to determine how many years the claims will remain open. Refinements to this methodology are obviously available, e.g., one can apply mortality tables to *each* claim open after ten years.

We will *assume* that claims open for ten years will remain open, on average, for an additional twenty-five years. Then the "tail reserve" would be the product of the number of claims open after ten years times twenty-five times the annual cost of handling the claim. Obviously, the tail reserve calculated in this manner is very sensitive to the number of years used in the calculation. The significant dollar amounts produced by this methodology (see Exhibit 5) begs the question "Will it really cost this much to handle tabular claims?"

Based on discussions with my claim department it has become clear that, while tabular claims incur expense, these claims are less expensive to handle than "newer" claims. Typically, the work involved in maintaining an open tabular claim is an annual or semi-annual review of the reserve and the mail delivery of a monthly or weekly check (which, typically, is an automated process). We have determined that tabular claims will incur roughly one-third of the expense of a newer claim. Obviously, this may differ from company to company.

The tail reserve for each report year is calculated as shown in Exhibit 6. In Exhibit 7, this tail reserve is shown for each report year after 120 months and the total reserve is calculated by summing the cost per quarter after a particular quarter.

Duration

We have, thus far, presented a methodology for calculating the *total reserve* which is the sum of the expenses in handling claims in the first ten years and the tail reserve for the tabular claims. Note that the reserve calculated in this manner results in a reserve for *all* claims, whether reported or not. For a company that does not wish to hold reserves for incurred but not reported (IBNR) claims or for claims which are not yet incurred, a variation of this methodology is necessary.

The concept of *duration* will be introduced to illustrate the calculation of a reserve per claim. Simply stated, the duration is the average life of a claim or the length of time, on average, that a claim remains open. *Please note that **duration** has a different and distinct meaning in the financial community from that offered here.* Since a claim incurs expense for as long as it remains open, the duration is obviously a key factor in calculating both the reserve and the cost of handling a particular claim.

One way of computing the duration of a claim involves counting the number of days between the date of report and the date of closure using "many" years. This method of computing the duration may understate a company's duration if the claims system began in (for example) 1970 or if the company has not been writing

workers compensation claims since the early 1900s because it is not uncommon for workers compensation claims to remain open for fifty years or more. Even for a company writing business for many years, the duration may be mis-stated if the volume has changed significantly over time.

Another way of estimating duration is to use triangles. For each report year, one would take the weighted average over time of the incremental closed claims in each quarter as well as the weighted average over time of the incremental reported claims in each quarter. The difference of the closed weighted average and the created weighted average gives an estimate of the duration for each report year.

A company with only twenty years of workers compensation experience could compute the truncated duration of the first twenty years worth of claims and then make the assumption that claims still open after twenty years are tabular claims. Using annuity tables, one could then estimate the length of time the tabular claims will remain open or one could use a method similar to what was illustrated above for the tail reserve. The total duration could then be calculated using a simple weighted average.

As an example, assume the duration of report year 1977 claims as of December 31, 1996 is 12.6 months and that 99.5% of these claims are closed. The remaining 0.5% of claims are open and are expected to remain open for an *additional* 21 years. The total duration would be (0.995 x 12.6) + (0.005 x [21 + 19.5] x 12) = 15 months.

Obviously, the duration will differ by state because of the different laws in each state for workers compensation benefits. For example, the duration of the permanent total claims in the ten states in the NCCI Closed Claims Studies[1] ranged from 21.3 months (South Carolina) to 50.2 months (Wisconsin).

Industry data from the NCCI Closed Claims Studies[2] showed increasing durations for all of the ten states in the study. This study measured the duration in median number of days for permanent disability claims through closure year 1992. It seems likely that managed care will have some impact on decreasing the overall claim duration, but it is too soon to determine the validity of this hypothesis.

We will assume that the countrywide duration for a workers compensation lost time claim (WCLT) claim is 15 months, the cost *per month* of handling a claim is $50, and there is no inflation. Then every reported claim will need to have a reserve of $750 (= 15 x $50) set aside. Therefore, the reserve as of any point in time would be {the number of created claims} *times* {$750} *minus* {the money released from the reserve from open claims}. This concept is probably easier to illustrate than to explain.

Assume that one claim is reported at the beginning of each quarter and that the number of open claims at the end of each quarter is as shown below. Also assume for simplicity that claims close at the end of the quarter.

Quarter	Number of Reported Claims	Number of Open Claims*	Addition to Claim Reserve	Subtraction from Claim Reserve	Reserve at the end of the Quarter
1	1	1	$750	$150	$600
2	1	2	$750	$300	$1,050
3	1	3	$750	$450	$1,350
4	1	3	$750	$450	$1,650

***Note: This is the number of open claims at the *end* of *each month* of the quarter.**

In the example above, the reserve is increased by $750 whenever a claim is reported and the reserve is drawn down by $50 for every month a claim is open. So each quarter the reserve is computed as the reserve at the beginning of the quarter plus the addition to the reserve (from newly-reported claims) minus the claim expenses incurred during the quarter.

In the example above, the assumption is made that claim expense is incurred if the claim is open at the *end of the month.* Since, in the fourth quarter, one claim was closed before the end of the first month of the quarter, no money is released from the reserve for this claim. In this way, the money set aside for claims that close "early" (before 15 months) is there for the claims that remain open "late" (after 15 months).

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Pricing Claims Service

The concept of duration was used to compute the reserve per claim, which can easily be modified to derive the price of handling a claim. For many customers today and for virtually all National Accounts customers, claims service is an unbundled, separately-negotiated piece of the risk-financing program.

The methodology described here is only for the *basic claim expenses*, i.e., the unallocated loss adjustment expenses. The *total cost* of adjusting claims would be the sum of the basic claim expense and the sundry allocated types of loss adjustment expenses such as legal expenses, managed care expenses, 1-800 telephone reporting systems, nurse case managers, etc.

In the examples presented thus far, we have assumed that claims incur uniform expenses each month for the first ten years. Discussions with my claim department would indicate that this is an overly simplistic assumption. Rather, a claim generally incurs the most expense during the first month in which it is open, during which time the file must be set up, various phone calls must be made, investigatory work is necessary, etc. Therefore, the expense incurred by a claim may better be modeled by assuming an **intake expense** and then several months of **outstanding expense** for as long as the claim is open.

A further refinement in modeling the claim expense would be to differentiate between the outstanding expenses. Again, the idea is that the first few months a claim is open are more labor-intensive than the later months. Thus, there may be

discriminatory standards for outstanding expenses. The cost of handling a claim (excluding ALE) would then be:

Intake Expense + (OS1 * x months) + (OS2 * [duration - 1 - x] months),

where OS1 is the higher cost of handling claims in the first few months and OS2 is the lower cost of handling claims later. Note that we are assuming the cost of handling a claim in the first month is included in the intake expense, so that we only have to account for (duration - 1) months of outstanding expenses.

In setting the reserve using the reserve per claim concept, a reserve equal to **(OS1 * x months) + (OS2 * [duration - 1 - x] months)** would be set aside for each claim in the month in which the claim is reported. If the claim closes in the first month, then the full reserve would be banked for claims remaining open longer than the average life of claim. If the claim remains open at the end of the second (or third) month, then OS1 dollars would be released from the reserve. If the claim remains open at the end of the fourth and succeeding months, then OS2 dollars would be released from the reserve for each month the claim is open.

