

1976年唐山大地震 房屋建筑震害图片集

中国建筑科学研究院 编

THE MAMMOTH TANGSHAN EARTHQUAKE OF 1976

BUILDING DAMAGE PHOTO ALBUM

COMPILED BY CHINA ACADEMY OF BUILDING RESEARCH

中国学术出版社

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内 容 提 要

1976年7月28日,在中国唐山、丰南一带发生了7.8级大地震,波及天津和北京。由于震级大,烈度高,而且发生在城市,因此灾情之重,损失之大,不仅在我国地震史上是空前的,在世界地震史上也是罕见的。我们在详细的震害调查和分析研究的基础上,现从大量拍摄的照片中选择一部分典型的,汇编成册出版。

房屋建筑的倒塌和损坏,是造成人民生命财产巨大损失的直接原因,故本图片集重点放在房屋建筑震害上,也涉及有关的其他工程震害。涉及的地区,包括唐山地区、天津和北京。从地震烈度来说,从高烈度(11度)区一直到6~7度区的震害都有所反映。

我国是一个多地震的国家,本图片集的编辑出版,不仅对地震工程学科的发展具有重要意义,而且对工程抗震的科研、设计、施工和教学等工作来说,也是一本很有价值的参考资料。

BRIEFING OF CONTENTS

On July 28th of 1976, an earthquake of magnitude 7.8 on the Richter scale hit Tangshan and Fengnan areas of China and spread to the areas of Beijing and Tianjin. The occurrence of such a high intensity and magnitude earthquake in a densely populated big city caused a great disaster unprecedented in the history of China and even very rare in that of the world. China Academy of Building Research sent researchers immediately to the earthquake-prone area, investigating the damages and other earthquake phenomenon for the study of technical problems thereby incurred. This "Photo Album" collects the most important pictures to illustrate the damages to buildings.

Since the direct cause for the losses of life and property is the collapse and damage of buildings, this Selection put emphasis on the damage of building structures. Damages to underground structure, chimney, water tower, road and bridge are also involved. The Photo Selection illustrate the damages to buildings in different localities including Tangshan, Fengnan, Tianjin and Beijing with different intensities from as high as 11 to 6-7 accordingly.

China is a seismically active country. The compilation and publication of this Photo Album will not only benefit the development of the science of earthquake engineering, but also become a good aid for scientific researchers, professors, designers and contractors in their work.

1976年唐山大地震 房屋建筑震害图片集

中国建筑科学研究院 编

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前 言

1976年7月28日凌晨,在中国河北省的唐山、丰南一带发生了7.8级(里氏震级,下同)强烈地震,並波及天津市和北京市。这次地震不仅震级大、烈度高,而且波及面广,因此震灾之重,损失之大,在我国地震史上是空前的,在世界地震史上也是罕见的。

这是一次主震-余震型的浅源构造地震,震源深度为12~16公里,震级为7.8级。主震发生在7月28日3时42分56秒(北京时间,下同)。主震的宏观震中在唐山市路南区,仪器震中位于东经118.2°、北纬39.4°,震中烈度为11度。

这次地震的有感范围很广,北到哈尔滨,南至河南省黄河以北,西到山西省全境,东至渤海。这次地震造成的破坏极为严重。按地震烈度划分,唐山市路南区至女织寨为11度区,面积约47平方公里。该区的房屋几乎全部塌毁,钢筋混凝土结构的胜利桥桥墩折断,桥面下落;机车车辆厂的钢筋混凝土结构和钢结构厂房也大部倒塌。10度区东至古冶,西到丰南以西,南至稻地镇,北到傅家屯,面积为367平方公里(含11度区面积,下同)。9度区面积约为1,800平方公里。8度区面积约为7,270平方公里。7度区面积约为33,300平方公里。

