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Transition of Japanese Architectural Demolition “Kaitai” - Until the Establishment of the Tokyo Demolition Cooperative -

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1. Introduction

Now, half a century after Japan’s period of rapid economic growth after World War II, buildings are being demolished frequently. Among them, there are many issues regarding the subsequent use of demolition materials, the current situation being that the technology for second-hand materials is not progressing. This problem has evolved into a global environmental crisis; this scrap-and-build trend is expected to continue in the future.

This report records a survey from the Meiji era to the middle of the Showa era (year that Tokyo Demolition Cooperative was established and its subsequent years).

2. History of Wooden Building Demolition Industry

2.1 History Prior to the Razing/ Demolition Industry

Initially, no contractor specialized in demolishing buildings, and it was said that the Japanese steeplejacks (Tobi) and carpenters lead the demolition work. At that time, the steeplejacks were said to demolish a building’s framework while the carpenters broke the interior and other decorations. Around 120 years ago (early Meiji era), the first contractor specializing in building demolition and structure relocation was recorded.

In the early Meiji era, the authority of the feudal lord (daimyo) fell, along with the shogunate’s overthrow. As a result, the feudal lord (daimyo) could not manage the land he owned and put it up for sale. As time passed, some people bought the land and built a new building. During this era, timber was precious commodity due to its high price and shortage. Therefore, there was no choice but to procure materials by dismantling the existing building. The demand to use second-hand materials then increased, and a market for selling and buying second-hand materials has gradually become necessary. Thus, a second-hand store selling old fittings and old timber opened in Kurumazaka, Ueno, Tokyo, and a market was established. The re-used wooden materials in these markets (materials from the dismantled buildings) were traded at about 70% of the price of the new materials.

In this way, old timber was traded at a price comparable to new timber, so when demolishing a building, workers used a demolition method that would not damage the timber materials. If damaged, the value of the wood decreased, therefore, the workers put their hearts into dismantling the wood without damaging it. If a blade like a saw were used to demolish a building, the material would be damaged, so there was a demand for a tool that would not damage the material. The razing/ demolition industry worked with a blacksmith to develop a tool that would satisfy their needs; these tools are shown in **Fig. 1**, **Fig. 2**.

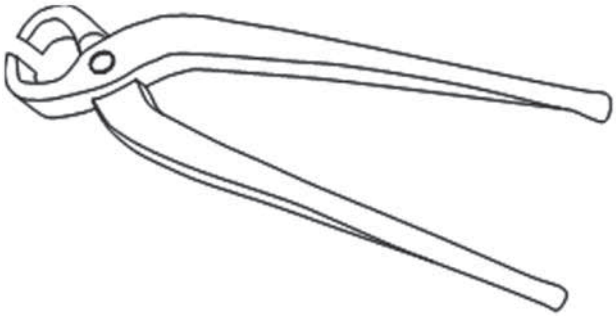

Fig. 1 Tool used to pull out a Japanese nail

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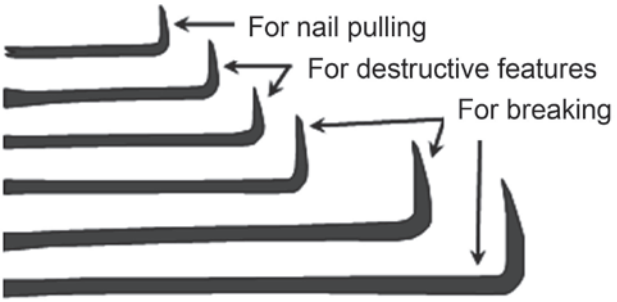

Fig. 2 Pry bar

Fig. 1 is a tool used to pull out a Japanese nail and pull the nail vertically without leveraging the principle of leverage to pull out the nail. On the other hand, the pry bar in Fig. 2 uses the principle of leverage to pull out nails: this tool was used when pulling out western nails. Also, there were various sizes and shapes of this pry bar, and depending on the size, not only can it remove nails, but it can demolish floor materials and roofing materials. In addition, the ceiling board was pushed up and dismantled using the pry bar. Unlike today's efficient tools, the tools used then were time-consuming and labor-intensive but do not damage timber. By using these tools, each nail and each floorboard were separated.