These additional claim standards will have to be determined based on some type of work measurement study. A few years ago, my company embarked upon an automated work measurement study in order to derive precise measures of these standards. Although these standards will conceivably differ by state, the real

difference by state is due to the duration. One could take these differing durations into account in pricing claims service to avoid adverse selection in "problem" states.

The formula presented above is for *handle-to-conclusion* pricing, i.e., the fee is sufficient to cover the expenses of handling the claim for as long as the claim is open. Today many third party administrators (TPAs) also price claims on a *limited time handling* basis. Under this option, an additional fee would be levied to service claims remaining open after (for example) two years. Typically, this additional fee would be negotiated at the time of sale.

Today most large (self-)insureds separately negotiate the cost of claims service with an insurance company TPA or a stand-alone TPA. The stand-alone TPA will partner with an insurance company who is willing to unbundle its claims service. While an insurance company TPA would be willing to offer this limited time handling option, many insurance companies would not want the insured to take its claims elsewhere to be serviced since these claims are the insurance company's liability (or conceivably could be if serviced under a deductible policy).

Given a handle-to-conclusion fee, how could one determine the limited time handling fee? The statistics in Exhibit 2 show that 22.6% of claims remain open after two years. We could then estimate the limited time handling fee for two years as (1 - 0.226) x HTC, where HTC is the handle-to-conclusion fee. The claims remaining open after two years would begin to incur a monthly fee and would continue to do so for as long as the claim stayed open.

Note that those claims still open at 24 months would likely remain open for an *additional* 24 months. This is calculated as the reserve as of 24 months divided by the number of open claims at 24 months divided by the cost per outstanding (including inflation). Therefore, if a customer chose instead to pay a one-time fee to handle the claims remaining open after 24 months, the necessary fee assuming a monthly outstanding expense of $50 would be $1,200 = 24 x $50.

This one-time fee could also be calculated as the cost of handling *take-over claims*. A customer who has a limited time handling option who chooses to take its claims to another TPA would be subject to a take-over claim fee.

Monitoring the Duration

As mentioned earlier, there is some evidence that duration has increased during the 1990s. It also seems likely that managed care will play some part in decreasing the duration. Because it is generally true that the longer a claim remains open, the higher will be the expense of handling that claim, it is a good idea for claim departments to monitor progress or slippage in duration.

A process for monitoring the duration would be to use quarterly report quarter outstanding rates. The example presented below shows claims reported during a quarter and the number of claims open at 3, 6, 9, and 12 months.

	No. Claims Reported during Quarter	No. Claims Open after 3 months	No. Claims Open after 6 months	No. Claims Open after 9 months	No. Claims Open after 12 months
	(1)	(2)	(3)	(4)	(5)
1-st Quarter 93	3,481	2,536	2,012	1,647	1,287
2-nd Quarter 93	3,623	2,668	2,082	1,721	1,401
3-rd Quarter 93	4,220	3,098	2,461	2,013	1,648
4-th Quarter 93	4,002	3,034	2,315	1,921	1,613
1-st Quarter 94	3,991	3,100	2,320	1,920	1,647
2-nd Quarter 94	3,621	2,850	2,134	1,738	1,514
3-rd Quarter 94	3,398	2,649	2,014	1,651	1,429
4-th Quarter 94	2,910	2,287	1,741	1,426	1,248
1-st Quarter 95	3,830	3,041	2,297	1,896	
2-nd Quarter 95	3,863	3,079	2,326		
3-rd Quarter 95	3,284	2,642			

The table below shows the percentage of claims open at successive evaluations. Of course, in the absence of change in claims handling, one would expect the same percentages throughout a column.

	Percentage of Claims Open after 3 months	Percentage of Claims Open after 6 months	Percentage of Claims Open after 9 months	Percentage of Claims Open after 12 months
	(6)	(7)	(8)	(9)
1-st Quarter 93	72.9%	57.8%	47.3%	37.0%
2-nd Quarter 93	73.6%	57.5%	47.5%	38.7%
3-rd Quarter 93	73.4%	58.3%	47.7%	39.1%
4-th Quarter 93	75.8%	57.8%	48.0%	40.3%
1-st Quarter 94	77.7%	58.1%	48.1%	41.3%
2-nd Quarter 94	78.7%	58.9%	48.0%	41.8%
3-rd Quarter 94	78.0%	59.3%	48.6%	42.1%
4-th Quarter 94	78.6%	59.8%	49.0%	42.9%
1-st Quarter 95	79.4%	60.0%	49.5%	
2-nd Quarter 95	79.7%	60.2%		
3-rd Quarter 95	80.5%			

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This example has been purposefully contrived to show that claims are remaining open longer, at least through the first twelve months. It seems likely that the duration of claims reported in the most recent report quarter will be greater than that of the earlier report quarters.

By using *report quarter* instead of *accident quarter*, there is no issue with claim development. Also, by using report *quarter* rather than report *year,* the analyst can more quickly discern changes in outstanding rates (because of the frequency with which these reports will be produced) or any seasonality that may exist.

While this type of triangulation may be used to monitor duration, it may also be used by claim departments or third-party administrators in setting goals for the future. The goal could be to continue to close claims at the same rate or the goal could be to close claims more quickly. Certainly, the longer claims stay open the higher the total cost of handling the claim although this could be somewhat of a trade-off in that closing claims too quickly could lead to more reopened claims and/or higher settlement values.

A claim department or third party administrator who is interested in more sophisticated monitoring techniques could use the same types of report quarter comparisons at successive evaluations to monitor

- average incurred claim size,
- average paid claim size,

- average outstanding claim size,
- ratio of paid ALE to paid loss,
- average ALE per reported claim,
- average recovery per claim,
- recovery as a percentage of loss,
- ratio of closed claims to the number of claims handlers.

By monitoring the claim closing rate as well as the claim costs and other measures at like points in time, a claim department can monitor not just the closing of the claims but the full range of statistics bearing on a claim department's performance.

By using the techniques described here, a claim department or third party administrator can price claim service based on the total cost of handling the claim. This will also allow the company to set up and maintain an adequate reserve and to monitor the success in handling the claims.

References

1 Hartwig, Robert P.; Kahley, William J.; and Restrepo, Tanya E., "Workers Compensation Loss Ratios and the Business Cycle", *NCCI Journal,* December, 1994.

2 Op. cit.

DEFINITIONS

Allocated loss adjustment expense (ALAE). Expenses associated with settling a claim that are allocable to a specific claim, e.g., attorneys' fees, investigative fees, independent medical examinations, many managed care expenses, and court and other legal fees.

Created Claims. Claims reported to an insurance company or third party administrator. *Also known as* ***reported claims.***

Duration. The amount of time that a claim remains open. *Also known as the* ***life of claim.***

Handle-to-conclusion. A term used by third party administrators to denote claims service that will continue for as long as the claim remains open. The fee charged for handle-to-conclusion would, unless otherwise stated, also cover the handling of any reopened claims for as long as they remain (re)-opened.