主震之后,发生了多次强余震。截至当年9月23日为止,共发生4级以上的强余震423次,其中5~5.9级的25次,6~6.9级的5次。最大的一次强余震为7.1级,发生在主震当天的18时45分,震中位置与主震震中的地理位置相距不远。由于余震次数多,且震级大,因此累积震害比较明显。例如,跨越滦河的长达800米的公路大桥,主震之后仍可通车,7.1级强余震时,大部分桥墩破坏,桥面塌落水中;有许多房屋主震时裂而未倒,7.1级强余震时倒塌。此外,6级左右的余震也加剧了建筑物的破坏。

在地震灾害中,房屋建筑的破坏和倒塌是造成人员伤亡和设备破坏的主要原因之一。本图集着重反映房屋建筑的震害,同时也涉及有关的地质地貌、烟囱、水塔、道路、桥梁等方面的震害。

这次地震发生在人口稠密、工矿企业集中的城市,发震时间正值人们沉睡的时候;震前没有明显的有感前震,又未能及时发出临震预报;加之震前唐山市的基本烈度定为6度,因而绝大多数建筑物都没有抗震设防。基于这些因素,地震所造成的损失和破坏是极其严重的。据人民日报1979年11月23日报道,“这次大地震总共死亡二十四万二千多人,重伤十六万四千多人”。又据有关部门估算,这次地震的直接经济损失达96亿元之多。

因此,认真总结唐山大地震的经验教训,是工程抗震工作者义不容辞的历史职责。中国建筑科学研究院在震后立即组织了包括工程抗震、地基基础、建筑结构、勘察技术、建筑设计、建筑标准、农村建筑、建筑情报等方面的科技工作者,深入唐山、天津、北京等市的不同烈度区,对各类工程特别是房屋建筑工程的震害进行

了详细的调查研究，並拍摄了大量的震害照片。本图片集即是在分析研究的基础上，选择其中一部分典型的震害照片，汇编成册出版的。

唐山大地震使人民的生命财产和各类工程设施遭受了巨大的损失，代价是惨重的。然而，通过唐山地震的严峻考验，使我们对各类建筑工程在6~11度不同烈度区的震害表现及其破坏规律有了一个比较全面而直观的了解，获得了许多有价值的宝贵的资料，这对地震工程学科的发展无疑具有重要的意义。

唐山地震以后，灾区人民在党和政府的领导下，开展了艰苦卓绝的抗震救灾工作。只经过两年时间，全市工业生产就恢复到震前水平。从1977年下半年开始，有规划、大规模的城市建设在唐山全面展开，唐山人民以百折不挠的毅力进行生产建设，在地震废墟上重建家园。经过九年多的努力，唐山的重建取得了巨大的成就。全市已经新建房屋1,770万平方米，其中住宅建筑面积1,127万平方米，95%的居民已经搬进了新居，全市的工业生产也有较大的增长。现在，一个规模宏大、布局合理的新唐山已经重新出现在中国的华北平原上。本图片集也记录了唐山人民重建新唐山的部分情景。

本图片集共分十三章，由中国建筑科学研究院《1976年唐山大地震房屋建筑震害图片集》编写组负责编写，编写组由孙立群、钟益村负责。各章的编写分工如下：第一章，徐显毅、王中南；第二章，徐显毅；第三、六、十二章，钟益村；第四、五章，李文俊；第七、八、十、十一章，孙立群；第九章，潘千里；第十三章，王中南、皮声援。英文翻译：聂凤兰、滕致佳、王亚勇。本图片集中文稿由王开顺校阅，英文稿全文由魏珽核阅。参加工作的还有张凤九和声像室的部分同志。

在编写过程中，除了院内工程抗震研究所提供了大量的资料和照片以外，还得到了中国建筑技术发展中心、建设部综合勘察研究院等单位的大力支持，并提供了部分资料和照片，在此一并表示感谢。

1986年3月

Foreword

In the early morning of July 28, 1976, a strong earthquake of magnitude 7.8 occurred in Tangshan-Fengnan area, Hebei Province. The earthquake of high magnitude and intensity spread over a large area of Beijing and Tianjin in the North of China so that the devastation and the loss of both life and property were scarcely in the history of China as well as the world.

