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PLAN DESIGN UNDER ERISA

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1. Participation requirements.
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CHAIRMAN HOWARD H. HENNINGTON: As moderator of this panel on Plan Design under ERISA, I would like to make some introductory remarks on the broad impact of ERISA on plan costs. Some of these points may be discussed later by members of the panel, but it makes an impressive list to look at the cost aspects all at once. The following aspects of the law will introduce plan design requirements that will increase plan costs:

- Maximum age and service requirements for eligibility
- Requirements to include certain part-time employees
- Maximum age and service requirements for vesting
- Prohibition in most cases of the general practice of using unconditional vesting in contributory plans
- Rules to prohibit backloading of benefit accruals
- Requirements for liberal treatment of terminated employees who return to service

Minimum funding standards will in some instances increase plan costs; plan termination insurance will also be an added plan cost. The expenses of disclosure and reporting requirements, additional actuarial calculations, and the risks of fiduciary responsibility also add to plan costs. Is it worth all this to improve employee retirement income security? I believe it is. I'm a strong supporter of this legislation and its objectives. But I make a plea for liberal administration of the law. If the federal administrators are too zealous in their interpretations, the whole law could boomerang; and there could be widespread discontinuance of pension plans. On the other hand, a liberal administration of the law can, I believe, make it succeed.

One subject of particular interest to me is plan termination insurance and the employer contingent liability involved therein. In ERISA, if a plan termination occurs for which the Pension Benefit Guaranty Corporation (PBGC) steps in, the employer is obligated to reimburse the PBGC up to 30 percent of the employer's net worth. I believe firmly that an employer contingent liability is necessary in order to give the employer an incentive to avoid a claim against the PBGC. The difficulty is that the PBGC is specifically required by law to offer insurance protection for the employer contingent liability; and the PBGC, as I understand it, can either offer that insurance on a mandatory basis or on an optional basis. As an alternative, the PBGC could arrange with private carriers to offer this insurance, but I doubt that any private carriers will want to do so.

Now consider the dilemma of the PBGC:

1. A mandatory basis is probably the only sound way to offer employer contingent liability insurance because an optional basis would probably lead to anti-selection or an absurdly complex premium rate basis;
2. On a mandatory basis, it is just the same as if the original legislation had been passed with a somewhat higher plan termination insurance premium and without any employer contingent liability;
3. On a mandatory basis, this elimination of employer contingent liability can, in my opinion, only end up in abuse of the basic termination insurance program. There seems to me to be only one conclusion: Eliminate from the law the requirement for insurance of employer contingent liability. Fortunately, the law gave the PBGC three years to work out the insurance of employer contingent liability, and it would seem that there is time to change the law and eliminate this aspect before that part of the insurance program gets started.

At the risk of being critized for holding a partisan view, let me mention the impact of plan termination insurance on insurance company guarantees. I believe in insurance company pension guarantees and believe they enhance employee retirement income security. Furthermore, insurance company guarantees constitute a private approach for enhancing such security. The question is, will insurance company guarantees now have a lessened importance under the plan termination insurance provisions of ERISA as they now stand. There is, in general, no reduction in PBGC premiums for a plan with insurance company guarantees, so the guarantees seem to duplicate each other without any premium adjustment. One might justify all this and say that an employer would still want an insurance company guarantee in order to avoid the 30 percent net worth contingent liability. But if there develops under the PBGC a mandatory program for insuring the employer contingent liability, this reason for an insurance company guarantee might disappear. Again the solution seems to me to require the elimination from the law of the requirement for insurance of employer contingent liability. Otherwise, wouldn't it be ironic if ERISA operated to eliminate the attraction of a private program effective for nearly 50 years of insurance company guarantees of employee retirement income security. ERISA should enhance such private efforts rather than hamper them, and ERISA should not interfere with plan designs involving privately guaranteed benefits.

MRS. ELIZABETH C. POSTON:* One of the most difficult areas facing a consulting actuary within the next year or so is redesigning his clients' pension and profit sharing plans to conform to the new participation, vesting and benefit accrual requirements of ERISA. Concurrent with redesign problems are problems of assisting his clients in establishing accurate records of hours of service and years of service.

Before delving into the new rules, it is necessary to understand what constitutes a year of service and what constitutes an hour of service. For purposes of participation and vesting (but not benefit accruals), a year of service means a 12-month period during which the employee has 1,000 or more hours of service.[1/] (Footnotes appear at the end of Mrs. Poston's remarks.) Regulations will deal with seasonal industries,[2/] and 125 days of service will constitute a year of service in the maritime industry.[3/] Although the Secretary of Labor is to issue regulations defining an hour of service, IRS issued TIR-1334 which provides that, until regulations are issued, a favorable determi-

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nation letter will not be issued unless the plan provides that an employee will be credited with one hour of service for each hour that the employee is:

(i) directly or indirectly compensated, or
(ii) performing duties, or
(iii) laid off for a temporary period (even if indefinite) based on a 40-hour week or pro rata portion, or
(iv) on sick or disability leave, or
(v) on jury or military duty, or
(vi) not working due to a labor-management dispute.

Rumor has it that Labor will follow the above definition in regulations.

For purposes of the foregoing, service with all employers who maintain the plan must be taken into account.[4/] In addition, service with all employers who are members of a controlled group,[5/] and all employees of trades or business under common control must be taken into account.[6/]

The Act provides three alternative participation options with respect to age and service:

(i) the later of age 25 and one year of service,[7/] or
(ii) three years of service if the plan provides immediate vesting,[8/] or
(iii) the later of age 30 and one year of service if the employer is an educational institution exempt from tax under section 501(a) of the Code, the plan covers only employees of such institution, and provides immediate vesting.[9/]

The sole exception to the preceding is the permissible exclusion of employees hired within five years of plan normal retirement age under a defined benefit pension plan or target benefit pension plan.[10/]

Once an employee has met the preceding participation requirements, he must become a participant at the <u>earlier</u> of

(i) the beginning of the next plan year, or
(ii) six months after he met such requirements.[11/]

Thus, a plan will no longer be able to defer participation until the beginning of the plan year following satisfaction of eligibility requirements. If an employee fails to complete 1,000 hours of service during his first year of employment, thereafter completion of 1,000 hours of service may be based on plan years, commencing with the first plan year beginning after the employee's date of employment.[12/] (Certain rules regarding not taking into account service before a break in service are generally applicable only to plans with three-year participation requirements and have not been included.[13/])

Once an employee becomes a participant in a plan he must commence to accrue benefits. Note that he already has service credit toward vesting since, in general, service for participation and vesting are the same. The exception is that vesting service can be based on plan years even in plans basing participation on employment years.[14/]

Certain service included for purposes of participation need not be taken into account for vesting, as follows:

(i) service before age 22 unless the plan adopts "rule of 45" vesting, in which event years of <u>participation</u> before age 22 must be taken into account;[15/]
(ii) service while the employee refused to contribute to a contributory plan;[16/]
(iii) service prior to plan inception[17/] unless credit is granted for benefit accruals;[18/]
(iv) certain service pursuant to break in service rules;[19/]
(v) service before January 1, 1971, unless the employee has three years of service after December 31, 1970;[20/]
(vi) years of service prior to compliance with ERISA pursuant to plan break in service rules.[21/]

Turning now to the three alternative vesting schedules, the first, and easiest to communicate is 100% vesting after ten years of service.[22] The initial reaction might be to design the plan to provide 100% vesting at the later of ten years of service and attainment of age 32. Although this would meet ERISA minimums, it could be more generous than required. Consider an individual who works four years between ages 18 and 22, left employment and returned at age 25. He would be 100% vested at age 32 (four years between ages 18 and 22 plus seven years between ages 25 and 32), whereas ERISA would not require that he be 100% vested until age 35.