During this time, homeowners spent money on ceiling boards, alcoves and beams (beams that run between columns in traditional Japanese architecture). They would use expensive woods for such parts, so workers became even more careful when dismantling these parts. For example, in high-value wood such as ebony, if one touches the surface with bare hands, the oil in their hands will be transferred to the wood, and that alone reduces the value. Therefore, after covering the wood's surface with paper, workers would then put on new work gloves. The value of a ceiling board and such will be reduced even if one piece was chipped (if one piece of the ceiling between 8 tatami mats is missing, it can only be used as a ceiling between 6 tatami mats, so the value will be reduced by two tatami mats) so workers went to the attic and removed the nails one by one. Workers also paid the utmost attention to items such as "絞 (Sibori)" logs (artificially shaped log) and wood films (**Fig. 3**) that would lose their value if they were damaged even slightly and demolished so as not to reduce their value.

In this way, a razing/ demolition industry specializes in demolishing buildings and taking out old materials. These workers in this industry worked not only on buildings but also on bridges. They broke everything on the bridge by hand, but only when demolishing the stakes, they used a ship to pull out the stakes using the tide's ebb and flow. Precious iron ships were used to extract the piles as the stakes on the bridge were so sturdy that the boat would dismantle if anyone tried to extract it with a wooden boat.

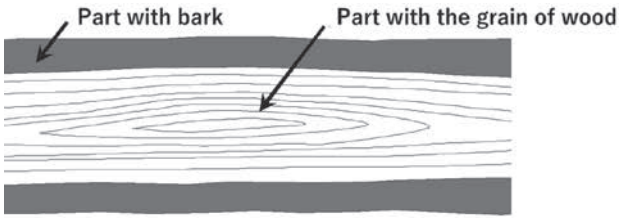

Fig. 3 Wood films

2.2 Razing/ Demolition Industry and Second-Hand Stores

Since the razing/ demolition industry's establishment, the relationship between the razing/ demolition industry and the second-hand stores grew very close. As old materials were traded at high prices, when demolishing a building, second-hand stores offered money to buy the building instead of getting a contract. Then, it was a form of making a profit by selling the timber and fittings from the demolished building. Therefore, in many cases, the second-hand stores first bought the building and had the demolition industry workers work as subcontractors. Some vendors (demolition industries) managed the entire process from ordering to selling.

Razing/ demolition industries sold the old materials from the day of the construction to a second-hand store on the same day. Therefore, when demolishing a building, workers always had the consideration to sell used building materials. Precisely, the woods were demolished by classifying according to size and material, dividing them by unit amount (e. g., 3.3m^2 for floorboards, 11.8m for pillars), and then neatly organizing them. The workers were also conscientious when handling the wood while distinguishing: the board materials were wedged with a paper-wrapped crosspiece, and old materials were not tied directly together with the crosspiece with a rough rope.

2.3 Demolition Industry from Taisho Era to Pre-War Time

In the Taisho era, the Taisho Expo was held in 1914 in Ueno, Tokyo (near the present Ueno Park). The main venue was in Ueno Park, but records show that inter-connected events were held in other parts of the Tokyo metropolitan area. Even at such a large-scale event, it is said that all the timber of the dismantled building was resold as used timber. There are records stating that such demolition work was carried out stably until before World war II.