Intake expense. The cost of setting up a newly-created claim into the system.

Limited-time handling. A term used by third party administrators to signify claims service for some specified time limit, after which time an additional fee will be charged for the continued handling of the claim.

Outstanding fee. The expense of handling a claim for as long as it remains open. This could be expressed in various ways, e.g., as a fee per month or a quarterly fee.

Reported claims. Claims for which the insurance company or third party administrator has been made aware. *Also known as* ***created claims.***

Third party administrator (TPA). A company who is in the business of handling and servicing claims. Such a company may also provide other than claims services such as loss control, risk management information systems, actuarial services, etc. These companies may either be affiliated with an insurance carrier or as a stand-alone entity.

Unallocated loss adjustment expense (ULAE). Expenses associated with settling a claim that are not allocable to a specific claim, e.g., claim adjusters' salaries, heat, light, rent, etc.

Workers Compensation Lost Time Claims

Report Year	Created Claims 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	23,983	48,487	73,985	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909
1987	24,634	49,335	72,704	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869
1988	24,555	49,550	75,570	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346
1989	25,500	52,425	80,455	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315
1990	25,788	55,292	82,434	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029	111,029
1991	23,898	50,323	77,879	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345	107,345
1992	25,318	52,893	81,827	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367	113,367				
1993	25,478	52,901	79,780	107,084	107,084	107,084	107,084	107,084	107,084	107,084	107,084	107,084								
1994	24,785	50,509	77,522	107,687	107,687	107,687	107,687	107,687												
1995	24,383	49,863	76,524	104,446																

Workers Compensation Lost Time Claims

Report Year	Created Claims 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	Ultimate
1986	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909	101,909
1987	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869	96,869					96,869
1988	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346	102,346									102,346
1989	107,315	107,315	107,315	107,315	107,315	107,315	107,315	107,315													107,315
1990	111,029	111,029	111,029	111,029																	111,029
1991																					107,345
1992																					113,367
1993																					107,084
1994																					107,667
1995																					104,446

Workers Compensation Lost Time Claims

Report Year	Open Claims 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	17,957	28,671	36,937	46,680	40,317	32,933	28,228	24,271	21,023	17,780	15,844	13,903	12,671	11,252	10,246	9,203	8,460	7,501	6,588	5,980
1987	18,115	28,998	36,325	45,306	33,093	26,843	22,631	19,287	16,601	14,405	12,368	10,849	9,234	8,325	7,227	6,341	5,774	5,186	4,743	4,410
1988	18,570	30,035	38,877	46,745	35,385	29,480	25,050	21,720	18,300	15,755	13,765	12,115	11,125	10,020	9,200	8,265	7,515	6,820	6,415	5,900
1989	19,230	32,975	39,548	49,865	37,310	31,055	26,015	22,355	19,555	17,040	15,370	13,775	12,015	10,755	9,830	8,835	8,060	7,460	6,820	6,320
1990	19,787	36,284	40,645	51,152	39,629	33,327	28,725	25,355	22,480	19,240	17,701	15,878	14,102	12,974	11,988	10,780	9,937	9,116	8,492	7,810
1991	18,879	33,587	40,522	49,710	39,400	32,630	28,360	24,630	21,810	19,330	17,505	15,585	14,290	12,840	11,800	10,630	9,850	9,020	8,210	7,245
1992	20,205	36,239	42,877	52,935	43,990	37,360	32,185	28,340	25,025	22,215	19,855	18,070	15,810	14,405	12,885	11,225	9,888	8,106	7,426	6,788
1993	19,243	33,259	40,855	49,428	37,867	31,360	26,760	23,352	20,787	18,868	16,833	14,554	12,850	11,597	10,505	9,391	8,395	7,657	7,014	6,393
1994	19,125	33,887	40,188	50,002	37,896	35,123	30,547	26,668	20,966	18,328	16,368	14,505	12,922	11,983	10,564	9,444	8,443	7,700	7,054	6,429
1995	18,455	32,651	39,586	49,155	37,674	31,710	27,135	23,573	20,357	17,777	15,876	14,069	12,534	11,312	10,246	9,160	8,189	7,468	6,841	6,235

Ratio of Open to Ultimate Claims

				12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	0.1782	0.2813	0.3625	0.4581	0.3956	0.3232	0.2770	0.2382	0.2063	0.1745	0.1555	0.1364	0.1243	0.1104	0.1005	0.0903	0.0830	0.0736	0.0647	0.0565
1987	0.1870	0.2993	0.3750	0.4677	0.3416	0.2771	0.2336	0.1991	0.1714	0.1487	0.1277	0.1130	0.0953	0.0859	0.0746	0.0655	0.0596	0.0533	0.0490	0.0455
1988	0.1814	0.2935	0.3799	0.4567	0.3457	0.2880	0.2448	0.2122	0.1788	0.1539	0.1345	0.1184	0.1087	0.0979	0.0899	0.0808	0.0734	0.0666	0.0627	0.0576
1989	0.1792	0.3073	0.3685	0.4647	0.3477	0.2894	0.2424	0.2083	0.1822	0.1588	0.1432	0.1284	0.1120	0.1002	0.0916	0.0823	0.0751	0.0695	0.0638	0.0589
1990	0.1780	0.3266	0.3661	0.4607	0.3569	0.3002	0.2587	0.2284	0.2025	0.1733	0.1594	0.1412	0.1270	0.1169	0.1080	0.0971	0.0895	0.0821	0.0765	0.0703
1991	0.1759	0.3129	0.3775	0.4631	0.3670	0.3058	0.2642	0.2294	0.2032	0.1801	0.1631	0.1452	0.1331	0.1196	0.1081	0.0990	0.0899	0.0840	0.0765	0.0675
1992	0.1782	0.3197	0.3782	0.4669	0.3878	0.3295	0.2839	0.2500	0.2207	0.1960	0.1751	0.1594	0.1395	0.1271	0.1137	0.0990				
1993	0.1797	0.3106	0.3797	0.4616	0.3518	0.2929	0.2499	0.2181	0.1941	0.1762	0.1572	0.1359								
1994	0.1776	0.3147	0.3732	0.4643	0.3519	0.3262	0.2837	0.2476												
Average				0.4626	0.3607	0.3036	0.2598	0.2257	0.1949	0.1702	0.1520	0.1347	0.1200	0.1083	0.0981	0.0877	0.0784	0.0715	0.0655	0.0597
Selected				0.4626	0.3607	0.3036	0.2598	0.2257	0.1949	0.1702	0.1520	0.1347	0.1200	0.1083	0.0981	0.0877	0.0784	0.0715	0.0655	0.0597

Example: For RY 1995 at 24 months: 23,573 = 0.2257 x 104,446.