The preceding vesting provision is, from an administrative point of view, probably the easiest. For example, consider an existing plan that covers white collar workers who seldom terminate employment and return to work, and that currently provides vesting based on complete years and months of employment. If ten-year vesting is adopted, then a participant who terminates employment after nine or less years of employment obviously has less than ten years of vesting credit and a participant who terminates employment after ten or more years of employment obviously has ten or more years of vesting credit. In the preceding situations, hours need not be counted. However, a participant who terminates employment with more than nine years of employment but less than ten years of employment may or may not have ten years of vesting credit. Therefore, it will be necessary to determine the number of hours of service between anniversary date of employment and date of termination to ascertain whether he completed 1,000 hours of service during such period.

The second vesting schedule provides 25% vesting after five years of service, increasing 5% per year to 50% vesting after ten years of service, and increasing 10% per year to 100% vesting after 15 years of service.[23] Again, service before age 22 may be excluded.

The third and most complicated vesting provision provides for vesting pursuant to the following:[24]

Years of Service	Sum of Age Plus Years of Service	Percentage
5	45	50%
6	47	60
7	49	70
8	51	80
9	53	90
10	55	100

However, a participant with ten years of service must be 50% vested plus an additional 10% for each year of service in excess of ten years.[25] Rule of 45 vesting assumes the employee participated in the plan prior to age 22 and, hence, all service is counted.

Note that it is possible for an employee to acquire additional vesting credit while working less than 1,000 hours per year. For example, consider an employee who changes from full-time to part-time and, hence, works less than 1,000 hours per year when he is age 40 with nine years of service. At that point in time he is 70% vested under rule of 45. Two years later, when he is age 42, he will be 80% vested and two years after that, when he is age 44, he will be 90% vested. Of course, once he separates from service he cannot acquire additional vesting credit.

ERISA introduces complicated break in service rules whereby prior service may be cancelled under certain conditions. A break in service occurs during each year that an employee fails to earn more than 500 hours.[26] If a break in service occurs, then,

(i) for administrative convenience, service before the break need not be counted until the employee returns and completes one year of service, at which time it must be counted both for vesting and benefit accruals[27]

(ii) if the participant is not even partially vested, service before the break in service may be cancelled once the number of consecutive one-year breaks in service equals the number of years of service before the break.[28]

Turning now to benefit accrual requirements, Congress felt that vesting could be circumvented by "back-loading," i.e., providing little, if any, accrual of benefits during early years of participation and extremely high benefits after certain age or service conditions were met. Accordingly, ERISA provides three alternative means of testing whether a particular benefit formula is acceptable. Note that for benefit accrual purposes:

(i) service may be based on participation rather than employment;

(ii) normal retirement age cannot be later than the later of age 65 and the tenth anniversary of the participant's date of participation;[29]

(iii) ancillary benefits, such as Social Security supplements, payment of medical expenses, certain disability benefits, and life insurance benefits need not accrue;[30]

(iv) to prevent circumvention of benefit accrual requirements by providing large early retirement benefits and small normal retirement benefits, ERISA provides that the "normal retirement benefit" is equal to the greater of the plan early retirement benefit and the plan normal retirement benefit.[31]

With respect to defined benefit plans, the first rule, the 3% rule, provides that the participant's accrued benefit cannot be less than 3% of the maximum possible normal retirement benefit at the earlier of plan normal retirement age and age 65 multiplied by the number of years of participation not in excess of 33 1/3 years.[32] If benefits are based on compensation, such computation must be based on the assumption that the participant continues to earn compensation at the average rate he earned in prior years (not in excess of ten years).

The Conference Committee Joint Explanation provides that, if the plan provides a given level of benefit to participants with a given level of service at normal retirement age, the same level of benefits must be provided for participants with the same level of service who terminate before normal retirement age.[33] This was based on a sentence in the law that was deleted under Concurrent Resolution 609, so the Joint Explanation will be ignored in drafting regulations.

The second rule, the 133 1/3% rule, provides that the annual rate at which benefits may be accrued during any later year may not be more than 133 1/3% of the annual rate at which benefits could be accrued for years before such plan year.[34] There is no reference to compensation, so this rule will invariably be used for career-average plans. Futhermore, the following governs for purposes of comparing benefit accruals.

(i) Any amendment in effect for the current year shall be treated as in effect for all years (i.e., an amendment may increase benefits for future years only without regard to the 133 1/3% limitation).

(ii) Any change in the accrual rate which does not apply to any participant in the current year shall be disregarded (i.e., a gradual increase in accrual rates may be effective in the future).

The third rule, the pro rata rule, provides that the participant's accrued benefit cannot be less than the normal retirement benefit he would have received if he had continued to earn the same compensation rate that he had earned during the number of years that would be taken into account under the plan (not in excess of ten years) multiplied by the ratio of actual years of participation to years of participation he would have had at normal retirement date.[35/] This is similar to integration rules except that integration rules are based on years of service rather than years of participation, which may produce a higher accrued benefit.

Participants must always be 100% vested in the benefit attributable to their own contributions, with a maximum equal to the total accrued benefit and a minimum equal to 10% of their contributions without interest.[36/] It should be noted that a benefit payable for life only commencing at age 65, pursuant to plan provisions, may be less than 10% of accumulated (without interest) participant contributions, and, hence, would not meet ERISA requirements. Except for the foregoing minimums and maximums, the benefit attributable to participant contributions is defined as 10% of participant contributions with interest pursuant to plan provisions until compliance with ERISA, and with interest thereafter at 5% compounded annually to age 65.[37/] Factors comparable to the 10% will be prescribed in regulations for other retirement ages and benefit forms.[38/] ERISA vesting schedules are, thus, applied to any excess of the participant's accrued benefit over the benefit attributable to the participant's own contributions. This complexity makes graduated vesting unattractive in contributory plans.

