Because they had considered they were living in a low earthquake-risk area, many people, realizing that this was a major earthquake, thought that a gigantic earthquake must have occurred either in the Nankai Area (south of Osaka in the Pacific Ocean, where an earthquake of M 8.1 had taken place in 1946) or in the Tokai Area (east of Nagoya and west of Tokyo in the Pacific where seismologists have long warned of an ocean tectonic-type earthquake). They believed that Osaka must have been flattened, and this idea later led to some mistakes by medical doctors and nurses in Kobe.

II. Damage

A. Damage Figures

The strong ground motion in the densely populated Hanshin (Kobe-Osaka) area resulted in the following damage. (The figures as of 23 April 1995 were compiled by the Disaster Prevention Bureau of the National Land Agency in the Prime Minister's Office, which is the Government's coordinating body for emergency response.)

Table 3
Summary of Damage Figures

No. of Persons Dead	5,502
Missing	2
Injured: Total	41,648
Seriously Injured	1,961
Slightly Injured	25,008
To be classified	14,679
Damaged Houses: Total	390,692
Totally Destroyed	101,233
Half Destroyed	107,269
Partially Damaged	182,190
(not including the number of partially damaged houses in Hyogo Prefecture, which is still to be precisely surveyed)	
Damaged Public Buildings	549
Other Damaged Buildings	3,120
Fires	294
Road Damage (impassable points)	9,403

B. Causes of Human Casualties

The following shows the main cause of death for all the 5,502 casualties:

Table 4
Cause of Death

Main Cause of Death	No. of Cases
Death from crushing and/or suffocation by collapsed building and/or furniture	4,831
Death from fire (includes corpses burned after death)	550
Other (direct blow to head by falling object and total body contusion from a falling vehicle, etc.)	121
	Total: 5,502

Source: National Police Agency (as of 26 April 1995)

Of the above 5,502 cases, 2,358 police autopsies were conducted to obtain detailed information on the exact cause and time of death. 77.1% died from crushing and/or suffocation, 5.3% from brain damage, 4.4% from burns and 2.0% of shock from external injuries.

Table 5
Time of Death

Estimated Time of Death	Cases
Within 15 minutes after the earthquake of 17 January	2,234
By the end of 17 January	36
On 18 January	3
On 20 January	1
On 21 January	1
Undetermined	64

Note: The percentages by death and also the total of Table 5 do not add up to 2,358 because of several unidentified cases.

Source: Office of Police Autopsy Medical Officer, Hyogo Prefecture (as of 5 March 1995)

Most deaths were caused by immediate physical destruction from the earthquake. This is one of the characteristics of the "Shallow Direct Hit" type of earthquake, in which people do not have 1-2 seconds to take initial, body-protective action. Deaths from subsequent fires accounted for only 4.4% of total casualties. Note: The 550 cases reported in Table 4 include bodies burned by fire after death.)

In the Great Kanto Earthquake of 1923, which claimed the lives of 142,807 people, more than 90% of deaths were from fires, most of them survivors of the first ground motion who escaped from their houses but who were later surrounded by fires and burned to death. Since then, the Japanese people have always been aware of the horrors of large-scale fires after a major earthquake.

Fires spread widely in the densely populated Nagata Ward. However, they spread more slowly than in 1923. In some cases people were trapped in collapsed houses and could not escape before the house caught fire.

Table 6
Number of Deaths by Age/Gender

Age	<10	10s	20s	30s	40s	50s	60s	70s	80s	90s	Total
Male	128	133	227	120	206	355	427	328	253	22	2,199
Female	121	177	243	141	262	459	634	701	483	73	3,294
Total	249	310	470	261	468	814	1,061	1,029	736	95	5,493

Note: This table does not include the 9 unidentified bodies.

Source: National Police Agency (as of 26 April 1995)

Fifty-three percent of the casualties were 60 years of age and older. This percentage is very high since only 17% of Kobe's population is over 60. There are several reasons for this. In the traditional two-story wooden houses, the elderly tend to sleep on the ground floor, since climbing up stairs is sometimes a burden for them. Secondly, the elderly live in houses they built when they were young, which means that they tend to live in old houses. As described later, most of the structures that totally collapsed were the traditional, old wooden houses.

C. Structural Damage to Houses and Buildings

The strong ground motion, described in Table 1, caused enormous structural damage. Most housing damage was to the old, traditional two-story-high wooden houses with heavy rooftiles. However, there were also many houses which did not sustain any structural damage. Even in the Higashinada Ward, where structural damage to residential buildings was most extensive, a housing unit with no structural damage can sometimes be seen standing right next to a heap of wood and rooftiles from a totally collapsed house. Three major factors determined the structural damage to housing. First was the condition of the ground, including the composition of the soil,

underground water level and ground topography. Second was the type of building. Third was the age of the house. A thorough scientific survey of the exact causes of structural damage in relation to these factors will be issued later, but initial surveys have already provided some indications.