Workers Compensation Lost Time Claims

Report Year	Open Claims 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	5,452	5,071	4,700	4,479	4,230	3,901	3,793	3,525	3,323	3,064	3,017	2,726	2,726	2,589	2,458	2,468	2,322	2,288	2,195	2,038
1987	4,086	3,749	3,632	3,438	3,272	2,975	2,781	2,648	2,552	2,464	2,391	2,218	2,052	1,971	1,841	1,742	2,208	2,160	2,083	1,937
1988	5,520	5,140	4,750	4,445	4,115	3,820	3,495	3,255	2,905	2,785	2,620	2,385	2,456	2,344	2,211	2,160	2,333	2,303	2,200	2,047
1989	5,800	5,045	4,820	4,550	4,115	3,980	3,740	3,470	3,123	2,982	2,833	2,608	2,576	2,458	2,318	2,264	2,447	2,415	2,307	2,146
1990	7,129	6,739	6,250	5,647	4,275	3,930	3,742	3,497	3,231	3,084	2,931	2,668	2,665	2,543	2,398	2,343	2,531	2,496	2,367	2,221
1991	5,754	5,292	4,959	4,637	4,133	3,800	3,618	3,381	3,124	2,983	2,834	2,608	2,576	2,458	2,319	2,285	2,447	2,415	2,308	2,147
1992	6,078	5,589	5,238	4,897	4,365	4,013	3,820	3,571	3,299	3,129	2,993	2,755	2,721	2,596	2,449	2,392	2,585	2,551	2,437	2,267
1993	5,740	5,279	4,947	4,626	4,123	3,791	3,609	3,373	3,116	2,956	2,827	2,602	2,570	2,452	2,313	2,259	2,442	2,409	2,302	2,142
1994	5,772	5,309	4,975	4,652	4,146	3,812	3,629	3,392	3,134	2,972	2,843	2,617	2,584	2,466	2,326	2,272	2,455	2,423	2,315	2,154
1995	5,596	5,149	4,825	4,512	4,021	3,697	3,520	3,290	3,039	2,883	2,757	2,538	2,507	2,392	2,256	2,204	2,381	2,350	2,246	2,089

	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	0.0535	0.0498	0.0461	0.0440	0.0415	0.0383	0.0372	0.0346	0.0326	0.0301	0.0298	0.0267	0.0267	0.0255	0.0241	0.0242	0.0228	0.0225	0.0215	0.0200
1987	0.0422	0.0387	0.0375	0.0355	0.0338	0.0307	0.0287	0.0273	0.0263	0.0256	0.0241	0.0229	0.0212	0.0203	0.0190	0.0180				
1988	0.0539	0.0502	0.0464	0.0434	0.0402	0.0354	0.0341	0.0318	0.0284	0.0270	0.0256	0.0233								
1989	0.0540	0.0470	0.0449	0.0424	0.0383	0.0371	0.0349	0.0323												
1990	0.0642	0.0607	0.0563	0.0509																
1991																				
1992																				
1993																				
1994																				
Average	0.0536	0.0493	0.0462	0.0432	0.0385	0.0354	0.0337	0.0315	0.0291	0.0278	0.0264	0.0243	0.0240	0.0229	0.0216	0.0211	0.0228	0.0225	0.0215	0.0200
Selected	0.0536	0.0493	0.0462	0.0432	0.0385	0.0354	0.0337	0.0315	0.0291	0.0278	0.0264	0.0243	0.0240	0.0229	0.0216	0.0211	0.0228	0.0225	0.0215	0.0200

Workers Compensation Lost Time Claims

Report Year	Average Open Claims* 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	8,979	23,314	32,604	41,609	43,496	36,625	30,581	26,250	22,647	19,402	16,612	14,873	13,287	11,962	10,749	9,724	8,831	7,981	7,045	6,275
1987	9,057	23,555	32,661	40,815	39,200	29,988	24,737	20,959	17,944	15,503	13,385	11,657	10,091	8,780	7,776	6,784	6,057	5,470	4,955	4,577
1988	9,285	24,303	34,456	42,811	41,065	32,433	27,265	23,385	20,010	17,028	14,780	12,940	11,620	10,573	9,610	8,733	7,890	7,168	6,618	6,158
1989	9,615	26,103	38,262	44,707	43,588	34,183	28,535	24,185	20,955	18,298	16,205	14,573	12,895	11,385	10,293	9,333	8,448	7,760	7,140	6,570
1990	9,864	26,025	38,464	45,899	45,391	36,478	31,026	27,040	23,917	20,860	18,470	16,689	14,890	13,538	12,480	11,383	10,358	9,526	8,804	8,151
1991	9,439	26,233	37,054	45,118	44,555	36,115	30,595	26,495	23,220	20,570	18,418	16,545	14,938	13,585	12,220	11,115	10,140	9,335	8,615	7,728
1992	10,102	28,222	39,558	47,906	46,448	40,660	34,773	30,263	26,683	23,620	21,035	18,983	16,940	15,108	13,645	12,055	10,057	8,497	7,786	7,097
1993	9,622	26,251	36,957	45,041	43,547	34,514	29,060	25,056	22,069	19,827	17,850	15,893	13,702	12,224	11,051	9,948	8,693	8,026	7,336	6,704
1994	9,563	26,506	37,038	45,095	43,949	36,510	32,835	28,808	23,828	19,858	17,348	15,437	13,714	12,293	11,114	10,004	8,944	8,072	7,377	6,742
1995	9,228	25,553	36,119	44,371	43,415	34,892	29,423	25,354	21,985	19,087	16,827	14,973	13,302	11,923	10,779	9,703	8,675	7,829	7,155	6,538

* *Average Open Claims* = Average number of claims at the beginning and the end of the quarter.

Report Year	Cost Per Open Claim** 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	105	105	105	105	109	109	109	109	113	113	113	113	118	118	118	118	123	123	123	123
1987	109	109	109	109	113	113	113	113	118	118	118	118	123	123	123	123	128	128	128	128
1988	113	113	113	113	118	118	118	118	123	123	123	123	128	128	128	128	133	133	133	133
1989	118	118	118	118	123	123	123	123	128	128	128	128	133	133	133	133	138	138	138	138
1990	123	123	123	123	128	128	128	128	133	133	133	133	138	138	138	138	144	144	144	144
1991	128	128	128	128	133	133	133	133	138	138	138	138	144	144	144	144	150	150	150	150
1992	133	133	133	133	138	138	138	138	144	144	144	144	150	150	150	150	156	156	156	156
1993	138	138	138	138	144	144	144	144	150	150	150	150	156	156	156	156	162	162	162	162
1994	144	144	144	144	150	150	150	150	156	156	156	156	162	162	162	162	168	168	168	168
1995	150	150	150	150	156	156	156	156	162	162	162	162	168	168	168	168	175	175	175	175

** *Cost Per Open Claim* is assumed to be $150 per quarter in 1995 dollars. Prior and subsequent expenses are derived assuming 4% inflation.

