



Title	STUDY ON INSURANCE AMOUNT OF PROFESSIONAL LIABILITY FOR ENGINEERING DESIGN SERVICES
Author(s)	WENG, CHING-FA; GUO, SY-JYE
Citation	Proceedings of the Thirteenth East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-13), September 11-13, 2013, Sapporo, Japan, A-4-6., A-4-6
Issue Date	2013-09-11
Doc URL	<a href="http://hdl.handle.net/2115/54214">http://hdl.handle.net/2115/54214</a>
Type	proceedings
Note	The Thirteenth East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-13), September 11-13, 2013, Sapporo, Japan.
File Information	easec13-A-4-6.pdf



[Instructions for use](#)

# STUDY ON INSURANCE AMOUNT OF PROFESSIONAL LIABILITY FOR ENGINEERING DESIGN SERVICES

Ching-Fa Weng<sup>1\*</sup>, Sy-Jye Guo<sup>2</sup>

<sup>1</sup>*Ph.D Student, Construction Engineering & Management Division Department of Civil Engineering, National Taiwan University.*

<sup>2</sup>*Professor, Construction Engineering & Management Division Department of Civil Engineering, National Taiwan University.*

## ABSTRACT

Engineering design represents a creativity of expertise and technology. All the results come out will directly affect the success or failure of the construction project. Once a serious disaster resulted from careless or negligent engineering design occurred, the loss may be too large for the small amount of the service fee to cover. Although the technical service companies are forced to buy the professional liability insurance in accordance with the laws and regulations of Taiwan, the insurance mechanism and concepts have been distorted and led to the companies' negligence of the design risk. The failure in full use of various insurances and proper planning of insurance policies might affect the work progress. In particular, the determination of insurance amount will not only affect the premium directly, but also decide the indemnity against the loss. In case the insurance amount is unable to totally indemnify the loss or damages, the Engineering company may be in serious financial difficulty and even go bankrupt.

The study investigated a domestic engineering consulting company as an example. This company has been involved in the technical engineering services for over 40 years, having 1,300 professional technical staff, with an annual revenue of more than NT\$3 billion (US\$100 million equivalent). It has handled thousands of professional liability insurances for its engineering design services. The appropriateness between the insurance amount of each claim stipulated in its insurance policy and the risk on professional liability actually borne will be carefully studied and analyzed. Thus, the fallacy of insurance amount equivalent to the contract amount will be well clarified. The inappropriate concept about the professional liability insurance will also be discussed. The findings generated in the study will function as references for the technical service companies to evaluate the risk and work on the insurance planning in the future.

**Keywords:** Technical services, Professional liability insurance, Insurance amount

## 1. INTRODUCTION

Engineers' professional liability insurance is an important tool with which providers of engineering technical services transfer risk to an insurance company. By purchasing insurance the engineering firm is not directly liable and, in the event a third party incurs losses, its exposure to potentially large compensation claims is reduced. Purchasing the insurance is mandatory on a case-by-case

---

\*Corresponding author: Email: chingfaw@mail.sinotech.com.tw

basis under the laws of Taiwan. The compulsory nature of this insurance has resulted in policyholders (the insured) being covered only up to the contract amount, i.e. the limit of liability is equal to the contract amount. However, the insurance amounts are insufficient to cover the cost of liability insurance claims with respect to damage to engineering structures or adjacent property and bodily injury to a third party. Moreover, in engineering design there exists a relatively high degree of risk. It is crucial that the insurance system be improved and that appropriate insurance amounts be covered by insurers; otherwise such insurance is not adequate for low-revenue projects. This is a serious issue that technical service firms in Taiwan are facing.

## **2. LITERATURE REVIEW**

Engineers' professional liability insurance has existed in Europe, the United States and Japan for several years. On 22 September 1993, the Taiwan Ministry of Finance promulgated the Regulations Governing the Underwriting of Architects and Engineers' Professional Liability Insurance, which would become the foundation of the engineers' professional liability insurance system in Taiwan. On 2 July 2003, the Act Governing the Administration of Professional Engineering Consulting Firms was promulgated, making it mandatory for engineering consulting firms to purchase professional liability insurance on a case-by-case basis.

