RMS® CCRA® Training Program
Accumulation Management Exercise

ANSWER KEY

Learning Objectives:

This exercise will take you through the process of manually calculating accumulations and comparing your methodology to RiskLink® accumulation methodology. The purpose of the exercise is to help you gain an appreciation for the relationship between your underlying data and the analysis results.

You may use either MS Excel or MS Access for your analysis, depending on your preferred method for manipulating data.

Exposure Summary:

Multi-line national writer

- Property
- Workers Compensation
- Separate Property and Workers Compensation exposure databases

Exposure summary

- Property
  - ~22,500 accounts
  - ~48,500 locations across the U.S.
  - Primarily first dollar policies, with a small portfolio of excess policies
  - Gross limits = $9.8 billion
- Workers Compensation
  - ~2,500 accounts
  - ~4,000 locations across the U.S.
  - Number of employees covered = 415,000

ZIP Code Accumulations:

Work in teams of two or three to answer all of the following questions. You have the following data available to help you with your analysis.

- Accumulation_by_ZIP.xls
- Accumulation_by_ZIP.mdb (MS Access database containing all data from the Excel spreadsheet)

Part 1

1. Using the data provided in the Accumulation by ZIP spreadsheet or the MS Access database, calculate the top five ZIP Codes in terms of gross ***property*** exposure.

> **STOP** for class discussion before doing calculations:
>
> - What do you need to consider when calculating gross exposure?
> - You will need to consider creating several queries to run in sequence. What would be the first? The second? And so on?
> - What data quality considerations would you investigate in your results?

ZIP Code & State	Property Gross Exposure
	145,387,000.00
NJ, 08226	*71,632,000.00*
NY,12065	*44,551,000.00*
NY,10022	*39,884,000.00*
NJ, 08243	*34,346,000.00*
FL, 33409	*32,727,000.00*

- *In order to determine the gross exposure, the calculations should take into account any financial structure that applies to the exposure (limits, attachment points, special conditions, deductibles, etc.).*
- *Since the data appears to contain multi-location accounts with at least one policy applying to each account, in order to determine the accumulation by ZIP Code, you can perform the following steps:*
    1. *Import the Fire Location Worksheet into MS Access, or use the MS Access database already provided to you.*
    2. *{in Access} Calculate the total value by account, by policy, by ZIP Code – Create a query Grouping by ACCGRPNUM, POLICYNUM, ATTACHMENTPOINT, POLICYLIMIT, STATE, and POSTALCODE and sum the LOCATION VALUE:*

        SELECT FireLocs.ACCGRPNUM, FireLocs.POLICYNUM, FireLocs.[ATTACHMENT POINT], FireLocs.[POLICY LIMIT], FireLocs.POSTALCODE, FireLocs.STATE, Sum(FireLocs.[LOCATION VALUE]) AS [SumOfLOCATION VALUE]

        FROM FireLocs

        GROUP BY FireLocs.ACCGRPNUM, FireLocs.POLICYNUM, FireLocs.[ATTACHMENT POINT], FireLocs.[POLICY LIMIT], FireLocs.POSTALCODE, FireLocs.STATE;

    3. *Calculate the impact of the policy terms (Attachment Point & Policy Limit) per Account, per Policy, per State, per ZIP.*
        - ***STEP A**: Apply attachment point → Total Value – Attachment Point. If result is less than zero, than the exposure to the policy = 0.*

            = IF(TotalVal – AttchPt < 0, 0, TotalVal – AttchPt)

- ***STEP B**: Apply Policy Limit. Compare result from Step A to the Policy Limit, take the minimum of the two.*

  Important – You must take into account policies where the LIMIT = 0. In these cases the coverage should be treated as unlimited. In cases where the LIMIT = 0, an "effective limit" equal to the total value of the specific ZIP Code should be assumed.

