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## EARTHQUAKE INSURANCE IN THE USA

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### SUMMARY

This paper presents the methods used by ISO Commercial Risk Services, Inc. (CRS) to rate commercial buildings in the USA for earthquake insurance.

This paper describes the way geological information and building construction and characteristics are used in the earthquake rating process. This contrasts with the methods used to make rates for virtually all other insurance coverages, where insurers use historical premium and loss statistics.

### INTRODUCTION

The ground moves violently and then parts. Buildings sway, and some collapse. Fire breaks out amid explosions. The earth chatters with after-shocks. This is a normal sequence of events during a major earthquake. Worse, lives could be, and often are, lost in a major earthquake.

Catastrophes like these make page one news. And these days, the news often includes predictions of when the next major earthquake will hit California. What doesn't make headlines, however, is how insurers determine the rates for earthquake insurance. How does an insurance company determine a rate for a wood frame building sitting 10 miles from a fault line in California -- or in Massachusetts, a U.S. state that lies 3,000 miles away from California and in an area not known for major seismic activity?

Because of the special nature of earthquake losses, insurance companies do not use premium and loss data to establish rates, as they do for virtually all other coverages. Because major earthquakes occur so infrequently, it is not possible to accumulate adequate statistical data in an actuarial period of 10, 20, 30 years, or even longer. For example, in most states outside California, the loss ratio for a 10 or 20 year period is negligible. However, a major earthquake could, at any time, cause catastrophic loss. Therefore, using what we call "experience" data to determine earthquake rates is simply not reliable or feasible.

How does the insurance industry in the U.S. establish accurate rates for

earthquake insurance? Insurers often rely on an organization called Insurance Services Office, Inc. (ISO) to help them evaluate properties in active seismic areas. ISO develops and maintains advisory earthquake rates, rules, and forms for the entire U.S. insurance industry.

#### BACKGROUND

ISO is a non-profit corporation that makes available advisory rating, statistical, actuarial, policy form, and related services for 16 lines of insurance to any U.S. property/casualty insurer. Over 1500 insurers use ISO's products and services. Some of the more familiar lines of insurance that ISO serves include general liability, automobile, boiler and machinery, homeowners, farm, and commercial fire.

U.S. insurance companies also turn to ISO Commercial Risk Services, Inc., (CRS) -- to rate commercial buildings for earthquake insurance in the U.S. CRS is a national corporation and subsidiary of ISO specializing in survey services. CRS provides insurers with individual risk analysis and advisory rating information to help underwrite property insurance. CRS gathers and distributes specific commercial fire advisory rates on 2.5 million buildings in the U.S and provides insurers with commercial fire and allied lines advisory class rates.

Earthquake insurance activities in the U.S. evolved long before ISO and CRS were established. In 1926 the Board of Fire Underwriters of the Pacific (BFUP) developed the first earthquake insurance rating system. Because of the special nature of earthquake hazards, the Earthquake Department of the BFUP'S successor organization, the Pacific Fire Rating Bureau (PFRB), operated independently of the total property rating system. The department contributed to the knowledge of earthquake rating by defining different building class levels for earthquake insurance.

In 1971 the PFRB was consolidated, along with other regional rating bureaus across the U.S., into a national organization, Insurance Services Office. The earthquake insurance program in the U.S., now operated by CRS, has undergone extensive changes over the last several years. CRS has revised and simplified the earthquake classification system throughout the U.S. to help provide consistent earthquake insurance rating.

#### HOW EARTHQUAKE ADVISORY RATES ARE DETERMINED BY GEOGRAPHIC ZONE

Since it is not possible to apply the usual loss-to-premium methods to develop earthquake insurance rates, CRS uses engineering analyses based on studies of earthquake damage to various types of buildings and the seismic history of earthquakes in the U.S. A separate component of CRS's engineering analyses includes seismic data from the U.S. Coast and Geodetic Survey, the U.S. Department of Commerce, the Applied Technology Council, the U.S. Department of the Interior Geological Survey, and the latest available published material. This data makes it possible for CRS to divide the country into zones based on earthquake frequency, intensity and geographic area of damage.

For practical insurance coding purposes, earthquake zones follow county boundaries. However, since county boundaries do not generally coincide with theoretical seismic boundaries, CRS gives adequate weight to population concentrations and to property value in establishing the boundaries. The total number

of earthquake zones in the U.S. is five. This figure tracks consistently with the quality of available data. Zone 1 is the highest for earthquake potential and Zone 5 the lowest. Therefore, an advisory rate for an existing building in Zone 1 -- the highest earthquake zone -- represents the maximum advisory rate. Conversely, a rate for a building in the lowest earthquake zone -- Zone 5 -- represents the minimum advisory rate.