Although 5% interest is mandated in determining the benefit attributable to employee contributions, there does not appear to be any minimum interest rate that must be credited on employee contributions for purposes of refunds to terminating employees who are not vested. However, if the plan has graduated vesting, the use of any other interest rate will require two sets of records.

Under certain limited circumstances, prior benefit accruals may be cancelled even for a vested employee. These circumstances are:

(i) if an employee is less than 50% vested, benefit accruals may be cancelled if the employee withdraws any part of his own contributions, but the amount must be restored if the employee subsequently repays the contributions with 5% interest [39/] (The Act is silent on repayment restrictions, such as repayment must be before benefits would normally have commenced); or

(ii) if an employee receives a lump sum distribution equal to the entire value of his accrued benefit;[40/]

(iii) if an employee receives a lump sum distribution equal to the entire value of his vested benefit (not more than $1,750) without his consent, such amount is less than the value of his accrued benefit, the employee is subsequently reemployed and does not repay the amount of the distribution with interest;[40/]

(iv) if an employee receives a lump sum distribution at his own election of less than the value of his accrued benefit and does not repay the amount of the distribution with interest.[40/]

Certain exceptions to the foregoing apply to defined benefit plans funded exclusively by individual level premium insurance contracts and then only if the premium payment period ends at normal retirement age.[41/] For example, benefit accrual requirements are met if the participant's accrued benefit is not less than the cash surrender value of the contracts.[42/] In addition, if an employee has a one-year break in service, years of service after the break in service need not be taken into account in determining his vested interest in the benefit accrued before the break in service.[43/] This probably was put into the law to meet the requirements of section 404 (a)(2) of the Internal Revenue Code that premium refunds are applied against the next year's premium.

Because of time limitations, plus the fact that actuaries usually are not deeply involved in defined contribution plans, the minor exceptions to the foregoing discussion of the defined benefit plan area have not been addressed.

FOOTNOTES

1/ Act section 202(a) (3) (A)
2/ Act section 202(a) (3) (B)
3/ Act section 202(a) (3) (D)
4/ Act section 210(a)
5/ Act section 210(c)
6/ Act section 210(d)
7/ Act section 202(a) (1) (A)
8/ Act section 202(a) (1) (B) (i)
9/ Act section 202(a) (1) (B) (ii)
10/ Act section 202(a) (2)
11/ Act section 202(a) (4)
12/ Act section 202(a) (3) (A), explained in further detail in Conference Committee Joint Explanation
13/ Act section 202(b)
14/ Act section 203(b) (2) (A)
15/ Act section 203(b) (1) (A)
16/ Act section 203(b) (1) (B)
17/ Act section 203(b) (1) (C)
18/ Act section 204(f)
19/ Act section 203(b) (1) (D)
20/ Act section 203(b) (1) (E)
21/ Act section 203(b) (1) (F)
22/ Act section 203(a) (2) (A)
23/ Act section 203(a) (2) (B)
24/ Act section 203(a) (2) (C) (i)
25/ Act section 203(a) (2) (C) (ii)
26/ Act section 203(b) (3) (A)
27/ Act section 203(b) (3) (B), explained in further detail in Conference Committee Joint Explanation
28/ Act section 203(b) (3) (D)
29/ Act section 3(24)
30/ Act section 3(22)
31/ Act section 3(22)
32/ Act section 204(b) (1) (A)
33/ Conference Committee Joint Explanation
34/ Act section 204(b) (1) (B)
35/ Act section 204(b) (1) (C)
36/ Act section 204(c) (1) (E)
37/ Act section 204(c) (2) (B) and (C)
38/ Act section 204(c) (2) (B) (ii)
39/ Act section 203(a) (3) (D)
40/ Act section 204(d) and (e) and Conference Committee Joint Explanation. Law provides repayment only on reemployment, but Conference Committee Joint Explanation provides repayment circumstances of voluntary cash-outs will be prescribed in regulations.
41/ Act section 301(b)
42/ Act section 204(b) (1) (f)
43/ Act section 203(b) (3))C)

MR. A. NORMAN CROWDER, III: One of the more complex provisions of ERISA is the requirement under Section 205 that every pension plan which provides annuity payments must include two types of benefits for surviving spouses. Briefly stated, these benefits are:

After Retirement - If a participant has been married for at least one year before his retirement date, his benefit must be paid in the form of a 50% "Joint & Survivor Annuity" with his or her spouse as beneficiary. This option is automatic unless he elects otherwise. The cost of this benefit may be charged to the participant by an actuarial equivalent reduction and an opportunity to elect other than a 50% Joint & Survivor annuity must be given to the participant.

Before Retirement - A pension plan must also offer an opportunity for a participant to elect an option that provides payment of not less than 50% of a participant's actuarially reduced pension to a surviving spouse if the participant dies after becoming eligible for early retirement (but not more than 10 years before NRD). The cost of this option may be charged to the employee by reducing his normal pension or in some other equivalent manner.

As we read the law at this stage, there are certain other conditions involved with the 50% Joint & Survivor benefits:

(1) Explanation: A participant must be given a written explanation of the terms and conditions of the Joint & Survivor annuity. This probably means specific illustrations of the impact of these elections on his formula plan benefit.

(2) Elections: The post-retirement benefit is automatic unless another form is elected, while the pre-retirement coverage must be affirmatively elected. A participant must be given a "reasonable time" (to be specified by regulations) to change or elect these benefits.

(3) Accidental Death: If the participant dies as a result of an accident, within a period not greater than two years following his election of this benefit, the election will be rescinded. The exact operation of this antiselection device as it should be applied before and after retirement is not clear to me since triple negatives are used in the regulation.

(4) Present Participants: Apparently, the post-retirement option is not applicable to those already retired. However, active participants within the eligible early retirement zone will need to be enrolled for the pre-retirement coverage.

(5) Vested Participants: Participants, who terminate prior to early retirement eligibility or to the effective date of this requirement, apparently do not have to be given the right to elect the pre-retirement benefit. However, they will receive a Joint & Survivor benefit after retirement unless they elect otherwise.

The extra cost of these benefits may be charged to the participant. Many employers are thinking in terms of an actuarial equivalent reduction in the benefit payable, but Section 205(h) says that regulations may allow reasonable approximations. Here are some of the alternatives available:

(1) Actuarial Equivalents - The full cost of both coverages may be charged to the participant by computing the exact equivalent Joint & Survivor option income. Use of the normal double-entry tables will complicate both administration and employee understanding. One approach would be to develop a special reduction table for the pre-retirement benefit which is a function of plan benefits, early retirement factors, age of the participant and spouse, etc. This can be simplified into a table which is a function of "n" = number of years retired early and "m" = the number of years of pre-retirement coverage. David Lively of Aetna has developed an actuarial note detailing this proce-

dure.