This was a main-after shock type of earthquake with shallow source having a depth of 12-16 km tectonic. The mainshock ($M_L = 7.8$) occurred at 03:42:56 (China Standard Time) on July 28, 1976. The epicenter was located in southern part of Tangshan City at 118.2°E , 39.4°N . The highest intensity assigned to the event was 11 on new Chinese scale (essentially, the Modified Mercalli Scale).

The earthquake was perceptible to the north as far as Harbin and to the south as far as the north bank of Yellow River in Henan Province, to the west as far as Shanxi Province and to the east as far as Buohai Bay.

The earthquake disaster is relatively high in this region. The areas covered by different intensities (equal to or greater than) were as follows:

1. Area of intensity 11, 47km^2 , in this area more than 90 percent of residential dwellings collapsed, for the Victory Bridge which was reinforced-concrete structured, the piers were broken and the deck spans fell, most of industrial buildings, such as the steel-structured workshop of the Locomotive Plant, collapsed.
2. Area of intensity 10, 367 km^2
3. Area of intensity 9, $1,800\text{ km}^2$
4. Area of intensity 8, $7,270\text{ km}^2$
5. Area of intensity 7, $33,300\text{ km}^2$

Following the mainshock, there were many aftershocks. From July 28 till September 23, 1976, there were 423 events above magnitude 4 including 25 ($M_L = 5.0 - 5.9$) and 5 ($M_L = 6.0 - 6.9$) strong aftershocks. The largest aftershock ($M_L = 7.1$) with the epicenter near by the mainshock's occurred at 18:45 on the same day. The accumulative damage effect of the successive aftershocks was very pronounced, for example, the highway bridge which was 800 m in length and crossed the Luan River still served as passage for trucks until the biggest aftershock ($M_L = 7.1$) occurred. After the aftershock the bridge piers were damaged and the deck spans fell. Another example, was that in the area of north-east to Guyie there were many houses still standing with severe damages after the main-shock, but collapsed during the $M_L = 7.1$ aftershock.

The collapse of building was the main reason causing the loss of life and the damage of equipment during earthquake. The collection of photos shows earthquake damages with emphasis on those to buildings, also involving some facilities, such as railway line, bridge, hydraulic structure, chimney, elevated water tank, etc.

Tangshan earthquake was such a great disaster mainly because the seismic risk in the region has not been adequately estimated. The Building Code had zoned Tangshan for intensity 6, which did not require buildings to be designed with earthquake-resistant measures. The earthquake was not predicted and there were no perceptible foreshocks prior to the mainshock. When people fell into a deep sleep the earthquake broke out just in the down-town of Tangshan.

The People's Daily of November 23, 1979 stated that 242,000 persons were killed and another 164,000 persons seriously injured during the earthquake. These figures were obtained covering Tangshan, Tianjin and Beijing areas. As for economic loss, the involved organizations revealed that the direct economic loss was up to 9.6 billion RMB.

Clearly, it is an unshirkable historic duty of earthquake engineers to learn much lessons from Tangshan earthquake. The China Academy of Building Research had paid much attention and efforts to this event. Immediately after the earthquake, some special groups of engineers, seismologists and architects from following relevant Institutes of the Academy: Earthquake Engineering, Foundation Engineering, Building Structures, Geotechnical Survey, Architectural Design, Building Standard, Rural Housing Construction and Building Information, etc. were organized and sent to Tangshan, Tianjin and Beijing regions. Specialists made a survey of damages to different types of constructions. Shown here are some typical pictures selected from the photos taken in the above mentioned areas and classified scientifically for publication.

We suffered a great loss in both human life and various facilities and paid a high price of blood. After the severe test of Tangshan Earthquake, we acquired more understanding about different performances of various structures and the rules of damage under earthquake with intensity from 6 till 11, we also got valuable reference materials, which are of great importance in the development of earthquake engineering.