Workers Compensation Lost Time Claims

Report Year	Average Open Claims* 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	5,706	5,262	4,886	4,590	4,355	4,066	3,847	3,659	3,424	3,194	3,041	2,872	2,726	2,663	2,529	2,463	2,395	2,305	2,242	2,116
1987	4,248	3,917	3,690	3,535	3,355	3,123	2,878	2,714	2,599	2,518	2,408	2,275	2,135	2,012	1,906	1,791	1,975	2,195	2,132	2,010
1988	5,710	5,330	4,945	4,598	4,280	3,868	3,558	3,375	3,080	2,835	2,693	2,503	2,421	2,400	2,278	2,186	2,247	2,318	2,252	2,124
1989	6,060	5,423	4,933	4,685	4,333	4,048	3,880	3,605	3,297	3,043	2,898	2,721	2,592	2,517	2,388	2,291	2,356	2,431	2,361	2,227
1990	7,470	6,934	6,495	5,949	4,961	4,103	3,836	3,620	3,364	3,148	2,998	2,815	2,682	2,604	2,471	2,371	2,437	2,515	2,443	2,304
1991	6,500	5,523	5,126	4,798	4,385	3,987	3,709	3,500	3,253	3,044	2,899	2,721	2,592	2,517	2,389	2,292	2,356	2,431	2,362	2,228
1992	6,422	5,833	5,414	5,068	4,631	4,189	3,917	3,696	3,435	3,214	3,061	2,874	2,738	2,659	2,523	2,421	2,489	2,568	2,494	2,352
1993	6,067	5,510	5,113	4,787	4,375	3,957	3,700	3,491	3,245	3,036	2,892	2,715	2,586	2,511	2,383	2,286	2,351	2,426	2,356	2,222
1994	6,101	5,541	5,142	4,814	4,399	3,979	3,721	3,511	3,263	3,053	2,908	2,730	2,601	2,525	2,396	2,299	2,364	2,439	2,369	2,235
1995	5,917	5,374	4,987	4,669	4,267	3,859	3,609	3,405	3,165	2,961	2,820	2,648	2,523	2,450	2,324	2,230	2,293	2,366	2,298	2,168

** Average Open Claims = Average number of claims at the beginning and the end of the quarter.*

Report Year	Cost Per Open Claim** 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	128	128	128	128	133	133	133	133	138	138	138	138	144	144	144	144	150	150	150	150
1987	133	133	133	133	138	138	138	138	144	144	144	144	150	150	150	150	156	156	156	156
1988	138	138	138	138	144	144	144	144	150	150	150	150	156	156	156	156	162	162	162	162
1989	144	144	144	144	150	150	150	150	156	156	156	156	162	162	162	162	168	168	168	168
1990	150	150	150	150	156	156	156	156	162	162	162	162	168	168	168	168	175	175	175	175
1991	156	156	156	156	162	162	162	162	168	168	168	168	175	175	175	175	182	182	182	182
1992	162	162	162	162	168	168	168	168	175	175	175	175	182	182	182	182	189	189	189	189
1993	168	168	168	168	175	175	175	175	182	182	182	182	189	189	189	189	197	197	197	197
1994	175	175	175	175	182	182	182	182	189	189	189	189	197	197	197	197	205	205	205	205
1995	182	182	182	182	189	189	189	189	197	197	197	197	205	205	205	205	213	213	213	213

*** Cost Per Open Claim* is assumed to be $150 per quarter in 1995 dollars. Prior and subsequent expenses are derived assuming 4% inflation.

Workers Compensation Lost Time Claims

Report Year	Incremental Cost Per Quarter 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	942,795	2,447,970	3,444,420	4,389,945	4,741,282	3,992,125	3,333,329	2,861,250	2,559,111	2,192,426	1,899,756	1,680,849	1,567,866	1,411,518	1,268,382	1,147,432	1,066,213	981,663	866,535	771,825
1987	987,213	2,587,495	3,580,049	4,448,835	4,429,600	3,388,384	2,795,281	2,368,387	2,117,392	1,829,354	1,579,430	1,375,526	1,241,193	1,079,940	956,448	834,432	775,296	700,160	634,240	585,656
1988	1,049,205	2,746,239	3,893,528	4,837,643	4,845,670	3,827,094	3,217,270	2,759,430	2,461,230	2,094,444	1,815,480	1,591,620	1,467,360	1,353,344	1,230,060	1,117,824	1,049,370	953,344	880,194	819,014
1989	1,134,570	3,080,154	4,278,916	5,275,426	5,361,324	4,204,509	3,509,605	2,974,755	2,682,240	2,342,144	2,074,240	1,865,344	1,715,035	1,514,205	1,368,969	1,241,289	1,165,824	1,070,880	985,320	908,660
1990	1,215,732	3,447,075	4,731,072	5,645,577	5,810,048	4,689,184	3,971,328	3,461,120	3,180,981	2,774,380	2,456,510	2,219,637	2,054,820	1,868,244	1,722,240	1,570,854	1,491,552	1,371,744	1,267,776	1,173,744
1991	1,208,192	3,357,824	4,742,912	5,774,848	5,925,815	4,803,295	4,069,135	3,523,835	3,204,360	2,836,660	2,541,664	2,263,210	2,151,072	1,953,360	1,758,880	1,600,560	1,521,000	1,400,250	1,292,250	1,196,200
1992	1,343,566	3,753,526	5,261,214	6,371,498	6,685,824	5,611,080	4,788,674	4,176,294	3,842,352	3,401,280	3,029,040	2,730,672	2,541,000	2,286,200	2,046,750	1,808,250	1,568,892	1,325,532	1,211,496	1,107,132
1993	1,327,636	3,622,638	5,100,066	6,215,658	6,270,788	4,970,016	4,184,640	3,608,064	3,310,350	2,974,050	2,677,500	2,353,950	2,137,512	1,906,944	1,723,956	1,551,888	1,440,666	1,300,212	1,188,432	1,086,048
1994	1,377,072	3,818,864	5,333,472	6,493,680	6,592,350	5,476,500	4,925,250	4,291,200	3,717,188	3,066,848	2,706,288	2,408,172	2,221,668	1,991,466	1,800,468	1,620,648	1,502,592	1,356,096	1,239,336	1,132,656
1995	1,384,200	3,832,950	5,417,850	6,655,650	6,772,740	5,411,952	4,589,988	3,955,224	3,558,330	3,088,854	2,725,974	2,425,626	2,234,736	2,003,064	1,810,872	1,630,104	1,518,125	1,370,075	1,252,125	1,144,150

Example: For RY 1995, expenses in the fourth quarter = $6,655,650 = 44,371 x 150.