2.4 Demolition Industry During Wartime

During the war (around 1945), the Japanese government proposed to "organize a union of the demolition industries and reorganize the city of Tokyo to prevent fires." At that time, Hatsutaro Oguma and three to five other demolition

contractors were called to the section chief's office of the Metropolitan Police Department, where a meeting was held to organize the union. It has been stated that many members of the Metropolitan Police Department and senior military personnel were present in the forum. The administration thought that the demolition contractors would demolish buildings as roughly as the construction laborers and manual laborers. To prove that this was not the case, the contractors demolished the Metropolitan Police Department's Chief's office, which was the meeting place. They then immediately reassembled it. Impressed by the dexterity and carefulness of their work, the army decided that the original Japanese word for demolition contractors wouldn't fit their description and sought another title. The colonel of the military named the current Japanese word "解体 (Kaitai)" for demolition contractors. Currently, two characters represent the word "解体 (Kaitai)" in Japanese: one with the meaning "to disassemble", "解 (Kai)" in Japanese, and the other, "the body", "体 (Tai)" in Japanese. After this forum, a union of the contractors was established under the title "Tokyo Demolition (Kaitai) Cooperative."

Since the Tokyo Demolition Cooperative's inauguration, the demolition industry has also worked under the military's jurisdiction. There is such a story in that the records show: when asked to demolish a building, an angry soldier who was upset that the demolition wouldn't succeed on the exterior tried to smash the structure with an armored vehicle. The armored vehicle was utterly stuck in the construction and could not move, which only led to the process slowing down. This story highlights a lesson that many contractors can learn from: even if you try to dismantle a building with force, it will never go well and there are consequences to dismantling it this way. Taking this case as an example, if you demolish the building from the top of the wall, the broken wall will accumulate at your feet, and you will not be able to dismantle the lower part of the wall. Therefore, when demolishing a wall, it is a rule of thumb to dismantle it from below.

The technology of demolition results from the accumulation of the inherited technology based on many years of experience: efficient demolition requires the technology, knowledge, and expertise passed down from many years ago.

2.5 Post-War Days and Demolition Industry

Contracts to demolish wooden buildings have dropped sharply in Tokyo, which became a burnt field due to the Great Tokyo Air Raid in 1945. Instead, contractors temporarily started to demolish steel-frame building warehouses that escaped air raids. During this time, steel was a valuable resource, and if a contractor had one or two jobs like this a year, they had a steady annual income. Records state that the demolition industry stayed in business by doing such work for about ten years after the war.

As the economy gradually improved, contractors resumed demolition of wooden structures. In this era, wood, roof tiles, and corrugated sheet iron were demolished and resold. Tiles were demolished by hand in assembly line work, and corrugated sheet irons were sold after filling the nail holes with solder.

The number of steel construction jobs had increased over time, but the plan to demolish materials and resell remained. The thick iron plate that was demolished and taken out was thinly stretched and sold as a reinforcing bar. This work was called "伸鉄取 (Shin-Tetsu-Tori: Strech-Iron-Getting)."

As shown in **Fig. 4**, in the Mid-Showa era, reinforced

Fig. 4 Yuraku-cho Pikaderie Theater Demolition (1956) Provided by Asahi Shimbun

concrete constructions were also demolished. Again, the contractor used a hammer and chisel to dismantle the materials by hand to remove reinforcing bars in the concrete without damaging them.

In this way, as time progresses, it is no longer just the demolition of wooden structures. Therefore, the conventional demolition contractor demolishes the wooden building, and the demolition of reinforced concrete construction is done by the contractor “Yamaya”, who specializes in stone cutting. The two traders were co-dependent as they relied on each other for work contracts. Although the division of labor was carried out in this way, old materials were no longer in demand. Around 1963, due to the mechanization of demolition, there was a decline in craftsmanship. The number of contractors today who can carry out demolition without damaging materials has decreased as there is a low demand to sell old materials.

Acknowledgments

The photograph, Fig. 4 original drawings by Asahi shimbun. I would like to thank Asahi Shimbun.

