Remembering the Great Hanshin-Awaji Earthquake

At 5:46 a.m. on the morning of January 17, 1995, a magnitude 7.3 earthquake struck with an epicenter at the northern part of Awaji Island, and a seismic intensity of 7 was recorded in Kobe City and other areas. The disaster caused by this earthquake is now known as the Great Hanshin-Awaji Earthquake. The human toll from this disaster was 6,437 dead or missing and 43,792 injured. It also caused extensive damage to housing and other buildings and to critical infrastructure such as expressways, railroads, and electricity, gas and water utilities, resulting in catastrophic destruction mainly in the Hanshin region (between Kobe and Osaka). January 17, 2025 marks the 30th anniversary of this unprecedented disaster.

On the occasion of the 30th anniversary of the Great Hanshin-Awaji Earthquake, this feature looks back on the mission we achieved in the aftermath of the quake based on excerpts from our 40th anniversary commemorative publication (published in 1998) and messages from our directors who experienced the disaster firsthand.

The moment the earthquake struck

I awoke with the first tremor and immediately realized it was an earthquake. I quickly tried to reach my mother downstairs but I couldn't even crawl, let alone stand. Our house was shaking a great deal and I was jolted and tossed violently. Our wardrobes collapsed and I was aware of the sound of breaking crockery. Various objects were constantly being flung left and right before crashing to the floor. After a while, the shaking ceased. I quickly made my way downstairs only to find myself stepping in a pile of shattered glass. I tried to calm myself amidst the darkness. My mother was sitting on her knees in the scattered room with a look of stunned disbelief. A mirror stand lay half collapsed right beside the pillow of her bed. At the foot of her bed lay the television and wall clock in positions that defied explanation as to how they got there. And then another large tremor occurred. Gas was leaking into the room from the disconnected hose of our heater. Outside we could heard crushing sounds. Although the quake only lasted moments, it seemed like an eternity.

Our house had tilted on its foundations but had somehow managed not to collapse. I don't even recall getting changed. I looked down at my bleeding feet but oddly did not feel any pain. I made my way to the front door and tried to open it but it wouldn't budge. I could hear my heart thumping. I barely managed to squeeze my body through and made it outside, where I encountered the sight of heavily tilting telephone poles and cracked and buckled roads. The neighboring walls had collapsed, roof tiles were strewn across the street, and the smell of leaking gas filled the air. Covering my nose and mouth, I evacuated with my mother to the nearby middle school. (Experience of a Kobe Branch office employee recounted in our 40th commemorative publication)

In the heavily damaged Hanshin region, SHO-BOND CORPORATION's presence consisted of the Kobe Branch and Osaka Branch, as well as small and large sub-branches and subsidiary locations, collectively employing a total of 145 personnel at the time of the guake.

Communication and transportation networks were disrupted after the earthquake so it was very difficult to confirm the safety of our employees and their families, and it took two days after the disaster to confirm that everyone was safe. The letters that our employees contributed to our commemorative publication are a stark reminder of the confusion and fear that ensued immediately after this major earthquake

This major earthquake was incredible even for SHO-BOND engineers who are experts in seismic reinforcement of structures At around 30 to 40 minutes after the earthquake, the expressway was reported to have broken off at the median strip and collapsed. Not believing the report. I rode my bicycle to Route 43 and found that the elevated piltz structure section of the Hanshin Expressway Kobe Route 3 had collapsed. The expressway structure had also fallen, the PC piers had sheared and collapsed, and the steel piers had buckled locally. I genuinely couldn't believe my eyes.

The closer I got to Kobe, the more severe the damage I encountered, with condominiums and houses completely collapsed without any trace of their former state. Cars lay crushed under the collapsed structures of the expressway and people stood dumbfounded along the roadside. The entire scene defied belief.

On my way to the Kobe Branch at 9:00 a.m., I saw that the Fukae Bridge was significantly sagging in one area. The road was covered with sand boils triggered by liquefaction and the Kobe Branch building had collapsed to the northeast, with sand spewing out around the building due to liquefaction. I was shocked as this was the first time I had witnessed liquefaction. We used our Hanshin Sub-branch as an emergency response office, and cleared up the scattered desks and documents before going into action

(Experience of a former Senior Managing Director recounted in our 40th commemorative publication)



Collapsed expressway bridge (Hanshin Expressway Kobe Route No. 3)



Collapsed Shinkansen overpass (Sanyo Shinkansen)

Company-wide commitment to restoration work

SHO-BOND established the "Southern Hyogo Prefecture Earthquake Response Headquarters" a few hours after the earthquake to mount a company-wide respond to this major disaster. From the day after the disaster, our directors from Tokyo were consecutively dispatched to the damaged area to lead the recovery efforts. In addition to our local employees and local partner companies, a total of more than 100 SHO-BOND employees and partner company personnel from Hokkaido to Kyushu rushed to the damaged area to help survey and inspect damaged structures and reinforce and restore them in order to prevent secondary disasters.