Report Year	Reserve as of Quarter* 3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	51,961,680	49,513,690	46,069,270	41,679,325	36,938,043	32,945,918	29,612,589	26,751,339	24,192,228	21,999,802	20,100,046	18,419,397	16,851,531	15,440,015	14,171,633	13,024,201	11,937,988	10,956,325	10,089,790	9,317,965
1987	44,862,280	42,294,785	38,734,736	34,285,901	29,856,301	26,469,917	23,674,636	21,306,249	19,188,877	17,359,523	15,780,093	14,404,567	13,163,374	12,083,434	11,126,986	10,292,554	9,517,258	8,817,098	8,182,858	7,597,002
1988	52,555,848	49,809,609	45,916,081	41,078,438	36,232,768	32,405,674	29,188,404	26,426,974	23,967,744	21,873,300	20,057,820	18,466,200	16,978,840	15,625,496	14,395,416	13,277,592	12,228,222	11,274,878	10,394,684	9,575,670
1989	58,058,743	54,978,589	50,699,673	45,424,247	40,062,923	35,858,414	32,348,809	29,373,854	26,891,814	24,349,470	22,275,230	20,409,888	18,694,851	17,180,648	15,811,677	14,570,388	13,404,564	12,333,684	11,348,364	10,441,704
1990	66,887,665	63,440,590	58,709,518	53,063,941	47,253,893	42,584,709	38,613,381	35,152,281	31,971,300	29,196,920	26,740,410	24,520,773	22,465,953	20,597,709	18,875,469	17,304,615	15,813,063	14,441,319	13,173,543	11,999,799
1991	67,269,464	63,911,680	59,186,748	53,393,900	47,488,085	42,664,790	38,595,655	35,071,820	31,867,480	29,028,800	26,487,116	24,203,906	22,052,834	20,099,474	18,339,794	16,739,234	15,218,234	13,817,984	12,525,734	11,366,534
1992	75,936,773	72,183,247	66,922,033	60,550,535	53,864,711	48,253,631	43,454,957	39,278,663	35,436,311	32,035,031	29,005,991	26,275,319	23,734,319	21,468,119	19,421,369	17,613,119	16,044,227	14,718,695	13,507,199	12,400,067
1993	69,800,344	66,177,708	61,077,640	54,861,982	48,591,214	43,621,198	39,436,558	35,828,494	32,518,144	29,544,094	26,866,594	24,512,644	22,375,132	20,468,188	18,744,232	17,192,344	15,751,678	14,451,466	13,263,034	12,176,986
1994	74,435,670	70,618,806	65,265,334	58,781,654	52,199,304	46,722,804	41,797,554	37,906,354	33,769,186	30,722,536	28,016,250	25,606,076	23,366,410	21,394,944	19,584,476	17,973,628	16,471,236	15,115,140	13,875,804	12,743,148
1995	74,252,881	70,419,931	65,002,081	58,348,431	51,573,691	46,181,739	41,571,751	37,616,527	34,058,197	30,969,343	28,243,369	25,817,743	23,583,007	21,579,943	19,769,071	18,138,967	16,620,842	15,250,767	13,998,642	12,854,492

Example: For RY 1995, the reserve as of 36 months = $25,817,743 = $2,234,736 + $2,003,064 + $1,810,872 + . . .

**Note: This reserve calculated in this example only covers claim expenses through the first ten years.*

Workers Compensation Lost Time Claims

Exhibit 4
Page 2

Report Year	Cost Per Quarter 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	730,368	673,536	625,408	587,520	579,215	540,778	511,651	486,647	472,512	440,772	419,658	396,336	392,544	383,472	364,176	354,672	359,250	345,750	336,300	317,400
1987	564,984	520,981	490,770	470,155	462,990	430,974	397,164	374,532	374,256	362,592	348,752	327,600	320,250	301,800	285,900	268,650	306,100	342,420	332,592	313,560
1988	787,980	735,540	682,410	634,524	616,320	556,992	512,352	466,000	462,000	425,250	403,950	375,450	377,676	374,400	355,368	341,016	364,014	375,516	364,824	344,088
1989	872,640	780,912	710,352	674,640	649,950	607,200	579,000	540,750	514,332	474,708	452,088	424,476	419,904	407,754	386,856	371,142	395,808	408,408	396,648	374,136
1990	1,120,500	1,040,100	974,250	892,350	773,916	640,068	598,416	564,720	544,968	509,976	485,676	456,030	450,576	437,472	415,128	396,326	426,475	440,125	427,525	403,200
1991	1,014,000	861,588	799,656	748,488	710,370	642,654	600,856	567,000	546,504	511,392	487,032	457,128	453,600	440,475	418,075	401,100	428,792	442,442	429,884	405,496
1992	1,040,364	944,946	877,068	821,016	778,008	703,752	658,056	620,928	601,125	562,450	535,675	502,950	498,316	483,938	459,186	440,822	470,421	485,352	471,366	444,528
1993	1,019,256	925,680	858,964	804,216	765,625	692,475	647,500	610,925	590,590	552,552	526,344	494,130	488,754	474,579	450,387	432,054	463,147	477,922	464,132	437,734
1994	1,067,675	969,675	899,850	842,450	800,618	724,178	677,222	639,002	618,707	577,017	549,612	515,970	512,397	497,425	472,012	452,903	484,620	499,995	485,645	458,175
1995	1,078,884	978,068	907,834	849,758	808,483	729,351	682,101	643,545	623,505	583,317	555,540	521,656	517,215	502,250	476,420	457,150	488,409	503,958	489,474	461,784

Report Year	Reserve as of Quarter* 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1986	8,587,597	7,914,061	7,288,653	6,701,133	6,121,918	5,581,140	5,069,489	4,582,842	4,110,330	3,669,558	3,249,900	2,853,564	2,461,020	2,077,548	1,713,372	1,358,700	999,450	653,700	317,400	0
1987	7,032,018	6,511,057	6,020,287	5,550,132	5,087,142	4,656,168	4,259,004	3,884,472	3,510,216	3,147,624	2,800,872	2,473,272	2,153,022	1,851,222	1,565,322	1,296,672	988,572	646,152	313,560	0
1988	8,787,690	8,052,150	7,369,740	6,735,216	6,118,896	5,561,904	5,049,552	4,563,552	4,101,552	3,676,302	3,272,352	2,898,902	2,519,226	2,144,826	1,789,458	1,448,442	1,084,428	708,912	344,088	0
1989	9,569,064	8,788,152	8,077,800	7,403,160	6,753,210	6,146,010	5,567,010	5,026,260	4,511,928	4,037,220	3,585,132	3,160,656	2,740,752	2,332,998	1,946,142	1,575,000	1,179,192	770,784	374,136	0
1990	10,879,299	9,839,199	8,864,949	7,972,599	7,198,683	6,558,615	5,960,199	5,395,479	4,850,511	4,340,535	3,854,859	3,398,829	2,948,253	2,510,781	2,095,653	1,697,325	1,270,850	830,725	403,200	0
1991	10,352,534	9,490,946	8,691,290	7,942,802	7,232,432	6,589,778	5,988,920	5,421,920	4,875,416	4,364,024	3,876,992	3,419,864	2,988,264	2,525,789	2,107,714	1,708,614	1,277,822	835,380	405,496	0
1992	11,359,703	10,414,757	9,537,689	8,716,673	7,938,665	7,234,913	6,578,857	5,955,929	5,354,804	4,792,354	4,256,679	3,753,729	3,255,413	2,771,475	2,312,289	1,871,667	1,401,246	915,894	444,528	0
1993	11,157,730	10,232,050	9,373,066	8,568,850	7,803,225	7,110,750	6,463,250	5,852,325	5,261,735	4,709,183	4,182,839	3,686,709	3,199,955	2,725,376	2,274,989	1,842,935	1,379,788	901,866	437,734	0
1994	11,675,473	10,705,798	9,805,948	8,963,498	8,162,880	7,438,702	6,761,480	6,122,478	5,505,771	4,926,754	4,379,142	3,863,172	3,350,775	2,853,350	2,381,338	1,926,435	1,443,815	943,820	458,175	0
1995	11,777,596	10,799,530	9,891,896	9,042,138	8,235,675	7,506,324	6,824,223	6,180,678	5,557,173	4,973,856	4,418,316	3,898,660	3,379,445	2,877,195	2,400,775	1,943,625	1,455,216	951,258	461,784	0

Note: This reserve calculated in this example only covers claim expenses through the first ten years.