(2) Simplified Tables - Although it is possible to develop exact factors, many feel that a simplified set of reduction factors is preferable, especially for the pre-retirement coverage. Our firm has done some testing that indicates that 1/2% reduction for each year of pre-retirement coverage is a good approximation for the 50% Joint & Survivor option. This would mean a 5% reduction at age 65 for a full ten years of pre-retirement coverage. To adjust for major differences in the spouse's age, the 1/2% factor can be increased by 10% (of itself) for each year the spouse is more than 5 years younger. Variations in the spouse's age, credited service, salary scale, early retirement factors, etc. do not seem to cause any major changes in the range of factors under most reasonable conditions. Our tests indicate that this 1/2% basis will result in a modest undercharge or subsidy to the participant.
A simplified factor for pre-retirement coverage has appeal in that the cost aspects won't tend to further complicate a participant's understanding of this new benefit. And it will reduce the calculation requirements in plan administration. This is important since this coverage may not be continuous for the whole 10-year period. So far, most of our clients have readily accepted this simplified basis.
On the post-retirement side, most people are still thinking of exact Joint & Survivor tables, but an approximation might also be considered, e.g., 85% of benefit at retirement unless the spouse is more than 5 years younger.

(3) Subsidies: Since the cost of the pre-retirement benefit is modest in most instances, some plans are seriously considering no reduction, i.e., a full subsidy for pre-retirement elections. In fact, a significant number of large companies already have automatic coverage that equals or exceeds the required benefits. A full subsidy simplifies plan administration, avoids the negative implications of permanent reductions for prior coverage, eliminates enrollment procedures and will simplify the communications problems.
Partial or full subsidies for the post-retirement benefits are more costly. However, automatic continuation of income to a spouse has become more common in recent years. We would expect that these ERISA requirements and reactions to the reduction approach as well as union bargaining will lead to a progressive elimination of employee "contribution" to the cost of both pre-retirement and post-retirement Joint & Survivor benefits.

(4) Employee Contributions: Some have wondered if direct employee contributions to pay for either of these benefits is feasible. This would eliminate the benefit reductions, which may cause employee relations problems. While it is theoretically possible, the administration of otherwise noncontributory plans may become more complicated than the extra contributions warrant.

Some Problems & Open Questions

(1) Communications: A clear explanation of his rights both to the pre-retirement benefit and the choices available at retirement will be difficult and costly. Each participant must receive a written explanation and probably some personal counseling both prior to age 55 and again at normal retirement. The most important aspect that must be understood is that the basic pension formula income will be reduced by the election of either the pre-retirement or failure to waive the post-retirement benefit. A specific illustration is probably the best approach. Unless the cost of these benefits is fully subsidized by the employer, there is apt to be the implication that something is being taken away, rather than a new benefit given. A permanent lifetime reduction at age

65 for an event which did not happen (death between ages 55 to 65) may not be popular.

(2) Elections: Plan administration will be increased because each eligible participant must be informed of the option and its financial effect prior to age 55 and then again prior to retirement. Some question how often an active participant must be given the right to elect the pre-retirement coverage, just once prior to age 55, once each year, or what? This is not clear in the law, but most of us have presumed that there will be a single, irrevocable election prior to age 55. This is not necessarily the case and should be clarified in regulations.

(3) Remarriage: Confusion exists about whether a new spouse can be introduced after retirement. Section 205(d) defines an eligible spouse as a person who has been married for one year prior to the participant's death. But the Committee Reports indicate one year prior to the annuity starting date. The latter seems to make sense, otherwise the actuarial equivalent reduction calculation is disturbed. Corrective legislation or regulations will be needed to clarify this confusion.

(4) Accidental Death: The requirements of Section 205(f) relating to accidental death are not at all clear. Apparently this provision for up to a two-year waiting period was added to prevent antiselection in this election. But accidental death is specifically excluded so that the Joint & Survivor is immediately effective. But the logical place for antiselection to operate is before retirement. And yet, Section 205(f)(2) specifies that failure to effect the election can't deprive a survivor of the J & S benefit. Where does this leave us?

(5) Disability Benefits: If a pension plan pays pension benefits upon disability, must these disability features also provide Joint & Survivor provisions? The law doesn't specify, but it would seem logical that such spouses should have comparable coverage.

(6) Profit-Sharing and Thrift Plans: Some attorneys maintain that any defined contribution plan which offers alternative payment in annuity benefits must now provide Joint & Survivor benefits in some manner. But just how these requirements would apply before retirement and thereafter is not clear. We believe this provision was intended only for defined benefit pension plans and that later regulations will clarify this position.

(7) Survivor Benefits in Other Plans: In order to maximize their integration "spread," a number of companies have moved their pre- and post-retirement survivor benefits out of their qualified pension plans. These benefits are usually provided by group insurance contracts, 501(c)(9) trusts or self-insurance. How do these plans meet the new requirements? If these separate programs meet the design requirements, a good case can be made for saying that the combined program satisfies the law. Or, actuarial equivalent reductions can be made in the pension plan benefits and the survivor programs can be restructured to fill back in the benefit reductions. But this dual benefit procedure would be unnecessary if the alternative survivor programs would be accepted or the integration limits in Revenue Ruling 71-446 liberalized.

If Joint & Survivor benefits seemed complex, let's now turn to the maximum limits imposed on benefits and contributions under qualified plans. In the interest of time, we will attempt to cover these requirements only as they relate to corporate plans. This leaves out HR-10 groups, Subchapter S corporations, and 403(b) annuities; but this is a necessity because of our time limitations. Moreover, I will only summarize the key aspects of these limits in order to save more time to look at the implications of these maximum limitations and some alternatives available.

For most companies, these provisions only apply to the top 2 or 3 executives. And in fact, unless they are highly paid and long-service, the maximum limits are academic. But the concept is new and some executives may hit these limits in later years.

Basic Requirements

Simply stated, the new rules can be summarized as follows:

(1) Defined Benefit Pension Plans: The maximum annual pension is limited to the lesser of $75,000 (adjusted for future CPI changes) or 100% of the participant's highest consecutive three years' average compensation. There are adjustments for certain ancillary benefits, short service, and employee contributions, and grandfathering for plans that already exceed the new limits.

(2) Defined Contribution Plans: This means profit-sharing, thrift, and savings plans as well as money-purchase pension plans. The maximum annual addition, which is the employer contribution plus forfeitures plus a portion of an employee's contributions, is the lesser of $25,000 (adjusted for future CPI changes) or 25% of the participant's total current compensation.

(3) Combination Plans: If an employer maintains both a defined benefit plan and a defined contribution plan, the combination of employer benefits and contributions may not exceed 140% of the single plan limits. This overall limit is tested separately, using calculated fractions which must not total more than 1.4.

