

This supplementary document illustrates in detail our collection of original fragility data from each scrutinized literature (papers and thesis), process in classification and synthetization of buildings into different seismic resistance levels, as well as the derivation of fragility of each damage limit state for each building type and seismic resistance level.

(1) Filename “[step1]China_fragility_literature_review.xlsx”:

This is our original records of fragility data extracted from the aforementioned scrutinized publications. Among those mentioned 87 publications, 70 have given detailed fragilities; the other 17 publications are either concept/method related, or their data have been included in those 70 publications.

Sheet “[site survey and statistic 36](#)” includes empirical fragility data extracted from 36 publications with no clear building fortification information, which will be estimated from available supplementary information;

Sheet “[with fortification 16](#)” includes empirical fragility data extracted from another 16 publications with clear building fortification information given;

Sheet “[analytical prediction 18](#)” includes all the analytical fragility data extracted from 18 publications’ tables or figures, among them some have clear building fortification information, others not;

Sheet “[Ding Baorong 2016](#)” is the fragility data collected by Ding (2016, Doctoral Thesis). Due to the high similarity in research purpose, we also digitalized these data and actually reiterated his/her work based the assumptions described in Ding (2016). This comparison will be provided upon request.

(2) Filename “[step2]China_fragility_discrete_records.xlsx”:

Based on the results in Step (1), in this file the fragility data are further divided into different groups according to building types: [soil-wood](#), [brick-wood](#), [brick-concrete](#), [analytical_masonry](#), [RC](#), [analytical_RC](#), [industrial frame](#), [stone-wood](#), [Chuandou-timber](#), [wood](#), [stone and soil](#), as can be checked from each sheet with the same name as above building type. Here, ‘brick-concrete’ equals to masonry in our nomination. But for further development of intensity-PGA relationship using fragility data, we must focus only on masonry and RC, since analytical fragility data for other building types are not available.

(3) Filename “[step3]China_fragility_classification.xlsx”:

In this file, the exceeding probabilities of four damage limit states (LS1, LS2, LS3, LS4) are derived using Eq. (1) in the manuscript;

Given the focus of this work and variation in data abundance of each building type’s fragility data, for further fragility curve derivation and PGA-intensity relationship exploration, we finally focused only on Sheets “[1_brick-concrete](#)”, “[2_analytical_masonry](#)”, “[3_RC](#)” and “[4_analytical_RC](#)”.

To fully integrate the supplementary information given in each literature in grouping building fortification level, we added different fortification tags to [empirical fragility data](#) in Sheets “1_brick_concrete” and “3_RC”, and to [analytical fragility data](#) in Sheets “2_analytical_masonry” and “4_analytical_RC”. These tags illustrate the fortification level derived from the supplement information in each corresponding literature.

The grouping criteria are as follows:

For [empirical masonry fragility data](#) in Sheet “1_brick-concrete”: five tags specified in Column “Group of data” are used in differentiating the collected data: no fortification, unspecified fortification, low fortification, middle fortification and high fortification.

‘no fortification’ means there is no available fortification information we can get from corresponding publication;

‘unspecified fortification’ means that in some literature, they mentioned the building is fortified or unfortified, but without detailed fortification level;

‘low fortification’ refers to buildings with [VI level fortification](#) as given in corresponding literature;

‘middle fortification’ refers to buildings with [VII level fortification](#) as given in corresponding literature;

‘high fortification’ refers to buildings with [≥VIII level fortification](#) as given in corresponding literature.

Additionally, available building age information is used in grouping of fragility data extracted, like in Sheet “1_brick-concrete” from Hu & Sun (2010).

For [analytical masonry fragility data](#) in Sheet “2_analytical_masonry”, in Column “Group of data”:

‘low-middle fortification’ refers to buildings modelled with [0.05g~0.2g](#) fortification as described in corresponding literature;

‘high fortification’ refers to buildings modelled with [≥0.3g](#) fortification as described in corresponding literature.

For [empirical RC fragility data](#) in Sheet “3_RC”, the grouping criteria are similar to that in “1_brick-concrete”, with slight difference in that, given RC buildings are generally have better fortification performance than masonry, so in publications where building fortification information is not available, we mark it as “unspecified fortification”, as can be checked in Column “Group of data” as well.

For [analytical RC fragility data](#) in Sheet “[4_analytical_RC](#)”, the grouping criteria are like that in “[2_analytical_masonry](#)”.

Besides that, in Sheet “[2_analytical_masonry](#)”, fragility data based both on PGA and SA are collected; but since for masonry building, only PGA related fragility data are available, so finally we only use PGA related analytical fragility data for RC buildings.

(4) Filename “[\[step4\]China_fragility_output_database.xlsx](#)”:

This file is not so much different from the file in Step (3), only that we regrouped the data with different fortification level assigned in Step (3) and use them to plot the fragility related figures in the manuscript.

To achieve relatively sufficient statistical significance in the fragility data analysis, in this step subjective judgement is necessary. Thus for brick-concrete or masonry buildings, we assign “[masonry_A](#)”, “[RC_A](#)” building type to represent those with [unspericifed/low/middle](#) fortification level tag in Step (3), and “[masonry_B](#)”, “[RC_B](#)” to include those with [high](#) fortification level tag in Step (3).

The data within folder “[data_Fig3-4](#)” is the same regrouped fragility data extracted from this file.