In their study on architects and engineers' professional liability insurance in Taiwan, authors I-Feng Lu et alia found that the insurance amount for a given project is typically the cost of engineering design and service fees, in accordance with Taiwan law. In the event of a design omission, the resulting damage would be significant – in monetary terms, the cost may even exceed the total contract amount. Insurance becomes effectively useless in such cases. It is therefore evident that the case-by-case basis on which insurance amounts are determined is inadequate with respect to covering loss as a result of negligence in engineering design. In addressing this problem, Hao-Ji Shih proposed a form of hybrid insurance in which the insurance amount is determined on an annual basis and calculated based on the firm's financial soundness, taking into consideration the liability for a typical project. Shih also proposed other forms of insurance for projects with a relatively high degree of risk.

## **3. ENGINEERS PROFESSIONAL LIABILITY INSURANCE**

Professional liability insurance is a part of an insurance system of risk financing. An insurer is legally required to protect the insured entity in the event a third party incurs loss as a result of the insured entity's negligent acts, errors and omissions or malpractice with respect to the professional service it provides. The insurer must pay the cost of claims that come within the coverage of the insurance policy.

Professional liability insurance policies are claims-made policies, meaning that during the policy period an insured entity is covered for claims made against it by a third party. Regardless whether the insured entity is liable for malpractice prior to the policy effective date or within the policy period, as long as a third party makes claims against the insured during the policy period, the insurer must provide coverage to the insured. The insurance policy may also have a retroactive date,

meaning the insurer may be liable to provide coverage for an incident that occurs prior to the policy period.

Engineering technical services are an important part of the engineering profession, but they are also a great financial liability. About 70 percent of engineering consulting firms in Taiwan are small-sized, each with a registered capital of no more than NT\$5 million. Both their finances and service fee income are limited, making it extremely difficult for them to burden the cost of professional liability where found to be negligent. Engineers' professional liability costs might be in the tens of or even hundreds of millions of New Taiwan dollars.

#### **4. DETERMINING PROFESSIONAL LIABILITY INSURANCE AMOUNTS FOR ENGINEERING DESIGN SERVICES**

Engineering design results determine the success or failure of an entire project, placing a substantial amount of professional liability on engineers. Since engineering design carries the greatest risk of any technical service, it is beneficial in both terms of risk transfer and risk control to explore how insurance amounts for professional liability insurance are determined.

##### **4.1. Significance and purpose of insurance amount**

The insurance amount, or limit of liability, is the maximum amount an insurer is liable to pay within the policy period. Limit of liability in an engineers' professional liability insurance policy consists of the per-claim insurance amount and the aggregate insurance amount. Thus during the drafting of the insurance policy, the insured must assess the extent of potential injury or property damage that a third party might incur in an accident for which the insured is liable. In this way an appropriate insurance amount can be determined.

##### **4.2. Per-claim insurance amount vs Aggregate insurance amount**

Per-claim insurance amount refers to the amount an insurer is liable to pay when a third party seeks damages. In each claim there may be multiple third parties or multiple accidents for which a single claim is filed. Or, multiple claims may be filed for a single accident. This means each claim filed is not necessarily associated with a single accident or third-party. Aggregate insurance amount refers to the maximum amount an insurer is liable to pay during the entire policy period. The insurer might pay out the entire insurance amount for a single claim or multiple claims filed within the policy period. Coverage ceases once the aggregate limit is reached and may be renewed subject to the agreement of the insurer and payment of a premium.