After the earthquake, under the leadership of the Chinese Communist Party and the China government, the Tangshan people took undaunted and hard struggles against earthquake disasters. Only two years later the capacity of industrial production was recovered to the level before the event. Since the second half of 1979 a planned large scale urban construction has been carried out in Tangshan. The Tangshan people restored the production and rebuilt their own homes on the stretch of debris with indomitable willpower. Through ten years' efforts great achievements have been attained, 17.7 million m² of new buildings, including 11.27 million m² of housing, have been completed, 95% of the families have moved in their new houses. The industrial production has been developed with great speed. Now, a new Tangshan of broad scale and rational layout has appeared on the vast plain of North China. The album also collects some pictures showing the reconstruction of Tangshan.

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The whole text in Chinese of the Photo Album was checked up by Wang Kaishun; the English version examined by Wei Lian. Chang Fengjiu and Some Staffs in the Sound-Picture Department also took part in the compilation work.

The compilation group is grateful to the following units for their great support and generously offering large number of pictures and material: The Institute of Earthquake Engineering of China Academy of Building Research. China Building Technology Development Center and the Comprehensive Institute of Geotechnical Investigation and Surveying, etc.

March 1986

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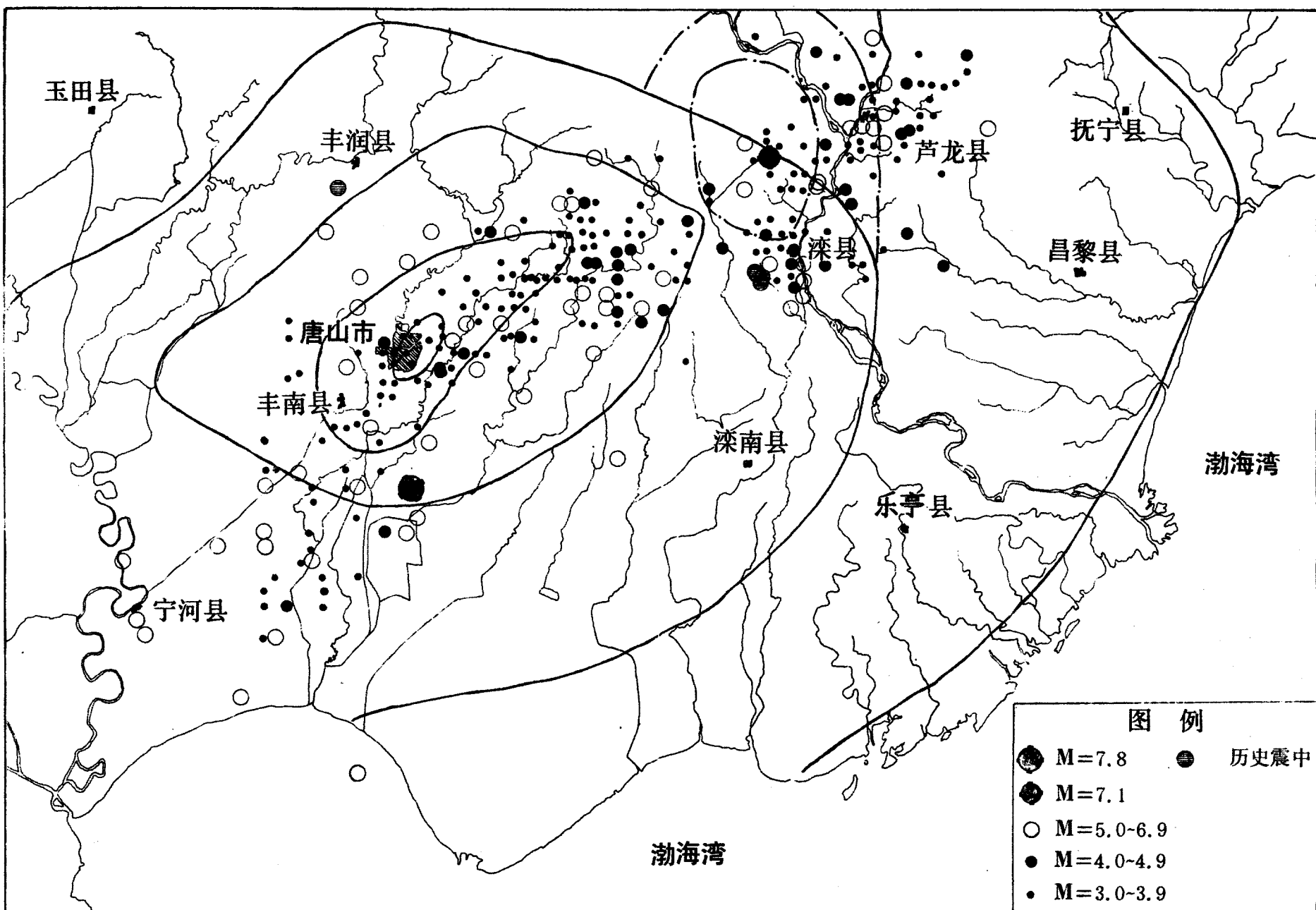
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一、唐山大地震概况