Timeline of SHO-BOND's response immediately after the quake

(excerpt from President's submission to 40th commemorative publication)

January 17, 1995 (the day of the earthquake)

Established "Southern Hyogo Prefecture Earthquake Response Headquarters" headed by the President to provide on-site support

January 18, 1995

General Manager of Construction Division arrives at Osaka Branch and establishes local Response HQ

January 19, 1995

Administrative department staff attend Response HQ meetings to strengthen lifestyle support for employees and partner companies

- Support personnel continue to arrive in Kobe from all over the country
- →A total of 62 SHO-BOND employees and 40 workers from 7 partner companies come to provide support
- SHO-BOND is inundated with requests for structural survey and construction work
- * Contact was made with one employee whose safety had not been confirmed, and all employees were confirmed to be safe

January 20, 1995

Tokaido Shinkansen Line between Shin-Osaka and Kyoto re-opens

January 23-24, 1995

Our President, Vice President, and Managing Director visit the Osaka and Kobe Branches to strengthen the local Response

January 25, 1995

We organized local special construction systems for Japan Highway Public Corporation, JR Tokai, JR West, and Hanshin Expressway Public Corporation, and established a dynamically responsive system by delegating significant authority equivalent to that held by our branches.

From onset of the earthquake to Day 10

Immediately after the disaster, transportation, logistics, and information networks were in chaos, but all of our employees who were able to come to work did so. Our personnel in charge of each construction site performed status checks and began taking the initiative where feasible to remove hazardous materials from roads, ensure traffic flow, and survey the damage.

As time passed, we were inundated with requests for support from expressway, railroad, and other critical infrastructure administrators, and we responded by launching full-scale efforts on emergency surveys, inspections, and restoration work. Over the next 10 or so days, we began the immense, sleepless task of addressing infrastructure damage on a hitherto-unseen scale in order to expedite restoration of the infrastructure that acts as a lifeline to the Hanshin metropolitan area

On January 18, we mobilized after receiving successive requests for bridge surveys, inspections, and reinforcement and restoration of damaged roads and bridges from various government agencies and design firms. We used a conference room on the fifth floor of the Osaka Branch as temporary lodging, with tarpaulins spread on the floor and futons arranged in rows.

The Osaka Branch sent bedding, food, water, and construction materials to the Kobe Branch every day but it took six to seven hours (more than six times longer than usual) to transport them so the provided lunches arrived late at night.

On January 19, the first group of 11 support personnel arrived from the Head Office and immediately began group-based bridge inspection and survey work that continued every day late into the night. While the number of support personnel was later increased and some were replaced, a total of 62 employees came to provide support. Our system for earthquake restoration work was enhanced with the support of 40 workers from 7 partner companies including those from Hokkaido and elsewhere.

Traffic congestion was particularly severe due to the collapsed bridges, and it took one hour to travel one kilometer in heavily damaged areas. The transportation of materials, equipment, and workers proved difficult for a number of days, and we were often unable to start work on time. We arranged cell phones for all of our employees and subcontract managers to facilitate communication but this was not always possible. The chaotic state of transportation and communication networks and the lack of information also complicated the process of receiving recovery instructions from our customers. All of our employees worked diligently to meet our customers' requests, even at the expense of eating and sleeping.

(Experience of the General Manager of the Osaka Branch Construction Department recounted in our 40th commemorative publication)





immediately prior to the earthquake

The damage to the Hanshin Expressway Kobe Route No. 3 was beyond imagination. Communication and transportation networks were severed and we did not have enough employees to conduct the necessary surveys and inspections amidst the ensuing chaos. We were therefore unable to perform detailed assessments of structural damage for two to three days after the earthquake.

The extent of damage to bridge piers required urgent inspection so various organizations (such as maintenance companies, general contractors, bridge manufacturers, and design firms) cooperated to conduct detailed surveys including photographs of damaged areas and measurement of crack dimensions, and to compile and report basic data for emergency repairs. After each aftershock during the survey period, we were asked to resurvey the site, inspect for abnormalities, and report back, which proved very difficult for our employees as they had no choice but to conduct surveys on foot.