Implications

(1) Looking at the details of the Defined Benefit limit, we see that there are actually several aspects which give real, extra benefits beyond the basic $75,000:
   (a) Use of the highest consecutive three years, as opposed to the five-year average normally used in pension plans, gives extra benefit dollars.
   (b) The definition of "compensation" in the limit involves all compensation (base salary, overtime, bonuses, etc.) regardless of the plan definition. Since most top executives receive some form of cash incentive compensation, this extra pay could be important in certain situations.
   (c) The full use of ancillary benefits in pension plans seems to be encouraged. That is, there will be no reduction in the limit for:
   - early retirement on or after age 55, regardless of the degree of subsidy
   - fully subsidized joint and survivor options after retirement which don't continue more than 100%
   - any other benefits which are not directly related to pension benefits, e.g., a pre-retirement survivor's benefit equal to 30% of pay at death.

   By making maximum use of these ancillary benefits, an executive's maximum pension can effectively be increased by as much as 25-30%.

(2) If the defined benefit limit is still exceeded, it will be logical to consider an "excess benefit plan." This is a newly-defined term under ERISA which specifically allows benefits for higher-paid executives in excess of the Section 415 limits. Essentially, it is a nonqualified, unfunded program which remains exempt from most ERISA requirements. It provides the means to give the executive any additional pension benefits up to the original amount (or higher). For example, if the plan formula currently gives a $100,000 pension, the qualified plan could provide $75,000 and the excess plan would pay the balance. All other related benefit provisions can be duplicated also. Although the excess benefits will be deductible only when paid by the Company, this excess plan creates no added cost beyond what the Company had been contributing prior to ERISA.

If the excess benefits involve only one or two executives, it may be more appropriate to write a deferred compensation contract which effectively sets up the extra benefits without defining a new "plan." However, since most senior executives will probably get salary increases at a higher rate than inflation, it is likely that other executives will be hitting the limit as time progresses. Therefore, the excess benefit plan approach may be worthwhile.

(3) If the employee has only a defined contribution plan, there are no real adjustments which can effectively increase the $25,000 limit. Forfeitures can be eliminated but this change may have adverse employee relations impact in order to benefit only a few people. In computing this limit, also don't forget to add in any thrift or savings plan additions with the profit-sharing contributions.

(4) An excess profit-sharing plan can be defined here also to replace extra benefits limited by the qualified plan. A special account can be maintained. In addition to the excess contribution which is added each year, the investment earnings comparable to the basic plan experience may be credited. This duplicates the pre-ERISA plan. These excess amounts may be paid yearly in cash as a bonus or accumulated in the special account. If accumulated, special vesting requirements can be set which need not conform to ERISA, e.g., at retirement, death, or disability only. This vesting change would give this "phantom" profit-sharing account some executive retention characteristics.

However, there are two disadvantages to an excess profit-sharing plan over its pension counterpart. First, it represents added cost to the employer in that the executive's excess share of contributions and forfeitures will be allocated to other participants. If it is replaced in the excess plan, extra total cost results. Second, unlike the excess pension plan, the long-range value of this phantom profit-sharing account cannot be so readily projected. The Board of Directors may be more reluctant to obligate itself for an excess profit-sharing plan, even for its top executives.

(5) Among companies with executives who are apt to hit these maximum limits, many have both a pension plan and a profit-sharing or thrift plan. This means that the 1.4 limit operates. In computing the defined contribution plan fraction, you should note that <u>all</u> years of service can be counted in the denominator regardless of plan eligibility. Moreover, any employee contributions not in excess of 10% per year which are made before 1976 may be excluded. These two aspects can give some leeway. If the total of both fractions exceeds 1.4, the employer must decide how to proceed. Three broad alternatives can be explored:

- create both an excess pension plan and an excess profit-sharing plan to duplicate each benefit separately. This was discussed earlier.
- limit either the qualified pension plan or the profit-sharing plan to the full 1.0 and use the remaining .4 in the other qualified plan. Add a single excess benefit plan to accommodate extra benefits or contributions.
- conform to the qualified plan limits and use some other type of executive compensation plan (e.g., a performance share plan, stock option program, or share unit plan) which will approximately duplicate the excess compensation.

On the second alternative, preliminary study indicates that full use of the qualified profit-sharing plan, with the .4 limit on the qualified pension plan, is probably the best approach in most situations. If the profit-sharing plan is cut back, these deferred compensation dollars cannot be recovered by the executive (in that form). But the excess pension plan <u>does</u> give retroactive credit for the full extra benefit.

We think that, for many companies, other types of current or deferred compensation programs may be a better answer than exact duplication of pre-ERISA pension and profit-sharing benefits. This means further revision to executive compensation devices, at least as it affects top management who are limited by ERISA. But, these improvements will probably be coordinated with overall revisions caused by a tax reform bill in 1975 or 1976.

MR. FRANK H. DAVID: In view of the rapid rate of increase in Social Security benefits, an offset integration formula seems to offer a better chance than an excess formula of producing an after-tax retirement income that is reasonably related to preretirement income. The reason is that the offset is more responsive to future changes in Social Security up to the point of retirement; after retirement, of course, further adjustments are not permitted.

I am sure all of you remember the infamous Section 1021(g), which emerged from the ERISA Conference Committee. It would have frozen Social Security benefits and the wage base for integration purposes until July 1, 1976 at the level prevailing in June, 1974. This provision, which was in neither the House nor the Senate version, created such a storm of protest that it was deleted from the bill.

However, it is still not clear whether an active participant's accrued benefit can be reduced as a result of an increase in Social Security benefits. Consider a plan which provides 2% of final five-year average earnings for each year of service, less, at age 65, 75% of the Social Security Primary Insurance Amount. For this plan, the accrued benefit at any time is 2% of average earnings in the most recent five years times years of service, less a deduction for Social Security. This deduction is equal to the Social Security benefit based on the then existing law and earnings continuing to age 65 at the then existing rate, multiplied by the ratio of actual years of service to years of service at age 65. This is an acceptable formula under ERISA. If a large increase in Social Security benefit occurs, because of a change in the law or simply by the operation of the benefit formula, it is possible for an active participant's accrued plan benefit to be less at the end of the year than at the beginning, even though he has one more year of service and probably higher earnings. Is this permitted?

One might say no, because it would not be consistent with the nonforfeitability rules of Section 411(a) of the Internal Revenue Code. Certain permitted forfeitures are listed there, and this is not one of them. This would mean that the increased Social Security benefit would have to be ignored until additional service or earnings allow it to be reflected in the accrued plan benefit.

However, I believe that this argument can be rebutted and that there is a stronger one on the other side. Section 401(a)(15) states that benefits shall not be decreased for participants receiving benefits or deferred vested participants. By implication, it permits reduction of the accrued benefit for <u>active</u> participants on account of increases in Social Security benefits if the plan is properly integrated under a formula which takes such increases into account. This interpretation is reinforced by the deletion of Section 1021(g), which indicated Congress's intent to remove the limitations that section would have imposed on integration with respect to active employees.