A preliminary survey by Kobe University's School of Architecture and the Architectural Society of Japan points out the following characteristics of structural damage:

1) Wooden Structures

The damage to old houses with traditional heavy rooftiles was exceptionally great. These 20 to 50-year-old wooden houses had been built on a post and beam frame, and the joints of their beams and columns to the foundation had already been weakened over the years by humidity. Thus, the initial ground motion just blew the joints away and the houses collapsed. To withstand typhoons, many traditional wooden houses in the Hanshin (Kobe-Osaka) Area, had a mud layer on top of their roofing base in order to fix the ceramic tile. This made the roof even heavier. Also, damage to the locally-called 'Bunka Apartments' (cheaply built two-story wooden apartment housing) was very great. In many cases, the ground floor was just crushed or else fell apart, while the upper floor remained structurally intact but just fell down. Further, there was damage to traditional temples and shrines whose structures are typical post-and-beam type with heavy roofing.

Damage to new wooden houses was slight. Most of the new, wooden panel-structure prefabricated housing suffered little or no damage. These prefabs became popular in the last 25 years and proved to be earthquake resistant. Traditional wooden houses with lightweight ceramic tiles and no mud layers on top also had little or no damage.

2) Steel, Steel-Reinforced Concrete and Reinforced Concrete Structures

Damage to buildings constructed after 1981 was minor. The building code was revised in 1981, following the 1978 Miyagi-ken-Oki Earthquake which affected the City of Sendai (population 800,000). Structural damage to buildings erected before the code went into effect was very great. Many mixed-use (commercial and residential) buildings, where the ground floor was used for shops with large glass windows but with few partitions/walls, had their ground floors collapse. Many medium-height (4 to 11 stories high) old SRC and RC buildings put up before 1981 suffered from shear cracks to their columns and structural walls. In some cases, middle floors with fewer partitions than other floors (e.g. the 4th or 5th floor of an 8-story building) were crushed. High-rise buildings (more than 60m high) erected after the 1981 building code did not suffer structural damage. In many lightweight steel-structure buildings, damage occurred because beams had been poorly welded.

3) Brick or Stone Masonry Structures

These structures are found only in historic, western-style buildings and were few in number. Churches and former consulate buildings - which had been built in the late

Photo 4 Building Collapse in Suma-Ward Residential District
Collapse of two story wooden housing
Hyogo Prefectural Government

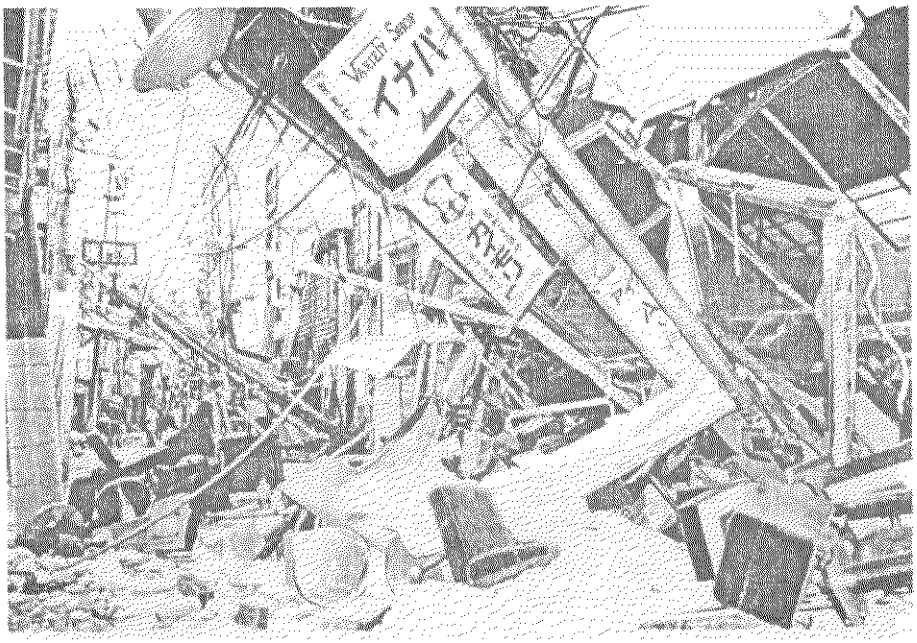

Photo 5 Building Collapse in Chuo-Ward Commercial District
Fallen signposts and debris blocking streets
Hyogo Prefectural Government