(Experience of a former Senior Managing Director recounted in our 40th commemorative publication)

In the chaos immediately after the disaster, our work did not go smoothly. Materials were scarce and the only means of transportation to the site was on foot or by bicycle. Despite these challenges, everyone worked desperately to protect the city and its people.

At around midnight on January 23, the Hanshin Expressway Public Corporation sent us an urgent message requesting us to investigate emergency preventive measures for RC bridge piers and to brief their Kobe Administrative Department by 9:00 a.m. the following day. We investigated using the Steel Jacketing method as a means capable of resisting seismic forces.

One major issue was whether it would be possible to procure the necessary materials due to the inability to gather sufficient information amidst the disruption to communication and transportation networks.

On January 24, the Hanshin Expressway administration office determined that secondary disaster prevention was a basic policy. As a result of our emergency surveys and inspections, a construction method using steel plates and concrete was adopted as an emergency disaster prevention measure. We were instructed to do our utmost in order to complete work on the 80 bridge piers urgently requiring reinforcement by January 27.

All construction work was directed to be performed by six infrastructure maintenance contractors under the direction of SHO-BOND CORPORATION.

While materials procurement was a major issue during the investigative phase, we were reassured to learn that the Osaka branch of MITSUI & CO. was able to make arrangements and would cooperate.

As a result of the combined efforts of each company while also resolving a series of other issues, the reinforcement of 80 bridge piers was successfully completed on the morning of January 28.

(Experience of a former Senior Managing Director recounted in our 40th commemorative publication)

Coincidentally, SHO-BOND had been using the Steel Jacketing method to perform seismic reinforcement work on bridge piers near Tsukimiyama on the Kobe Route No. 3 of the Hanshin Expressway just prior to the earthquake in December 1994. While the piers that we had reinforced were not damaged in the Great Hanshin-Awaji Earthquake, the adjacent unfinished piers had sustained damage. The Steel Jacketing method consequently garnered increased attention as a method for reinforcing bridge piers against earthquakes, and it has since been adopted as a key method for earthquake restoration work. At the time, few construction companies had the technology and expertise to repair such structures, while we demonstrated our expertise as a maintenance specialist at each stage from the design to construction of emergency repair and reinforcement projects.

One notable achievement during this period was our emergency restoration work on the Tokaido Shinkansen Line between Shin-Osaka and Kyoto. We worked for three days and three nights largely without food or sleep and in extreme conditions to repair the piers and achieve our goal of re-opening the bridge to traffic on January 22.

Looking back on the experience of overcoming these harsh construction conditions, the then Director of the Osaka First Branch who oversaw the project wrote the following.

[Completing bridge pier repairs in the early morning of January 20 after 3 days and 3 nights work] The end of our work is finally in sight. The news over

the car radio is reporting quake damage in Kobe in what sounds like a major fire. I hadn't had time to listen to the radio until now. Now it is almost morning.

"Director, Doctor Yellow (a yellow-colored Shinkansen track inspection train) will be passing us soon" my colleague tells me. It is already past 6:00 a.m. as I get out of the car and stand at the intersection under the elevated Shinkansen track. If I move back slightly, I can see in the direction of Osaka but the noise barrier is too high and we are too close to see the train approaching. My colleague places his hand on the bridge pier that we have finished working on in an attempt to detect the oncoming train's vibrations. 60 seconds. Now 30 seconds. The sound of the approaching train reaches my ears. I look up but cannot see the train. A faint light passes and the train speeds away with almost no vibration. The Shinkansen line is now safely re-opened. I look at my colleague and we exchange a knowing glance. The line's re-opening is unexpectedly quick. I was hoping that the moment would be slightly more emotional but I couldn't see the train so I resign myself to the fact. My colleague and I ascend the scaffolding and check the wedge packed in the gap between the bridge girders and the temporary columns by tapping it with a hammer. We don't detect any anomalies. In fact, the work is a great success. I am filled with a guiet sense of satisfaction. The hardships of the past three days run through my mind like a revolving lantern. I'm sure my colleague feels the same. Before I know it, the sun's rays are bathing the site in sunlight.

the second s

Initial response to approx. 3 months after

After our initial response which lasted around 10 days, we commenced full-scale restoration work without delay. This work was intended to further repair and reinforce the structures that were minimally repaired in the first 10 days in order to prevent secondary disasters and ensure transport capacity, thereby restoring these structures to levels approaching their normal condition. We organized a special system to enable dynamic responses to infrastructure administrators including then-Japan Highway Public Corporation, JR, and local governments, and subsequently undertook a major volume of construction projects.

However, the difficulties that hindered our employees during the first 10 days—such as repeated aftershocks, traffic chaos, mixed information, and shortages of construction materials, food, and other supplies—also continued into the full-scale restoration phase.