4. *Create a query to determine the overall accumulation (sum of the Step B results) by ZIP Code and State:*

   SELECT Sheet1.STATE, Sheet1.POSTALCODE, Sum(Sheet1.[apply limit]) AS [SumOfapply limit] INTO [Accum by state and zip]

   FROM Sheet1

   GROUP BY Sheet1.STATE, Sheet1.POSTALCODE

   ORDER BY Sum(Sheet1.[apply limit]) DESC;

- *It is important to note that the largest accumulation amount ($145,387,000) is from locations that contain neither State nor ZIP Code information. This should raise a red-flag with the portfolio manager that they need to spend some time cleaning up their data and gathering additional detail about their insured locations.*

2. Using the data provided in the Accumulation by ZIP spreadsheet or MS Access database, calculate the top five ZIP Codes in terms of ***ground-up workers' compensation*** exposure.

STOP for class discussion before doing calculations:

- Why is the calculation in terms of ground-up exposure?
- How are exposure data values captured?

State & ZIP Code	Workers Compensation Ground-Up Exposure
	18,750
NJ, 08540	*9,622*
NJ, 08837	*4,458*
FL, 32308	*3,757*
TX, 77024	*2,951*
IL, 60606	*2,699*

To calculate the Number of Employees per ZIP and State, you can import the data into Access, and then run a query to sum the number of employees grouping by the State and Postalcode fields.

It is a straightforward query to determine the number of employees exposed, but it is more difficult to translate number of employees into potential injuries (you need an injury distribution to determine fatalities, major/minor injuries, etc.) and even harder to then translate into dollar losses (you need cost severities… $ payout per injury type). You did not have ready access to this information, so number of employees was the best you could do. Although the question asks for ground-up exposure, you were unable to calculate that without further information.

It is important to note that there are a large number of employees associated with locations that either do not contain ZIP information or locations that contain an improperly formatted ZIP Code without state information. Again, this represents an opportunity for the portfolio manager to improve the quality of his/her data by encouraging the underwriters to collect more complete information.

3. Describe your main challenges with creating the tables in questions 1 and 2, and list potential resolutions if you had more time and/or data available to you.

   The calculation steps described in question 1 illustrate some of the difficulties associated with manually calculating accumulations. Although conceptually the process is fairly straightforward, there are a number of steps to go through. The example above utilized both Access and Excel to solve the problem, but it required that data be moved back and forth between applications, which certainly increased the chance for error. The biggest issues was recognizing that policies with LIMIT = 0 had to be treated as providing unlimited coverage. It is also clear that while this was a conceptually relatively easy example, it still took several steps. If the exposure data had been slightly more complex (e.g. deductible structures, sublimits, etc.) it would quickly become very difficult to calculate manually.

   With respect to the workers compensation data, it was very straightforward to calculate the number of employees per ZIP Code. However, the number of employees per ZIP Code is not necessarily the most useful measurement of potential loss exposure. In order to get a better idea of the magnitude of estimated loss, you need to make assumptions and manually apply an injury distribution as well as cost severities. This information is not readily available. Furthermore, even if the data is available to you, it will certainly complicate the calculations. The other simplifying component is that there are no financial structures (i.e. policies) associated with the data. As can be seen in the property example above, the introduction of financial structures further complicates the calculations.

Part 2

The following table shows the RiskLink Spider analysis results by ZIP Code for your property portfolio.

Table 1: Property Gross ZIP Code Accumulation – Spider Analysis

Total Property Gross Accumulation ($)	ZIP Code Accumulation Area
71,632,000	GEO:08226,NJ,US
44,551,000	GEO:12065,NY, US
39,884,000	GEO:10022, NY,US
34,346,000	GEO:08243, NJ, US
32,727,000	GEO:33409, FL, US

The following table shows the results from an accumulation analyses, based on circular areas with a 400 meter radius. This table shows the top five areas of gross accumulations for the property book.