Like many other questions under ERISA, this one awaits a definitive answer. Of course, a decrease in the accrued benefit may be undesirable from the point of view of employee relations, even if the law permits it. Another disadvantage is that such decreases create discontinuities. If Social Security benefits go up, employee B, who has the same service and earnings record as employee A but retires one month later, gets a smaller plan benefit.

Another problem with offset plans occurs in connection with early retirement or other termination of employment before age 65. Section 11 of Revenue Ruling 71-446 provides two methods of determining the offset; whichever method is chosen must be applied uniformly. Under one method, it is assumed that the employee will have no further earnings; I believe it qualifies under the 133 1/3 percent rule of Section 411(b)(1)(B) of the IRC. Under the other method, it is assumed that he will continue to earn at the rate in effect at the time of termination; the resulting Social Security benefit is then multiplied by the ratio of years of service at termination to years of service at 65. This is the formula in the example I discussed earlier; it complies with Section 411(b)(1)(C). For ages at termination over 55, this formula tends to produce higher offsets than the other one. The problem is what to use in the earnings projection for employees with widely fluctuating earnings; for example, those compensated primarily by commissions, or part-time employees who meet the minimum service requirements for coverage but have had an irregular compensation pattern. The only practical solution seems to be use of average earnings for, say, the last year of participation. The first method (assuming no future earnings) avoids this problem.

The problems I have discussed so far are technical in nature and relatively minor. A more important one is potential employee resentment of the offset as taking away something to which he feels entitled, particularly if it exceeds 50%. The record shows many plans under which the offset was gradually reduced, and sometimes eliminated. A careful communications program is necessary to educate employees to look at their <u>total</u> benefit, plan plus Social Security.

I believe that most plans using the offset approach have been final salary plans, but they don't have to be. Under today's conditions, with rampant inflation and the threat of another Section 1021(g) still looming in the background, I think final salary plans are very risky. On the other hand, a benefit based on career average is likely to be inadequate. A possible compromise, which gives the employer some control, is to relate benefits to earnings over a period beginning on a specified date 5-10 years ago. This starting date can then be moved up from time to time, if conditions warrant and the employer can afford it.

It has always been true that an employer who wants to establish a retirement plan but insists on limiting his financial commitment chooses a defined contribution plan. If he wants to contribute only when there are profits, he can establish a profit-sharing plan. If he is willing to contribute a stated amount or percentage of earnings in any event, a money-purchase pension plan is the answer.

A major problem of these plans is that they generally do not provide adequate benefits for employees who are middle-aged or older when the plan is established. Where adequacy of benefits is the major consideration, a defined benefit pension plan is the solution. Such a plan involves considerable uncertainty as to its cost, particularly if benefits are based on final salary.

These considerations haven't changed under ERISA. However, ERISA has added others which make a defined benefit plan less desirable. I think the most important one is the employer's contingent liability in the event of plan termination. Since defined contribution plans are not covered by plan termination insurance, such liability does not apply to them. Before ERISA, an employer could not be forced to make additional contributions once his plan had terminated, but this is no longer true; if plan assets are not sufficient to cover the benefits insured by the PBGC, he is liable to the extent of 30% of net worth. The balance sheet implications of this contingent liability are not yet clear. ERISA requires the PBGC to offer contingent liability coverage or to arrange with private insurers to do so by September 2, 1977. When that is done, this problem will be alleviated, but the difficulties in providing this coverage seem very great.

The existence of an unfunded liability creates uncertainty and adds to the complexity of defined benefit plans. The need for actuarial valuation and certification causes additional expense. These problems can be avoided if the plan is funded entirely through level premium insurance contracts, but then there is no funding flexibility.

The complicated benefit accrual rules apply only to defined benefit plans. For contributory plans, the allocation of accrued benefits between employer and employee contributions is simple for defined contribution plans, but quite involved for defined benefit plans.

The requirement of a preretirement joint and survivor annuity option is a source of several puzzling questions, but it seems logical to expect that it will be considered automatically met by a defined contribution plan which provides the full value of accumulated contributions as a death benefit.

Another point is that the 10% limitation on investment in qualifying employer securities does not apply to profit-sharing or thrift plans. However, this may be a spurious advantage. Such investments must still meet the test of prudence, and the trustees may have the unenviable job of telling the employer that, though there is no specific prohibition of his securities, they would not be a prudent investment.

The preceding points suggest that ERISA has made defined contribution plans more attractive. However, there are offsetting considerations. One of these is that a defined benefit plan still makes it possible to provide larger pensions for key employees (who are generally no longer young) within the framework of a qualified plan. This may well be a major factor, particularly for small companies.

Second, I believe the presence of plan termination insurance, apart from the employer contingent liability which it involves, is a plus for defined benefit plans. It will give the plan participants an additional source of security. They have the promise of a benefit, and insurance to back it up.

Under defined contribution plans, the participants, rather than the employer, bear the investment risk. Poor investment results directly affect their accounts and can cause pressure on the employer to make up losses. Under defined benefit plans, the effect of gains and losses is smoothed by a spreading technique.

No one can predict the net effect of these factors on the popularity of different types of plans. As for the past, Treasury statistics, quoted in a recent article in Trusts and Estates, show that roughly half of all new plans have been pension and half profit-sharing. The former group includes money-purchase plans, so more than half of the total are defined contribution plans. The same article quotes an early estimate by the PBGC based on Labor and Treasury Department files that there are about 250,000 defined contribution and 100,000 defined benefit plans.

I mentioned earlier that one of the drawbacks of defined contribution plans is the inadequacy of benefits for older employees. For money-purchase pension plans, this deficiency can be improved by adopting a contribution formula that takes past service into account. For example, the contribution rate might be 10% plus 1/2% for each year of past service. More complicated formulas can be devised so that the smaller the number of years to retirement, the higher the contribution rate. The maximum, of course, is 25%.

MR. DAVID L. LIVELY: Subsection 205(c) of the Employee Retirement Income Security Act of 1974 requires most pension plans to provide participants who are both eligible for early retirement and within ten years of their normal retirement date an opportunity to elect a preretirement spouse's annuity. However, according to Act Subsection 205(h) "...a plan may take into account in any equitable fashion (as determined by the Secretary of the Treasury) any increased costs resulting from providing joint and survivor annuity benefits under an election made under Subsection (c)."

The Secretary of the Treasury has not yet issued any such regulations. However, one might reasonably make such an equitable adjustment by reducing the early retirement factors (notionally 100% at normal retirement age) to reflect the accumulated value at retirement of the preretirement insurance, if any, which has been enjoyed by a retiring participant as the result of his or her previous election under Subsection 205(c).