[Completing our initial response of reinforcing 80 bridge piers on the Hanshin Expressway]

As a measure to prevent secondary disasters, the Hanshin Expressway administration office issued a policy to expand the scope of safety measures in the event of aftershocks that are expected to cause instantaneous collapses and further damage to structures. In addition to the 80 bridge piers that had already been reinforced, the Hanshin Expressway administration office issued instructions to urgently reinforce another 170 piers by the end of February.

It seems like only yesterday that I again found myself pondering at length about whether or not we could make sufficient progress in procuring materials and coordinating our manufacturing, transportation, temporary storage, construction, and other processes given the disruption of communication and transportation networks, whether our maintenance subcontractors would be able to keep pace, and whether SHO-BOND's employees and workers could manage to sleep and rest. Each company in charge affirmed their sense of responsibility in completing their respective construction projects no matter what, and committed to doing their utmost.

The quantity of materials used for the 250 units (80 units + 170 units) was 1,500 tons of steel plates, 600,000 H.T. bolts, and 5,000 m³ of concrete.

Our Steel Jacketing reinforcement was not performed during the installation of temporary columns. Rather, the girder support and bridge support temporary columns were done first and the Steel Jacketing was done after that. This required a great deal of time and effort, including partially dismantling the temporary columns already completed. Every time there was an aftershock we had to cope with our anxieties and concerns about the potential dangers, and we were driven solely by our mission of completing the restoration work.

(Experience of a former Senior Managing Director recounted in our 40th commemorative publication)



Reinforcing Shinkansen overpass piers using steel plate bonding

第一次の平住日

Reinforcing columns using CFRP

SHO-BOND employees slept in conference rooms in the Branch building or in hotels that could only be booked for one night, and they traveled around the Hanshin region on mopeds to perform restoration work. The Kobe Branch was built on reclaimed land and liquefaction after the quake caused the entire building to tilt by about 3 degrees and sink up to 70 cm, resulting in the government's assessment as completely destroyed. The water supply remained cut off so it was difficult to flush toilets but our employees came together and encouraged each other to complete the restoration work as quickly as possible.

Electricity and telephone services were restored relatively quickly at the Kobe Branch but there was no concrete timeline for restoring gas and water supplies, and the building's location on reclaimed land meant that it was among the last in Kobe City to have these services restored. Traveling by car in the Hanshin region inevitably meant becoming stuck in traffic jams so we leased moped bicycles to get around. Our employees who had difficulty commuting and those who were reluctant to sleep alone in their apartments after the earthquake instead slept in the 5th floor conference room and ate cup noodles while working tirelessly on emergency restoration projects including the Sanyo Shinkansen, JR commuter lines, and the Harbor Expressway.

(Experience of a former Kobe Branch Manager recounted in our 40th commemorative publication)

Kobe Branch building tilting after the earthquake

In pursuit of stronger infrastructure

We completed our contracted restoration projects consecutively over the 3-month period following the disaster up to the end of April 1995.

We were subsequently engaged in the main restoration work for the full re-opening of the Hanshin Expressway Kobe Route No. 3 which sustained the most serious damage of all expressways. In addition to repairing and reinforcing damaged areas, our technology has been utilized in a wide range of repairs and improvements including reinforcing bridge deck slabs with carbon fiber reinforced plastic (CFRP), improving median strips, eliminating the need for joints through connecting girders, replacing existing bearings with seismic isolation bearings, removing bridge deck slabs and replacing joints using JACK BEAM METHOD, and installing noise barriers. After more than 18 months of restoration work since the disaster, the Hanshin Expressway Kobe Route No. 3 was fully re-opened to traffic on September 30, 1996, and is now even stronger than before the earthquake. With this re-opening, the Hanshin Expressway has finally regained its function as the main arterial route linking East and West Kansai

The Great Hanshin-Awaji Earthquake significantly shook the conventional belief that infrastructure cannot collapse. The earthquake led to emergency inspections of bridges throughout Japan and the

revision of technical standards for the design and construction of road bridges to establish new earthquake resistance standards, resulting in the expedited seismic reinforcement of road structures throughout the country. On the back of these developments, we have made further strides as an expert in seismic reinforcement by leveraging our experience in earthquake restoration work.

Today, three years after the earthquake, there is no trace of the 250 Steel Jacketing points that we constructed as part of emergency response work. Starting in 1995, the Japanese government implemented a 3-year seismic reinforcement plan.