唐山地震是我国近几十年来发生在人口稠密的城市地区的一次大地震。这次地震的特点是震级大、震源浅、烈度高。震中烈度高达11度，唐山市区及其附近郊区为10度。影响天津市的烈度为8度，北京市为6~7度。房屋建筑和各类工程构筑物的倒塌和破坏是这次地震造成人民生命财产巨大损失的直接原因。另外，地震造成的地表破坏也是相当严重的。关于各类房屋建筑的震害情况，将在其后各章详细介绍，本部分的内容主要是介绍唐山地震的主震和强余震震中分布图，烈度分布图，唐山、天津、北京等地区房屋建筑的震害概况，以及8度以上烈度区的地表破坏情况。

I. BRIEFING OF THE TANGSHAN EARTHQUAKE

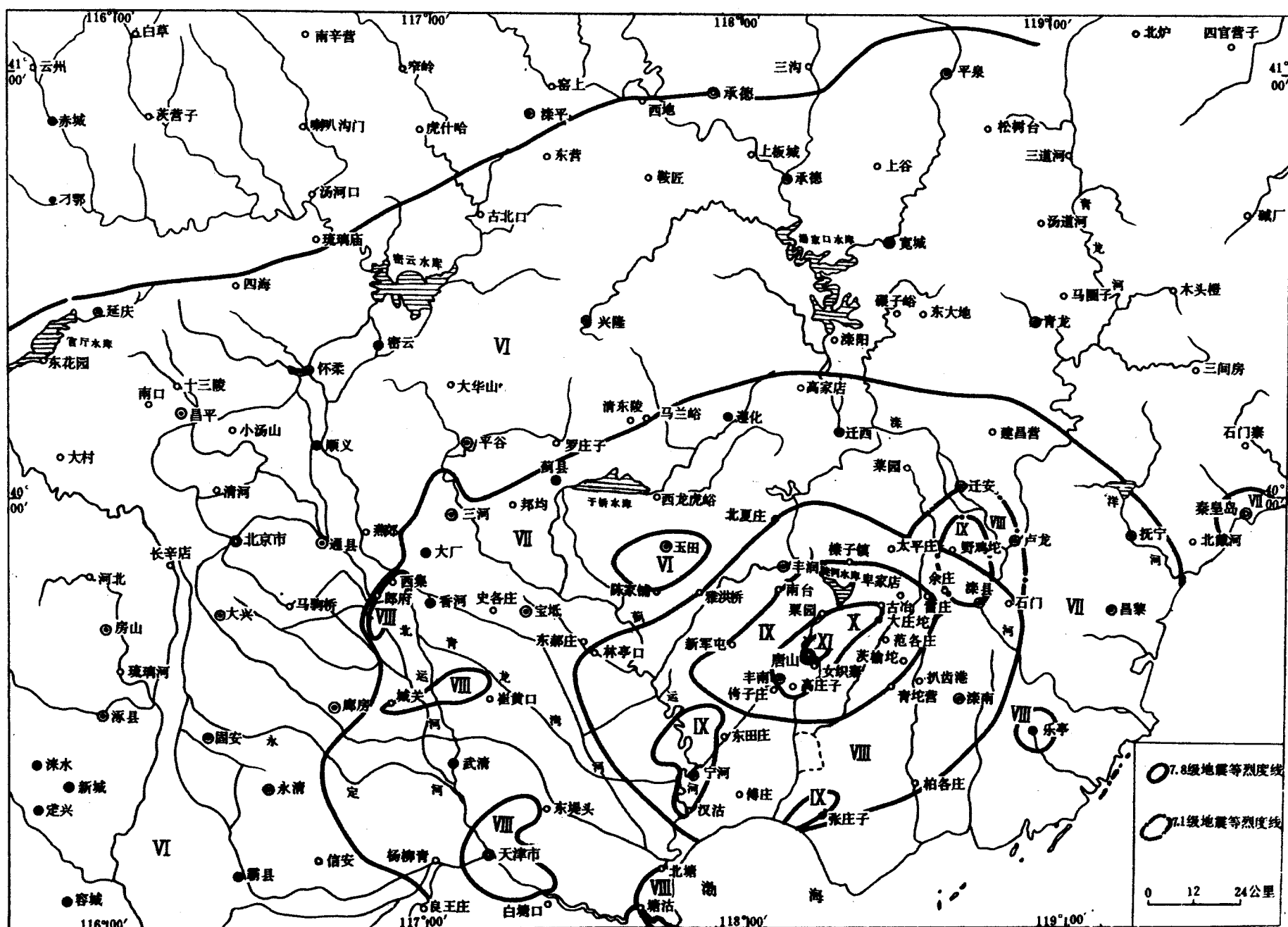
The Tangshan earthquake was a strong earthquake occurred in a densely populated city in our country in the last decades. This earthquake had the feature of great magnitude, shallow epicentre and high intensity. The intensity reached 11 at the epicentre and 10 in the city proper and its outskirts. The earthquake affected Tianjin with an intensity of 8 and Beijing with an intensity of 6-7. The collapse of houses and various structures caused great losses of people's life and properties. Besides, the earthquake also caused very serious failure of the ground surface. The damages of various buildings will be dealt with in the following chapters, while the main aim of this chapter is to illustrate the distributions of the epicentres of the mainshock and the aftershocks, and of the intensities, as well as damages of ground surface in the high intensity zones with intensity 8 and more.



1-1 唐山大地震主震和强余震震中分布图。

Map of distribution of the epicentres of the mainshock and aftershocks of the Tangshan earthquake.

唐山地震等烈度线图



1-2 唐山大地震烈度分布图。

The intensity distribution map of Tangshan earthquake.



1—3 震后的唐山市路南区，建筑荡然无存，成了一片废墟（11度区）。



1-4 震前的唐山市路南区建筑鸟瞰。

Bird's eye view of the buildings in Lunan district of Tangshan before the earthquake.



1—5 震后的唐山市路北区，绝大多数建筑塌毁，仅少数幸存（10度区）。

6

Most of the buildings were damaged with only a few left in the Lubei district of Tangshan after the earthquake (in the area of intensity 10).

1—6 震前的唐山市路北区建筑鸟瞰。

Bird's eye view of the buildings in Lubei district of Tangshan before the earthquake.







1—8 唐山市唐山开滦煤矿一带的建筑破坏情况（10、11度）。

Damage of buildings in the area of Kailuan coal mine in Tangshan (in the area of intensity 10 and 11).