##### **4.3. The problem of insurance amounts for case-by-case insurance in Taiwan**

Under Taiwan laws and regulations, it is mandatory for engineering consulting firms to purchase professional liability insurance as a means of protection against the risk of professional negligence. Yet the mandatory nature of this case-by-case insurance has led to great waste in premiums. Regardless of the type of project (research, planning, personnel support), the potential risks, or how minor the loss a third party may incur, firms must purchase relatively expensive insurance. In

contrast, the insurance amounts for high-risk projects such as engineering design, supervision or project management are disproportionate to potential loss—the insured, where found liable, may not receive sufficient coverage. And where the insured wishes to purchase greater coverage, the premium is extremely high such that it is not affordable for low-revenue projects. Under the case-by-case framework, it is crucial that different insurance regulations and comprehensive measures be determined. Failure to do so will lead to the aforementioned problems, while the current form of insurance becomes a risk in itself.

#### 4.4. Fallacy of equating the insurance amount with the contract amount

The insurance amount for engineers’ professional liability insurance should vary depending on the nature and type of each project, yet a coherent set of regulations is lacking. Service agreements in Taiwan currently contain clauses requiring the service provider to purchase professional liability insurance. However, most of these clauses in service agreements fail to specify the circumstances of the project and primarily stipulate that the insurance amount shall be equal to the contract amount. Furthermore, the premium is included in the total contract amount but it is not calculated separately. This indicates the payment of wasted premium dollars, in other words, insurance is purchased for projects that do not require insurance. Concurrently, there is insufficient coverage for projects that call for greater insurance amounts due to restrictions in the service agreement and the service provider’s inability to pay greater premiums. The problem of insufficient coverage poses the greatest risk to the system of engineers’ professional liability insurance in Taiwan and must be addressed.

### 5. CASE ANALYSIS

#### 5.1. Background

For case analysis this study has obtained data from Sinotech Engineering Consultants, Ltd., one of the largest engineering firms in Taiwan. Sinotech has provided a large variety of engineering design services since 1970. Over the past forty-plus years, it has completed more than 5,000 projects both in Taiwan and abroad. Sinotech currently retains more than 1,300 professional staff, and has a registered capital of NT\$ 1,031,850,000 with a mean annual revenue of NT\$ 3.5 billion.

Engineering firms in Taiwan once lacked a good grasp of professional liability insurance, thus Sinotech had an inconsistent record of purchasing insurance. When professional liability insurance became available in Taiwan and relevant laws and regulations were passed making it mandatory, the number of projects for which Sinotech purchased insurance rapidly increased. Professional liability has also become greater in recent years along with demand for insurance. Sinotech purchased engineers’ professional liability insurance for more than 1,800 of the 5,000 projects it has completed. In recent years, the mean annual expenditure on premiums

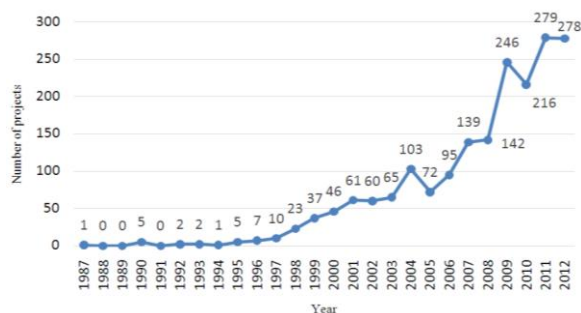
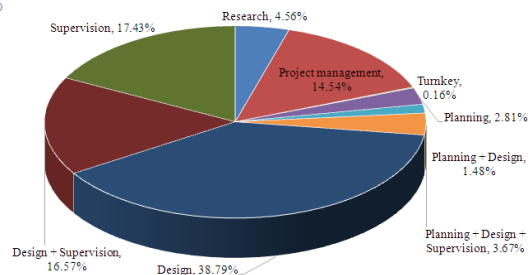
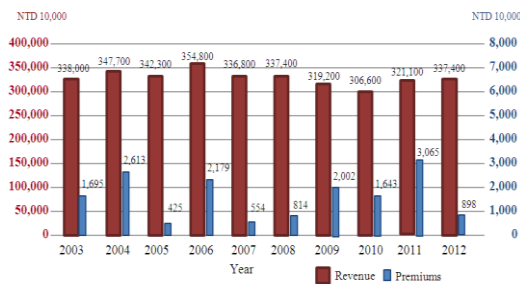


Fig. 1 Number of insured projects

amounts to NT\$ 15 million, or 0.5 percent of annual revenue. Engineering design was involved in 60 percent of all insured projects. Insurance statistics for Sinotech are presented in Fig. 1, Fig. 2 and Fig. 3.