Workers Compensation Lost Time Claims — Exhibit 5

Calculation of "Tail" Reserve

The tail reserve would be calculated as the number of claims open after ten years times the outstanding expense per year times the number of years the claim is expected to remain open. In this example, we assume claims open after ten years will remain open, on average, for an additional 25 years. Note that the resulting tail reserve is very sensitive to the number of years used.

For example, for report year 1986:

$$\text{"Tail" Reserve}^* = 2{,}038 \times 4 \times \$150 \times \{1.04 + 1.04^2 + \ldots + 1.04^{25}\}$$

$$= \$52{,}961{,}547.$$

As discussed in the paper, the "tail" or tabular claims incur roughly one-third the expense of a newer claim. Then the "tail" reserve for report year 1986 would be $17,653,849. Similarly, the "tail" reserve for other report years may be calculated.

**It will be helpful to recall the formula for the sum of a geometric series:*

$$1 + q + q^2 + \ldots + q^n = (1 - q^{n+1}) / (1 - q).$$

Workers Compensation Lost Time Claims

Exhibit 6

Report Year	Estimated Quarterly Expense after 10 Years	Inflationary Factor for 25 Years	Projected Number of Claims Open after 10 Years	Estimated "Tail" Reserve*
	(1)	(2)	(3)	(4)
1986	50	43.3117	2,038	$17,653,849
1987	52	43.3117	1,937	17,450,111
1988	54	43.3117	2,047	19,150,355
1989	56	43.3117	2,146	20,820,107
1990	58	43.3117	2,221	22,445,567
1991	61	43.3117	2,147	22,565,627
1992	63	43.3117	2,267	24,743,281
1993	66	43.3117	2,142	24,368,548
1994	68	43.3117	2,154	25,500,196
1995	71	43.3117	2,089	25,695,792

Notes:

(1) The estimated claim expense per quarter is one-third of the expense of handling newer claims.

(2) 43.3117 = 1.04 + (1.04 ^ 2) + . . . + (1.04 ^ 25).

(3) From Exhibit 2, Page 2.

(4) (1) x (2) x (3) x 4.

Workers Compensation Lost Time Claims

Report Year	Incremental Cost Per Quarter																			
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	942,795	2,447,970	3,444,420	4,369,945	4,741,282	3,992,125	3,333,329	2,861,250	2,559,111	2,192,426	1,899,758	1,680,649	1,567,866	1,411,516	1,268,382	1,147,432	1,086,213	981,663	866,535	771,825
1987	987,213	2,567,495	3,560,049	4,448,835	4,429,600	3,386,384	2,795,281	2,368,367	2,117,382	1,829,354	1,579,430	1,375,526	1,241,193	1,079,940	956,448	834,432	775,296	700,180	634,240	585,856
1988	1,049,205	2,746,239	3,893,528	4,837,843	4,845,670	3,827,094	3,217,270	2,759,430	2,481,230	2,094,444	1,815,480	1,591,620	1,487,360	1,353,344	1,230,080	1,117,824	1,049,370	953,344	880,194	819,014
1989	1,134,570	3,080,154	4,278,916	5,275,426	5,361,324	4,204,500	3,509,805	2,974,755	2,682,240	2,342,144	2,074,240	1,865,344	1,715,035	1,514,205	1,388,969	1,241,289	1,165,824	1,070,880	985,320	908,660
1990	1,215,732	3,447,075	4,731,072	5,645,577	5,810,048	4,669,184	3,971,328	3,461,120	3,180,961	2,774,380	2,458,510	2,219,537	2,054,820	1,888,244	1,722,240	1,570,854	1,491,552	1,371,744	1,267,776	1,173,744
1991	1,208,192	3,357,824	4,742,912	5,774,848	5,925,815	4,803,295	4,069,135	3,523,835	3,204,360	2,838,660	2,541,684	2,283,210	2,151,072	1,953,380	1,759,680	1,600,580	1,521,000	1,400,250	1,292,250	1,159,200
1992	1,343,566	3,753,526	5,261,214	6,371,498	6,685,824	5,611,080	4,798,674	4,178,294	3,842,352	3,401,280	3,029,040	2,730,872	2,541,000	2,296,200	2,046,750	1,808,250	1,568,892	1,325,532	1,211,496	1,107,132
1993	1,327,836	3,622,636	5,100,066	6,215,658	6,270,788	4,970,016	4,184,640	3,608,064	3,310,350	2,974,050	2,677,500	2,353,950	2,137,512	1,906,944	1,723,956	1,551,888	1,440,666	1,300,212	1,188,432	1,086,048
1994	1,377,072	3,816,864	5,333,472	6,493,680	6,592,350	5,478,500	4,925,250	4,291,200	3,717,168	3,068,648	2,706,288	2,408,172	2,221,668	1,991,488	1,800,468	1,620,648	1,502,592	1,358,096	1,239,336	1,132,656
1995	1,384,200	3,832,950	5,417,850	6,655,650	6,772,740	5,411,952	4,589,988	3,955,224	3,558,330	3,088,854	2,725,974	2,425,628	2,234,736	2,003,064	1,810,872	1,630,104	1,518,125	1,370,075	1,252,125	1,144,150

Example: For RY 1995, expenses in the fourth quarter = $6,655,650 = 44,371 x 150.

Report Year	Reserve as of Quarter																			
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1986	69,615,509	67,167,539	63,723,119	59,333,174	54,591,892	50,599,767	47,266,438	44,405,188	41,846,077	39,653,651	37,753,895	36,073,246	34,505,380	33,093,864	31,825,482	30,678,050	29,591,837	28,610,174	27,743,639	26,971,814
1987	62,312,391	59,744,896	56,184,847	51,736,012	47,306,412	43,920,028	41,124,747	38,756,380	36,638,988	34,809,634	33,230,204	31,854,678	30,613,485	29,533,545	28,577,097	27,742,665	26,967,389	26,267,209	25,632,989	25,047,113
1988	71,700,203	68,959,964	65,066,436	60,228,793	55,383,123	51,556,029	48,336,759	45,579,329	43,118,099	41,023,655	39,208,175	37,616,555	36,129,195	34,776,851	33,545,771	32,427,947	31,378,577	30,425,233	29,545,039	28,726,025
1989	78,878,850	75,798,696	71,519,760	66,244,354	60,883,030	56,678,521	53,168,716	50,193,961	47,511,721	45,169,577	43,095,337	41,229,993	39,514,958	38,000,753	36,631,784	35,390,495	34,224,671	33,153,791	32,168,471	31,261,811
1990	89,333,232	85,888,157	81,155,085	75,509,508	69,699,460	65,030,276	61,058,948	57,597,828	54,416,867	51,642,487	49,185,977	46,966,340	44,911,520	43,043,276	41,321,036	39,750,182	38,258,630	36,886,886	35,619,110	34,445,366
1991	89,835,111	86,477,287	81,734,375	75,959,527	70,033,712	65,230,417	61,161,282	57,637,447	54,433,087	51,594,427	49,052,743	46,769,533	44,618,461	42,665,101	40,905,421	39,304,861	37,783,861	36,383,611	35,091,361	33,932,161
1992	100,680,054	96,926,528	91,665,314	85,293,816	78,607,992	72,996,912	68,198,238	64,021,944	60,179,592	56,778,312	53,749,272	51,018,600	48,477,600	46,211,400	44,164,650	42,356,400	40,787,508	39,461,976	38,250,480	37,143,348
1993	94,168,892	90,546,254	85,446,188	79,230,530	72,959,762	67,989,746	63,805,106	60,197,042	56,886,692	53,912,642	51,235,142	48,881,192	46,743,680	44,836,736	43,112,780	41,560,892	40,120,226	38,820,014	37,631,582	36,545,534
1994	99,935,866	96,119,002	90,785,530	84,291,850	77,899,500	72,223,000	67,297,750	63,006,550	59,289,382	56,222,734	53,516,448	51,108,274	48,866,606	46,895,140	45,094,672	43,474,024	41,971,432	40,615,336	39,376,000	38,243,344
1995	99,948,673	96,115,723	90,697,873	84,042,223	77,269,483	71,857,531	67,267,543	63,312,319	59,753,989	56,665,135	53,939,161	51,513,535	49,278,799	47,275,735	45,464,863	43,834,759	42,316,634	40,946,559	39,694,434	38,550,284