Let x denote the attained age at retirement of a participant of sex p who at age x–m elected a preretirement option which provided to a spouse of opposite sex s a 100k% continuation $[.50 \le k \le 1.00]$ of the joint and survivor annuity (with 100k% continuation) to which the participant would have been entitled if he had elected that form of annuity and had retired immediately preceding his or her death.

Let $l_{[x-m]+t}$ denote the number of participants at age x–m+t surviving from $l_{[x-m]}$ participants who made a 205(c) election at age x–m. The use of select functions enables one to provide for the (probably temporary) excess mortality to be expected among participants who make a 205(c) election.

Let H(p,[x–m]+m) denote the single premium for a normal-form due annuity of $1.00 per year payable to the retiring participant described above.

Let d denote the difference between the participant's age and the spouse's age. From Table No. 93 at page 66 of the Statistical Abstract of the United States, 1974, it appears that one could take d = +2.5 years if the participant is male and d = –2.5 years if the participant is female.

Let G(s,u–d) denote the single premium for a due annuity of $1.00 per year payable to a surviving spouse of sex s commencing at age u–d. If the annuity payable to the spouse incorporates a death benefit or a cost-of-living benefit, the cost of that benefit will be reflected in G(s,u–d).

Let E(p,x,m) denote the early retirement factor applied under the plan to the accrued annuity of a member of sex p retiring at age x, a 205(c) election having been in force for m years, in order to compute the amount of that participant's normal-form annuity at his or her early retirement date. Thus, the pre-ERISA early retirement factors are the set denoted by E(p,u,o). For a participant retiring at normal retirement age having made no 205(c) election E(p,NRA,o) = 100%.

Let J(k,p,u,v) denote the joint and survivor option factors applied under the plan to the amount of normal form annuity payable to a participant of sex p and age u in order to compute the amount of an actuarially equivalent joint and survivor annuity with 100k% continuation to a surviving spouse of opposite sex and age v. Thus, the joint and survivor annuity with 100k% continuation to a spouse age v available to a member retiring at age u, a 205(c) election having been in force for m years, is

Accrued Annuity (Normal Form) X E(p,u,m) X J(k,p,u,v)

Let AP(u) denote a function such that the rate at which the accrued pension is assumed to increase between ages u and u+1 during the period in which a 205(c) election is effective can be represented as:

$$\frac{AP(u+1)}{AP(u)} - 1$$

For example, given a plan with a normal retirement age of 65 which permits early retirement at 55 or later, and given the assumption that participants' salaries increase at j% per annum, one might define AP(u) as follows:

Career-average plan	: $AP(u) = s_{\overline{u-40}|j\%}$, $55 \le u \le 65$
Final-average plan	: $AP(u) = (u-40)(1+j)^u$, $55 \le u \le 65$
Flat-dollar-per-year-of-service:	$AP(u) = u-40$, $55 \le u \le 65$

These are only examples. The selection of an appropriate AP(u) function requires a review of plan provisions and the age and service characteristics of the group which the plan covers.

The basic condition which must be satisfied for equity to be established is that, for each dollar of annual pension accrued at retirement age, the annual normal-form pension which would have been payable if the participant had made no 205(c) election — viz., $E(p,x,o)$ — must be reduced by an amount of annual normal form pension actuarially equivalent to the accumulated cost of the insurance on the life of the participant which was the result of his or her previous election under ERISA Subsection 205(c).

$$E(p,x,o) - E(p,x,m)$$

$$= \frac{\sum_{y=x-m}^{y=x-1} k \frac{AP(y+\frac{1}{2})\, d_{[x-m]+y-x+m}}{AP(x)\, l_{[x-m]+m}} E\left(p, y+\frac{1}{2}, y-x+m+\frac{1}{2}\right) J\left(k,p,y+\frac{1}{2},y-d+\frac{1}{2}\right) G\left(a,y-d+\frac{1}{2}\right)(1+i)^{x-y-\frac{1}{2}}}{H(p,[x-m]+m)}$$

$$= \frac{k\sum_{y=x-m}^{y=x-1} AP(y+\frac{1}{2})\, E\left(p,y+\frac{1}{2},y-x+m+\frac{1}{2}\right) J\left(k,p,y+\frac{1}{2},y-d+\frac{1}{2}\right) G\left(a,y-d+\frac{1}{2}\right) d_{[x-m]+y-x+m}\,(1+i)^{x-y-\frac{1}{2}}}{AP(x)\, l_{[x-m]+m}\, H(p,[x-m]+m)}$$

$$= \frac{k\sum_{y=x-m}^{y=x-1} C_{[x-m]+y-x+m}\, AP(y+\frac{1}{2})\, G\left(a,y-d+\frac{1}{2}\right) J\left(k,p,y+\frac{1}{2},y-d+\frac{1}{2}\right) E\left(p,y+\frac{1}{2},y-x+m+\frac{1}{2}\right)}{AP(x)\, v^{\frac{1}{2}}\, D_{[x-m]+m}\, H(p,[x-m]+m)}$$

$$= k\left[\frac{\begin{array}{l}\frac{1}{2} C_{[x-m]}\, AP(x-m)\, G(a,x-m-d)\, J(k,p,x-m,x-m-d)\, E(p,x-m,o) \\ + \sum_{y=x-m}^{y=x-2} \frac{1}{2}\left[C_{[x-m]+y-x+m} + C_{[x-m]+y-x+m+1}\right] AP(y+1)\, G(a,y-d+1)\, J(k,p,y+1,y-d+1)\, E(p,y+1,y-x+m+1) \\ + \frac{1}{2} C_{[x-m]+m+1}\, AP(x)\, G(a,x-d)\, J(k,p,x,x-d)\, E(p,x,m)\end{array}}{AP(x)\, v^{\frac{1}{2}}\, D_{[x-m]+m}\, H(p,[x-m]+m)}\right]$$

Solving for $E(p,x,m)$ which appears on both sides of this last equation, we get an expression from which adjusted early retirement factors may be computed in sequence, starting with the factors based on lowest values of x and m. This expression is as follows:

$$\bar{E}(p,x,m) = \frac{\begin{aligned}&2E(p,x,0)\,AP(x)\,v^{\frac{1}{2}}D_{[x-m]+m}\,H(p,[x-m]+m)\\ &-kC_{[x-m]}\,AP(x-m)\,G(a,x-m-d)\,J(k,p,x-m,x-m-d)\,E(p,x-m,0)\\ &-k\sum_{y=x-m}^{y=x-2}\left[C_{[x-m]+y-x+m}+C_{[x-m]+y-x+m+1}\right]AP(y+1)\,G(a,y-d+1)\,J(k,p,y+1,y-d+1)\,E(p,y+1,y-x+m+1)\end{aligned}}{2AP(x)\,v^{\frac{1}{2}}D_{[x-m]+m}\,H(p,[x-m]+m)+kC_{[x-m]+m+1}\,AP(x)\,G(a,x-d)\,J(k,p,x,x-d)},$$

The table below shows what adjusted early retirement factors would look like for a male participant under a career-average plan [$AP(u) = s_{\overline{u-40|}.045}$] which now incorporates fairly standard early retirement factors (shown in the m=0 column) and fairly standard J&S option factors (not shown). Participant mortality is based on the 1951 GA(+4) and spouse mortality is based on the 1951 GA(−6). Interest at 4½% per annum is assumed. This table is only an illustration based on assumptions chosen mainly for ease of calculation.