**Fig. 2 Revenue and cost of premiums**

**Figure 3 Premium expenditures by project type**

## 5.2. Statistical analysis

In recent years Sinotech has been committed to customer satisfaction surveys. Customer complaints are a benchmark with which to measure service results and are an important indicator of compensatory damages. Complaints filed against Sinotech in the past five years that resulted in liability are presented in Table 1. From 2008 to 2012 Sinotech was, on average, liable for error in 15 percent of projects per year. The mean annual amount of damages was approximately NT\$ 18 million, or 0.49 percent of annual revenue. The highest amount of damages for a single project was more than NT\$ 70 million. It must be noted, however, that Sinotech did not purchase insurance for every project prior to the promulgation of mandatory case-by-case insurance. And wherever loss was incurred, there may not have been insurance coverage, or Sinotech did not file a claim in consideration of current and future tender awards. Strangely enough, Sinotech to date has never filed a claim with an insurer.

**Table 1 Complaints filed against Sinotech that resulted in liability (2008-2012)**

		Currency Units: NTD 10,000					Total	Mean
Year		2008	2009	2010	2011	2012		
Projects	Number of projects	170	147	150	171	202	840	168
	Revenue (NTD)	527,105	288,118	407,322	342,662	296,909	1,862,116	372,423
Instances of liability	Number of errors	23	31	22	23	25	124	25
	Error rate	13.53%	21.09%	14.67%	13.45%	12.38%	-	14.76%
	Fines (NTD)	209	1,096	287	357	682	2,631	526
	Damages (NTD)	7,714	211	0	948	196	9,069	1,814
	Damages as percent of revenue	1.46%	0.07%	0%	0.28%	0.07%	-	0.49%

The total contract amount for projects that Sinotech undertook from 2008 to 2012 is approximately NT\$ 5.2 billion, with a mean annual contract amount of NT\$ 1.043 billion. Estimating that engineering design services account for 3 percent of construction costs, the mean annual construction cost over the past five years totals close to NT\$ 34.8 billion. The mean highest construction cost for a single project in a given year is NT\$ 9.6 billion – in fact, this is the mean highest amount of potential loss for a single project during the five-year period (Table 2). Although there has not been any instance where such massive damages were incurred in recent history, the

error rate in engineering design services is about 15 percent. In the event an engineering firm is liable for such massive damages, it is absolutely crucial that insurance can be relied on as a means protection. Therefore, appropriate insurance amounts must be determined in order to guarantee engineering firms protection against such substantial risk.

**Table 2 Engineering service design costs and estimated construction costs**

Year	Currency units: NTD 10,000						
	2008	2009	2010	2011	2012	Total	Mean
Number of engineering design projects	27	20	24	29	30	130	26
Total contract amount	68,000	139,100	62,600	158,900	92,900	521,500	104,300
Total construction cost	2,267,000	4,636,800	2,088,200	5,296,300	3,096,500	17,384,800	3,477,000
Greatest single contract amount	21,400	52,800	10,800	38,800	20,000	1,43800	28,800
Greatest single construction cost	712,300	1,761,500	360,500	1,292,800	666,700	4,793,800	958,800

Note: Engineering design fees are estimated as being 3 percent of construction costs according to the *Regulations for Selection and Fee Calculation of Technical Services Providers Entrusted by Entities* promulgated by the Public Construction Commission, Executive Yuan, Taiwan.

