

*Be Prepared For
The Unpredictable Largest Earthquake*



**POSITION STATEMENT ON EARTHQUAKE HAZARD ASSESSMENT
AND DESIGN LOAD FOR PUBLIC SAFETY**
地震危害度評估與建築物耐震設計之遠景

International Seismic Safety Organization (ISSO)
國際地震安全組織

摘要

從2004年東南亞的Sumatra地震到2011年的日本地震，很清楚地我們很清楚地瞭解必須工程設計必須提高耐震度，設計我們的工程建築物足以對抗那些大地震，才能將地震災害減少到最低的程度。Deterministic Seismic Hazard Analysis (DSHA)正是以此為精神所在，將所以，建築物耐震設計作為最大考量須以此為出發點，因此自而此觀點正是Deterministic Seismic Hazard Analysis (DSHA)的精神所在，而且從1970年代以來，此設計方法已經用於加州的地震設計規範。

除此之外，傳統的DSHA也漸漸的改良，並在2001年由義大利的學者發表所謂的neo-DSHA或NDSHA，並提供一些證據顯示此新的方法可以準確估算2012年義大利Northern Italy Earthquake所造成的地震災害。基於由上述的理由，DSHA或NDSHA在未來更應被更廣範利用於建築物的耐震設計。

另一方面另一方面，以下下述的一些論述清楚詳列理由是為什麼Probabilistic Seismic Hazard Analysis (PSHA)不足以提供一個安全的耐震設計：

- (1) 最近大地震所造成的地震危害度遠大於PSHA方法所估計的。換句話，PSHA通常低估了地震所造成的危害度。
- (2) 此外，相對於一個保守的耐震設計(例如比如用於核能電廠)，PSHA方法所估計的地震危害度將變得變的不切實際。
- (3) 最近的研究顯示PSHA方法存在一些缺陷(例如太過簡略的假設)，造成此方法所估計的地震價危害度缺乏明顯的物理意義義意。

從最近的地震驗證到DSHA的可靠度優點

(1) 規模6.3 L'Aquila 地震：2009年4月6日號義大利

最近的報導顯示被起訴的義大利地震風險評估委員會是由於缺乏對於地震風險的了解及判斷，而不是所謂錯誤的地震預測以及可能發生的時間。換句話說，假使當初此委員會從 "對抗最大的地震" 的角度出發進行地震風險及危害度評估，L'Aquila 地震所造成當地的傷亡將可以大大地降低，因為證據顯示此地震的規模並不大於當初科學家所估計的最大地震規模。

(2) 規模9.0 日本大地震：2011年3月11日號

眾所皆知，日本大地震伴隨的14公尺高的海嘯，並是造成福島核電廠的災的主因害。再推究其根本原因，此災害的發生，而其主要的破壞原因是由於當初的設計是以規模8.5的地震為考量，而非以歷史上曾經發生過規模更大的地震進行耐震設計。換句話說，如果當時的設計是以類似 DSHA 的方法針對最大規模地震進行設計，福島核電廠現在仍有可能仍持續運作，避免掉福島核災的發生大規模的輻射外射事件也就不會發生。

(3) 規模5.9 Emilia 地震：2012年5月20日號義大利

2012年的Emilia 地震造成當地地區的地表加速度高達 0.25 g，遠高於 PSHA 方法所估計的 0.175 g。相對來說，DSHA方法所估計的地表加速度大約為介於0.15 到 0.3 g 左右之間，不但與實際觀測的比較為接近，而此較為保守的估計也比較適用於建築物設計規範。。

結語

為確保建築物的耐震度，地震設計最好以當地有可能發生最大規模地震為考量，而此邏輯正是DSHA 方法的觀點，由於這個觀點比較可靠，DSHA更不用說此方法已經廣泛地運用在加州建築物的耐震設計。

證據及研究顯示PSHA所估計的地震危害度與現實有相當大的落差，而主要的原因可能為此方法受限於過於粗糙的分析及假設。相對而言，DSHA 或 NDSHA 是一種更符合邏輯的耐震設計，也更容易被社會大眾了解及接受。

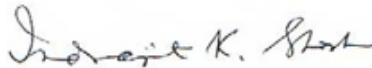
另一方面，最近許多研究證實DSHA所估計的地震危害度比較接近實際觀測，而所以此方法也越來越受到許多國家 (比如義大利) 的重視。

**Names (alphabetical) with selected particulars and country
for the International Seismic Safety Organization (ISSO)**



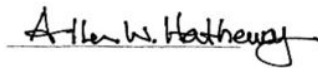
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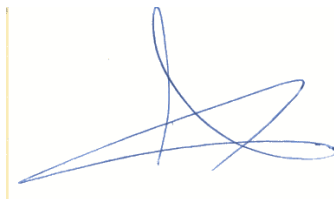
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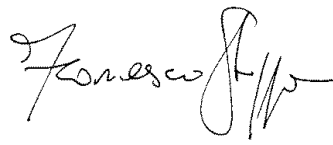


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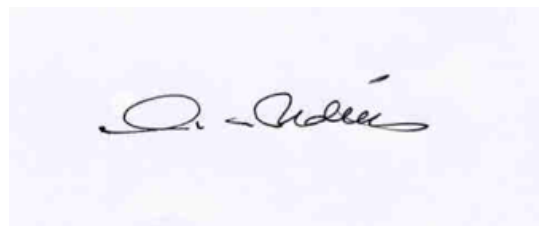
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