Example: For RY 1995, the reserve as of 36 months = $51,513,535 = $2,234,736 + $2,003,064 + $1,810,872 + . . .

Workers Compensation Lost Time Claims

Report Year	Cost Per Quarter 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	"Tail" Reserve
1996	730,368	673,536	625,408	587,520	579,215	540,778	511,651	486,647	472,512	440,772	419,658	396,338	392,544	383,472	364,176	354,672	359,250	345,750	336,300	317,400	17,653,849
1997	564,984	520,961	490,770	470,155	462,990	430,974	397,164	374,532	374,256	362,592	348,752	327,600	320,250	301,800	285,900	268,650	308,100	342,420	332,592	313,560	17,450,111
1998	787,980	735,540	682,410	634,524	618,320	556,992	512,352	488,000	462,000	425,250	403,950	375,450	377,676	374,400	355,368	341,016	364,014	375,516	364,824	344,088	19,150,355
1999	872,640	780,912	710,352	674,640	649,950	607,200	579,000	540,750	514,332	474,708	452,088	424,476	419,904	407,754	396,956	371,142	395,808	409,406	396,648	374,136	20,820,107
1980	1,120,500	1,040,100	974,250	892,350	773,916	640,068	598,416	564,720	544,968	509,976	485,676	456,030	450,576	437,472	415,128	398,328	426,475	440,125	427,525	403,200	22,445,567
1981	1,014,000	861,588	799,656	748,488	710,370	642,654	600,858	567,000	546,504	511,392	487,032	457,128	453,600	440,475	418,075	401,100	428,792	442,442	429,884	405,496	22,565,627
1982	1,040,364	944,946	877,068	821,016	778,008	703,752	658,056	620,928	601,125	562,450	535,575	502,950	498,316	483,938	459,186	440,622	470,421	485,352	471,386	444,528	24,743,281
1983	1,019,256	925,680	858,984	804,216	765,625	692,475	647,500	610,925	590,590	552,552	526,344	494,130	488,754	474,579	450,387	432,054	463,147	477,922	464,132	437,734	24,368,548
1984	1,057,675	969,675	899,850	842,450	800,616	724,176	677,222	639,002	616,707	577,017	549,612	515,970	512,397	497,425	472,012	452,903	484,920	499,995	485,645	458,175	25,500,196
1985	1,076,894	978,068	907,634	849,758	806,463	729,351	682,101	643,545	623,505	583,317	555,540	521,656	517,215	502,250	476,420	457,150	488,409	503,958	489,474	461,784	25,695,792

Report Year	Reserve as of Quarter 63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120
1996	26,241,446	25,567,910	24,942,502	24,354,982	23,775,767	23,234,989	22,723,338	22,236,691	21,764,179	21,323,407	20,903,749	20,507,413	20,114,869	19,731,397	19,367,221	19,012,549	18,653,299	18,307,549	17,971,249	17,653,849
1997	24,482,129	23,961,168	23,470,398	23,000,243	22,537,253	22,106,279	21,709,115	21,334,583	20,960,327	20,597,735	20,250,983	19,923,383	19,603,133	19,301,333	19,015,433	18,746,783	18,438,683	18,096,263	17,763,671	17,450,111
1998	27,938,045	27,202,505	26,520,095	25,885,571	25,269,251	24,712,259	24,199,907	23,713,907	23,251,907	22,826,657	22,422,707	22,047,257	21,669,581	21,295,181	20,939,813	20,598,797	20,234,783	19,859,267	19,494,443	19,150,355
1999	30,389,171	29,608,259	28,897,907	28,223,267	27,573,317	26,966,117	26,387,117	25,846,367	25,332,035	24,857,327	24,405,239	23,980,763	23,580,859	23,153,105	22,756,249	22,395,107	21,999,299	21,590,891	21,194,243	20,820,107
1980	33,324,866	32,284,766	31,310,516	30,418,166	29,644,250	29,004,182	28,405,766	27,841,046	27,296,078	26,786,102	26,300,426	25,844,396	25,393,820	24,956,348	24,541,220	24,142,892	23,716,417	23,276,292	22,848,767	22,445,567
1981	32,918,161	32,056,573	31,256,917	30,508,429	29,798,059	29,155,405	28,554,547	27,987,547	27,441,043	26,929,651	26,442,619	25,985,491	25,531,891	25,091,416	24,673,341	24,272,241	23,843,449	23,401,007	22,971,123	22,565,627
1982	36,102,984	35,158,038	34,280,970	33,459,954	32,681,946	31,978,194	31,320,138	30,699,210	30,098,085	29,535,635	28,999,960	28,497,010	27,998,694	27,514,756	27,055,570	26,614,948	26,144,527	25,659,175	25,187,809	24,743,281
1983	35,526,278	34,600,598	33,741,614	32,937,398	32,171,773	31,479,298	30,831,798	30,220,873	29,630,283	29,077,731	28,551,387	28,057,257	27,568,503	27,093,924	26,643,537	26,211,483	25,748,336	25,270,414	24,806,282	24,368,548
1984	37,175,669	36,205,994	35,306,144	34,463,694	33,663,078	32,938,898	32,261,876	31,622,874	31,005,987	30,428,950	29,879,338	29,363,368	28,850,971	28,353,546	27,881,534	27,428,631	26,944,011	26,444,016	25,958,371	25,500,196
1985	37,473,390	36,495,322	35,587,688	34,737,930	33,931,467	33,202,116	32,520,015	31,876,470	31,252,955	30,669,648	30,114,108	29,592,452	29,075,237	28,572,987	28,096,567	27,639,417	27,151,008	26,647,050	26,157,576	25,695,792