Table 2: Property Gross 400 meter Accumulation – Spider Analysis

Total Property Accumulation	400 meter Accumulation Area
46,983,000	NEW YORK, NY 10017, US
32,786,000	NEW YORK, NY 10022, US
25,008,000	NEW YORK, NY 10001, US
24,125,000	CHICAGO, IL 60606, US
22,757,000	RIVIERA BEACH, FL 33404, US

4. Your company is concerned with its exposure to wind during a hurricane. If you were asked to determine your company's largest property accumulations with respect to wind, which of the following accumulation analyses would you choose:

   a. The RiskLink ZIP Code accumulation analysis shown in Table 1 on the previous page,
   b. Or the RiskLink 400 meter circular accumulation analysis shown in Table 2 on the previous page?

   Provide an explanation for your choice as well as a general discussion of the pros and cons of using a geographic approach (i.e. ZIP Code accumulations) versus a circular approach (i.e. 400 meter circular analyses).

   The decision to use one methodology over another is dependent on the exact information needed to ultimately come to a decision on an issue, or your fitness for purpose. In this example, the ZIP Code accumulation analysis is more appropriate for wind because the size of the postal code is more representative of a wind event. The 400 meter circular accumulation represents an area too small for this peril, and would be better suited for a peril such as flood or some terrorism accumulation analyses.

   Pros and cons of each analysis type are noted below:

   Geographic Areas (ZIP Code)

   Pros

   - *Consistent with long-standing traditional approaches of managing capacity*
   - *Geographic areas are easily understood throughout an organization*
   - *Operationally easier to manage… the geographic areas are constant, unlike circular spider analyses where the areas may change as the portfolio changes*
   - *Easier to add results together from multiple analysis runs*

   Cons

   - *Areas vary in size and shape… some ZIP Codes are very large, others are small*

Circular Areas

Pros

- *More realistic representation of an "event"*
- *Not tied to arbitrary geo-political boundaries*
- *Consistent shape and size gives better idea of actual concentrations of exposure*
- *Spider analyses will allow new areas of concentration to be identified easier*

Cons

- *Position and size is hard for users to visualize.*
- *More difficult to add results together from multiple analyses*
- *In the case of Spider analyses, the position of the areas will vary as the portfolio changes making it difficult to manage consistently over time.*

Since a 2T bomb footprint causes the majority of its damage in a 400 meter area on average, your company has asked you to run a spider analysis using the 2T bomb simple damage footprint. The table below shows the results.

Property Gross 2T Bomb Spider

Total Property Accumulation	Accumulation Name
36,871,031.51	NEW YORK, NY 10017, US
20,359,850.89	RIVIERA BEACH, FL 33404, US
20,201,644.96	FARMERS BRANCH, TX 75244, US
20,026,251.34	BARABOO, WI 53913, US
20,021,846.59	HARAHAN, LA 70123, US

5. These results vary from the RiskLink 400 meter analysis shown in Table 2 on page 3 (page 5 on answer key), even though both analyses are represented by a circle with a similar radius. Are you surprised by these results? Provide a brief explanation for your answer.

   Although the shapes of the areas are similar the assumptions behind the two analysis types are fundamentally different which is likely to result in different answers.

   The Simple 100% Damage, 400 meter analysis is essentially a worst case scenario, assuming that all locations in an area are totally destroyed. The area could represent any number of loss scenarios. The result is the maximum possible loss that would be paid out. The advantages of performing this type of analysis in RiskLink rather than trying to calculate it manually is that RiskLink will apply the financial model and provide a more accurate representation of an insurer's liability. Given the complexity of the financial model, manually attempting to apply a complete financial structure is very difficult. Manual calculations tend to make simplifying assumptions regarding the financial structure which tend to lead to a more conservative estimate.

   The 2 Ton bomb analysis was specifically developed to represent a particular type of event. Unlike the Simple, 100% damage circle, the damage to a location is very dependent on where it falls within the circle. Typically, the closer a location is to the centroid of the event, the higher the damage will be. Depending on the type of event, the damage can quickly trail off as a location's position moves

away from the center. In addition to the positional dependency, it is important to note that the damage to a location will vary depending on its vulnerability to the particular type of event. A location's vulnerability will vary depending on its physical attributes (e.g. construction, height, etc.) as well as the type of exposure (i.e. Building, contents, BI).