However, it is unreasonable to assume that Sinotech is unprofessional to the extent that the mean highest amount of potential liability loss for a single project during a five-year period is NT\$ 9.6 billion. It should be considered that the possibility of total loss in an engineering project is extremely low. Suppose the following: Sinotech’s mean total contract amount for the past five years is approximately NT\$ 1 billion. If an insurance policy were purchased and renewed annually, it must pay a deductible of 10 percent (NT\$ 100 million) of any loss that occurs. According to historical data, Sinotech has paid premiums of 0.5 percent, so the calculated premium can be NT\$ 5 million. This amount is less than Sinotech’s mean annual expenditure on premiums (NT\$ 15 million). By considering the greatest instance of risk in recent years, and by incorporating the long-tail risk strategy of retroactive coverage, it is possible to increase insurance amounts. For example, Sinotech’s mean annual expenditure on premiums (NT\$ 15 million) could purchase NT\$ 3 billion worth of insurance coverage. A single loss of NT\$ 1 billion is considerably large. Excluding particular engineering projects (such as the construction of high-tech factories where fire could cause considerable loss) it would therefore be practical for an engineering firm the size of Sinotech to purchase an annual insurance policy. A per-claim insurance amount of NT\$ 1 billion may be stipulated in the policy; Sinotech could afford this amount since it has a registered capital greater than NT\$ 1 billion. At the same time, an “aggregate insurance amount” of NT\$ 3 billion can also be stipulated, an amount that is also reasonable since it is approximate to Sinotech’s mean annual revenue. Paying a deductible of NT\$ 100 million, or 10 percent of Sinotech’s registered capital, is also reasonable. However, it is also prudent to avoid excessively high deductibles that would place additional financial pressure on the insured or impose other disadvantages that might result in failure to obtain coverage. Thus where there are excess premiums, the deductible might be lowered so as to mitigate risk. With this type of professional liability insurance the coverage obtained by engineering firms would be far greater than that currently obtained under the case-by-case system; the insurance amount would be sufficient to cover potential loss.

## **6. CONCLUSION AND SUGGESTIONS**

### **6.1. Conclusion**

Statistical analysis of Sinotech's status with respect to this issue demonstrates that the current system of mandatory case-by-case insurance does not address the type of engineering service nor does it provide for alternative insurance planning. This has resulted in wasteful expenditures on premiums as well as the significant problem of insufficient insurance amounts. It is therefore necessary to re-examine the basics of professional liability insurance to create a system based on annual insurance policies instead of case-based situation. An equally important consideration is the affordability of premiums with respect to potential loss for different types of engineering design services.

### **6.2. Suggestions**

Taiwan laws and regulations require that engineering consultant firms purchase a mandatory form of professional liability insurance. Architects and members of other technical professions, however, are not subject to these laws, except the architects who deal with public buildings. This indicates a hole in current legislation. Engineers' professional liability insurance was originally introduced under a framework where insurance policies would be purchased and renewed annually. Yet in Taiwan this system was modified into a hidebound, blindly-followed, case-by-case system that lacks specific guidelines and comprehensive measures.

This case-by-case nature of liability insurance has resulted in a waste of expenditures on premiums by engineering firms as well as grossly insufficient coverage. Excluding projects that call for special technical services, the risk of potential loss may be controlled by stipulating in an engineering services agreement an insurance amount that conforms to a particular project. It is necessary to establish a system in which insurance is purchased on an annual basis.

A combination of basic know-how, effective mechanisms, and solid policy planning are needed to realize a form of engineers' professional liability insurance that provides adequate coverage to engineering firms and that charges reasonably-priced premiums.