This seismic reinforcement work has now been completed and work is proceeding on the final stage of installing sound absorption panels on the underside of the elevated expressway. At the end of March 1998, the Kobe Route No. 3 Expressway will be significantly improved compared to how it was prior to the earthquake.

(Experience of a former Senior Managing Director recounted in our 40th commemorative publication)

Natural disasters are becoming increasingly severe and frequent, and pose a major threat to our lives. The risk of earthquakes in particular has been increasing, with the Noto Peninsula earthquake occurring on January 1, 2024, and the Nankai Trough Earthquake Advisory issued in August.

These risks make it even more important to improve the strength and resilience of our infrastructure now. SHO-BOND will continue contributing to the realization of a safe and affluent society by drawing on the memories of the Great Hanshin-Awaji Earthquake that we experienced 30 years ago.



Experiences of Our Directors

Hiroshi Takemura

Managing Director, General Manager of Engineering Division and Director of Technical Research Institute (then a member of the Shikoku Branch Engineering Department)

SHO-BOND CORPORATION

Immediately after the disaster, I traveled to Osaka to offer my support. As we flew over Kobe, I looked out the airplane window and fell speechless as I witnessed a city in ruins that defied imagination. I was on my way to a site inspection while wearing a helmet bearing our company name when a site worker came dashing toward me and asked "Are you from SHO-BOND? When will you make it to our site? We have been waiting for your help three days already!" in a desperate tone. After a similar experience at a similar site, I became acutely aware of just how people were relying on our company to help fast-track the restoration work.

From the next day I was engaged in a damage survey. We traveled almost entirely on foot and I still don't know how many kilometers we walked each day. All I remember is that I was completely exhausted every day. I learned firsthand the severity of the damage, including the bending and shear cracks at the base of concrete piers, the buckling of steel piers and steel box girders, and the destruction of bearings. The ensuing hardships faced not only by our employees on site but also our Engineering Department personnel responsible for determining construction methods and designs were simply unfathomable. I recall being impressed by the senior staff who, in order to

Masaaki Konomi

Director and General Manager of Planning Department. West Japan in-house Company, Kyushu Branch Manage (then a member of the Engineering section, Precast Deck Slab Promotion Office) SHO-BOND CORPORATION

When I was asked to write this submission, I was reminded once more that 30 years have passed since the earthquake. When I attempted to recall the earthquake and its aftermath, I came to the realization that whatever humans can build can also break down or be destroyed. On that day, an entire area and Kobe City in particular was simply destroyed along with many buildings and other structures that we had previously used without any concerns

I was working at the Head Office at the time and I vividly recall seeing a Metropolitan Expressway engineer in tears when he saw images of the immediate aftermath of the earthquake. I felt that something truly terrible had occurred when the engineer expressed his surprise at the fact that, even though economic design was once standard practice in Japan*1, a structure built according to technical standards*² could be destroyed so suddenly. Even in the midst of this chaos, we could contribute to disaster recovery efforts by leveraging our experience in completing numerous repair projects under strict time constraints as a repair specialist since our founding.



respond to the constant influx of repair consultations, researched the relevant scientific literature in a brief period of time and then determined how to respond while also drawing on our company's previous experience.

I was officially transferred to the Osaka Branch Engineering Department in April of the following year, and for the next 20 years I was engaged in the front-line reconstruction of the Kansai region. The two devices we use to help prevent bridge collapses are the "Restraining Chain" and the "Shearing Stopper," which we developed to cope with major seismic events after the Great Hanshin-Awaji Earthquake. We verified the effective functioning of these devices in preventing bridge collapses in the subsequent Great East Japan Earthquake. Kumamoto Earthquake, and Noto Peninsula Earthquake. As the General Manager of the Engineering Division, I am proud that SHO-BOND's technology developed through our experiences of the Great Hanshin-Awaji Earthquake continues to protect infrastructure today.

The technical standards that serve as the basis for designs have been repeatedly revised to the point where we are now required to expect the unexpected. The increased scale of all aspects of our operational response-including the size of disasters we must anticipate and the scope of the countermeasures—has provided both opportunities for our company to grow and challenges for us to overcome

In the 30 years since the Great Hanshin-Awaji Earthquake, Japan has suffered many other disasters with an ever-increasing level of damage. I believe that we must accept these various disasters as a part of our daily life, and must constantly remind ourselves that disaster countermeasures are an issue that we all must address. As a leading infrastructure maintenance company, the SHO-BOND Group will continue to support the strength and resilience of Japan's land structures.

*1: Economic design refers to the practice of designing structures with an emphasis on cost reductions in order to curb construction expense

*2: Technical standards for bridges and elevated roads, etc., stipulated by the national dove