Ret. Age	m=0 %	m=1 %	m=2 %	m=3 %	m=4 %	m=5 %	m=6 %	m=7 %	m=8 %	m=9 %	m=10 %
65	100.0	98.3	96.9	95.8	94.9	94.1	93.5	92.9	92.5	92.1	91.8
64	89.1	87.7	86.6	85.7	85.0	84.4	83.9	83.4	83.1	82.8	
63	79.8	78.7	77.8	77.1	76.5	76.0	75.6	75.2	74.9		
62	71.7	70.8	70.1	69.5	69.0	68.6	68.3	68.0			
61	64.7	64.0	63.4	62.9	62.5	62.2	61.9				
60	58.5	57.9	57.4	57.0	56.7	56.4					
59	53.1	52.6	52.2	51.9	51.6						
58	48.4	48.0	47.7	47.4							
57	44.2	43.9	43.6								
56	40.5	40.2									
55	37.1										

MR. ETHAN STROH: The Employee Retirement Income Security Act of 1974 (ERISA) stipulates that pensions be payable to married participants in a pension plan as a "qualified joint and survivor annuity" unless the participant elects otherwise. Participants who are eligible to retire and receive benefits before normal retirement age and who are within 10 years of the normal retirement age must be allowed to elect to place a qualified joint and survivor annuity in effect while they are in active employment. Should the participant die prior to retirement, his spouse would receive benefits as if the participant had retired on the day preceding the day of death with a qualified joint and survivor annuity in effect.

A "qualified joint and survivor annuity" is defined as an annuity payable for the life of a participant with a specified portion between 50 percent and 100 percent continued after his death to a surviving spouse for life, and which is equivalent in actuarial value to a single whole-life annuity to the participant.

It is seen that election of the qualified joint and survivor annuity amounts to placing an insurance benefit in effect on the life of a participant. ERISA allows a plan to take increases in cost resulting from this insurance benefit into account in an "equitable fashion." This note is written to describe a simple upper limit for this cost which may be of some use in the approximation process.

A method for taking increased costs into account is to reduce the amount of pension the participant receives if he survives to retire, or that a surviving spouse receives if a death benefit becomes payable, by an amount actuarially equivalent to the cost of the insurance coverage received.

Let

x = participant's age

p = participant's age at retirement or death

y = spouse's age

k = portion of participant's pension which is continued to the surviving spouse

$f(x,y,k)$ = annual pension per unit of whole life pension to (x) which is payable to (x) and (y) on the qualified joint and survivor basis

$B(x)$ = accrued benefit of the participant at age x, in the form of a deferred annuity commencing at normal retirement age

$E(x)$ = portion of $B(x)$ which is payable in the form of an immediate annuity. This may be an immediate actuarial equivalent pension amount or a reduction based on another formula.

$R(x,y,k,p)$ = reduction in the benefit payable at retirement or death which is equal to the value of death benefit coverage.

$$R(x,y,k,p)\ \frac{D_p}{D_x} B(p)\, E(p)\, \bar{a}_p =$$

$$k \sum_{t=0}^{p-x-1} {}_tp_x\, q_{x+t} \frac{\bar{N}_{y+t+\frac{1}{2}}}{D_y} B(x+t+\tfrac{1}{2})\, f(x+t+\tfrac{1}{2}, y+t+\tfrac{1}{2}, k)\, E(x+t+\tfrac{1}{2})$$

This expression depends on a wide number of variables but simplification may be obtained by assuming $E(x)$ to be on the actuarially equivalent basis.

If w is the normal retirement age, $E(x) = \bar{N}_w / \bar{N}_x$

So that:

$R(x,y,k,p)$ =

$$k \sum_{t=0}^{p-x-1} q_{x+t} \frac{l_{x+t}}{l_{x+t+\frac{1}{2}}} \frac{l_{y+t+\frac{1}{2}}}{l_y} \frac{B(x+t+\frac{1}{2})}{B(p)} \frac{\bar{a}_{y+t+\frac{1}{2}}}{\bar{a}_{x+t+\frac{1}{2}}} f(x+t+\tfrac{1}{2}, y+t+\tfrac{1}{2}, k)$$

As a practical matter

$$\frac{\ell_{x+t}}{\ell_{x+t+\frac{1}{2}}} \cdot \frac{\ell_{y+t+\frac{1}{2}}}{\ell_y} \leq 1 \; , \qquad \frac{B(x+t+\frac{1}{2})}{B(p)} \leq 1$$

while

$$\frac{\bar{a}_y}{\bar{a}_x} f(x,y,k) = \frac{\bar{a}_y}{\bar{a}_x + K(\bar{a}_y - \bar{a}_{xy})} < \frac{\bar{a}_y}{\bar{a}_x + K(\bar{a}_y - \bar{a}_x)} = \frac{1}{(1-K)\frac{\bar{a}_x}{\bar{a}_y} + K}$$

so

$$R(x,y,K,p) \leq \sum_{t=0}^{p-x-1} q_{x+t} \frac{K}{(1-K)\frac{\bar{a}_{x+t+\frac{1}{2}}}{\bar{a}_{y+t+\frac{1}{2}}} + K}$$

The annuity ratio may be replaced by its minimum value over the interval of the summation to obtain a first simplification. Further simplification can be obtained by using a reasonable extreme value for the annuity ratio such as the value when (x) is a male age 70, (y) is a female aged (30). In this case, using a recent pensioner's mortality basis and 5% interest, a value of about .4 would be obtained. Using this value:

$$R(x,y,k,p) \leq \frac{K}{.4(1-K)+K} \sum_{t=0}^{p-x-1} q_{x+t} \leq \sum_{t=0}^{p-x-1} q_{x+t}$$

In the event a pension plan provides early retirement benefits which are greater than the actuarial equivalent of the accrued benefit, an adjustment must be made in the preceding inequality equal to the maximum ratio over the range $0 \leq t \leq p-x-1$ of the function

$$\frac{E(x+t+\frac{1}{2})}{\bar{N}_w / \bar{N}_{x+t+\frac{1}{2}}}$$