## **REFERENCES**

- Baster, Jenny and Davis, Martin (2006), "Professional Indemnity Insurance- a Better Way", Institution of Civil Engineers Engineering (ICE) 159, pp.62-64.
- Charles, D. (1982), "A Guide to the Insurance of Professional Negligence Risks".
- Chen, J. Y. (2002), "Engineering Insurance Principles and Practice", Best-Wise Publishing-Co., Ltd.
- Chiu, P. C., and Guo, S. J. (2003), "Study on Construction Risks of Domestic Public Works in view of Insurance Principles", Construction Management Association of Taiwan, No.55 Quarterly Issue, pp.
- Day, R.W. (1993), "Strict Liability in Civil Engineering Practice," Journal of Professional Issues in Engineering Education and Practice, ASCE, Vol. 119, No. 2, pp.134-137.
- Du, C. S. (1996), "The Architects and Engineers' Professional Liability Insurance Approval", Insurance Series, Issue 45, pp. 170~180.
- Du, Y. M., and Guo, S. J. (2009), "Study on Additional Terms to Contractor's All Risks Insurance – An Example of Hydraulic Engineering Works", Construction Management Association of Taiwan, No.80 Fall Issue, pp. 83~95.



- Guo, S. J., Leu, I. F., Lee, M. X., and Chiu, P. C. (2005), "Surveying and Problems Exploration of Architects' Professional Liability Insurance in Taiwan", Construction Management Association of Taiwan, No.65 Winter Issue, pp. 46~61.
- Guo, S. J., and Chiu, P. C. (2000), "Analysis of Current Construction Engineering Insurance System and Problems Exploration", Construction Management Association of Taiwan, No.42 Quarterly Issue, pp. 32~44.
- Harrington, S. E., and Niehaus, G. R. (1999), "Risk management and insurance", McGraw-Hill, Boston, MA, U.S.A., pp. 8, 10-13, 271, 281.
- Horne, R. (1990), "Understanding Terra RRG Professional Liability Insurance," Journal of Professional Issues in Engineering, ASCE, Vol. 116, No. 3, pp. 239-249.
- Janney, J. R. (1996), "Claim analysis from risk-retention professional liability group," Journal of Performance of Constructed Facilities, ASCE, 10(3), pp.115-122.
- Ling, Y. B., Kang, Y. M., and Chen, S. S. (2012), "Insurance Theory and Practice (7<sup>th</sup> edition)", Hwa-Tai Publishing, Ltd.
- Lu, I. F., Guo, S. J., and Pan, Y. J. (2011), "Construction Project Management and Insurance Program for Taiwan High Speed Rail Project", ASCE Leadership and Management in Engineering, pp. 45-56.
- Reynolds, G. M. (1980), "Legal and Insurance Trends in Engineering," Issues in Engineering Journal of Professional Activities, ASCE, Vol. 106, No. 1, pp.3-10.
- Rodriguez, A. P. (1981), "Is the Risk Insurable," Issues in Engineering Journal of Professional Activities, ASCE, Vol. 107, No. 4, pp.281-287.
- Rubin, R. A. (1994), "Liability Insurance for Design Professionals: Can't Live with It, Can't Live Without It," Journal of Management in Engineering, ASCE, Vol. 10, No. 2, pp.18-23.
- Shih, H. J., Chiu, P. C., and Guo, S. J. (2004), "Legal Basis and Coverage of Architects and Engineers' Professional Liability Insurance", Construction News Record, No.257, pp. 21~30.
- Shih, H. J., and Guo, S. J. (2004), "A/E Professional Liability Insurance Policy Analysis", Construction Management Association of Taiwan, No.59 Summer Issue, pp. 24~33.
- Siu, J. B., and Du, C. S. (2000), "Study on Establishment of Housing Construction Liability Insurance System", Architecture and Building Research Institute, Ministry of the Interior, Taiwan.
- Surminski, Swenja and Philp, Arthur (2010), "Guidance on Insurance issues for new developments", Institution of Civil Engineers Engineering (ICE) sustainability 163, pp. 3-6.
- Xie, M. R., Liang, R. H., Lee, L. C., Lan, Y. J., Chiu, R. R., and Shao, A. R. (2003), "Insurance", National Open University.
- Zhang, F. L., and Su, S. W. (2012), "Principle and Practice of Insurance (2<sup>nd</sup> edition)", China Science Publishing & Media Ltd.