Not only is the U.S. divided into five earthquake zones, but it is also divided into two basic areas. And based on this geographic division, two sets of advisory rates exist for the country. One set applies to the "Western States" region. This region includes all states west of the Rocky Mountains, including Alaska and Hawaii. Another set of advisory rates applies to the area CRS has designated as "Other-Than-Western States." This region includes all states east of the Rocky Mountains. For rating purposes, CRS divided the country into these two basic areas because earthquakes in the U.S. between the Rocky Mountains and Pacific Ocean have similar characteristics -- they occur more frequently and, normally, with greater intensity. Earthquakes in the states east of the Rockies occur less frequently and with less severity.

Insurance companies will use this geographic information as well as information on building construction characteristics and contents (occupancy and product hazards) to determine an adequate earthquake insurance rate for a commercial building and its contents.

Based on a building's construction characteristics, insurance companies can rate a commercial building in one of two ways. They may rate a building based on a class rate or a specific rate. Basically, class rates are generic rates designated for homogeneous types of buildings. A specific rate on the other hand, is based on more detailed information about the particular building.

CRS divides commercial buildings into one of six construction types for earthquake insurance: wood frame, all metal, steel frame, reinforced concrete, mixed construction, and earthquake resistive. The first five building categories may simply be class rated by the insurance company. The procedure used to class rate a building is straightforward. The building can be rated by the insurance company by referring to ISO's Commercial Lines Manual. The insurer follows the procedures outlined in the general rules of the Manual and then refers to specific state pages to rate a building.

However, an insurance company may request a specific rate from CRS for the first five building categories if, for instance, a building is located in a hazardous earthquake zone, the building is exceptionally large, or the insurer is unfamiliar with the building's construction.

To get a specific rate for a commercial building, the insurance company applies to CRS for a property survey and analysis. Buildings with superior earthquake damage control features -- called earthquake resistive, the last of the six construction categories -- require specific rating. That's where CRS most often comes in. As part of its survey procedure for a specific building, CRS refers to the published reference called the Guide for Determination of Earthquake Classifications (Ref. 1).

#### THE EARTHQUAKE CLASSIFICATION SYSTEM

The Guide assigns ranges of so-called rating points for various characteristics such as a building's framing system, walls, partitions, diaphragms

(floors and roofs), size, shape, ornamentation, design, equipment, and any quality control features.

Based on a building survey, or on building plans, which may be submitted to CRS for verification, CRS uses the Guide to determine building classification rating points and a classification number. The insurer then looks up the classification number in the Commercial Lines Manual to find the appropriate advisory earthquake rate.

By requesting a specific rate, the insurer is in essence asking CRS to verify the appropriate classification number for an earthquake resistive building or for a building which requires more detailed information. The rating points CRS assigns confirm how CRS arrived at the classification number.

When the insurer class rates a building, it uses one of 15 classifications specified in ISO's Commercial Lines Manual to find the appropriate advisory earthquake rate. (The first five building construction types are broken down into classifications signifying the degree of damage to which a building is susceptible in strong ground motion.)

Additionally, when an insurance company class rates or specific rates a building, it places the contents into one of four rate groups depending on the nature of the contents, occupancy and any product hazards. These rate groups correspond to advisory contents rates.

#### CONCLUSION

Many components go into developing appropriate earthquake insurance rates in the U.S. For insurance rating purposes, the country is divided geographically into two basic areas, which translate into two sets of advisory rates for the country. Further, the country is divided into five earthquake zones.

Commercial buildings are either class rated or specifically rated, most often depending on whether the building has superior damage control features requiring verification. For specifically rated buildings, CRS surveys the building and refers to the Guide for Determination of Earthquake Classifications. For buildings that are class rated, insurance companies refer directly to ISO's Commercial Lines Manual. Commercial buildings are then placed into one of six construction categories and further designated by a specific classification number. The insurance company then classifies the building's contents into one of four rate groups.

Using all of this information as a reference point, the insurance company then determines if the advisory earthquake rate is appropriate for insuring a commercial building -- whether it's in California or in Massachusetts.

#### REFERENCE

1. Guide for Determination of Earthquake Classifications, 1983 Edition, Insurance Services Office, Inc., (1983).