Disclosure

This paper is an extended version of published without examination in Japanese[1)]

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日本の建築解体の変遷－東京解体協同組合発足まで－

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概　要

元来建物を壊すことを専門に行う業者はなく，鳶職や大工がその業務を行っていた。鳶職は木造躯体を壊し，大工は内装などの装飾を壊していた。建物の壊しを専門に行う業者がでてきたのは，明治初期頃だとされている。

明治初期，大名は土地・建物を手放し，そこに新たな建物を建てるには，木材が非常に貴重なものであったため，既存の建物を壊して材料を調達した。古材は新材のおおよそ７割程度の価格であり，傷がつかないように壊すという精神は徹底された。そして材料を傷つけない道具が必要とされ，壊し屋は鍛冶屋と連携し独自の道具を開発した。こうして古材を生かして取り出すことを専門に行う壊し屋業が誕生した。お金を支払って建物を買い，建物から出る木材や建具を売ることにより儲けを出していた。戦前まで安定的にこのような解体の仕事を行っていった。

戦時中，「壊し屋の組合をつくり，火事防止のために東京を区画整理する」ことになったが，「壊し屋組合」では格好がつかないということになり，“体” を “解す” という意味で “解体” という言葉が生まれた。そして，壊し屋の組合は「東京解体協同組合」という名前で発足した。

東京大空襲により，木造解体の仕事は激減した。そこで，解体業者は空襲を免れた鉄骨造倉庫の解体を仕事とした。鉄鋼は非常に貴重な資源であり，これについても材料を取り出し再び販売して使うスタイルは受け継がれた。

昭和中期になると鉄筋コンクリート造も解体されるようになった。当初は，コンクリート中の鉄筋を傷つけずに取り出すため，ハンマーとノミを使って手壊していた。

次第に，従来の解体業者は木造建物の解体を行い，鉄筋コンクリート造などの解体は石切を専門に行っていた業者 “やまや” が行うようになった。

古材が売れなくなり，解体の機械化に伴い，昭和 38 年頃には，材料を傷つけずに壊し，古材として売りに出すという本来の解体を行う業者は少なくなった。

Biographical Sketches of the Authors

Dr. Noboru Yuasa is a professor of College of Industrial Technology, Nihon University. He earned his B. Eng. in 1988 from Hokkaido University and M. Eng. in 1990 from Tokyo Institute of Technology.

After finishing master course in Tokyo Institute of Technology, he moved to Nihon University as a research associate. He promoted to a lecturer in 1998, an associate professor in 2003 and a professor in 2011. He received the degree of Dr. Eng. for "A Fundamental Study on the Quality of Surface Layer Concrete" in 1998 from Nihon University.

He has been studied "The surface layer concrete" in the point of view from moisture content and porosity as life work. And he received The Prize of AIJ 2019 (Research Theses Division) from Architectural Institute of Japan for "A SERIES OF STUDY ON SURFACE LAYER CONCRETE QUALITY" in 2019.

His current research topics include durability of concrete structures and finishing materials, non-destructive testing method, demolition of structures, earthquake resistance improvement for building of developing country and investigation of historical buildings.

He has been participated in several international research projects for Santuario di Vicoforte and L'Hangar per dirigibili di Augusta; 2002-03 and 2006-08, Sant'Agostino, San Silvestro e Torre Civica in L'Aquila; 2010-2014, Italy, Spain, Portugal; 2016-2021. And, he also participates in "Bhutan Project" by the JST/JICA SATREPS (Science and Technology Research Partnership for Sustainable Development).

During he was a lecturer of Nihon University, he was visiting researcher for one year at University of Dundee, England in 2011.

He is a chairman, secretary or research leader of a lot of committees in Architectural Institute of Japan, Japan Concrete Institute, Japan cement association, Japan Society for Finishing Technology and Japanese Society of Non-Destructive Inspection.

Mr. Tokuhiko Oguma is a president of Tokyo Dismantling Works co., ltd... He was born in 1942. He graduated from Department of Architecture, College of Science and Technology, Nihon University in 1967, and joined the Tokyo Dismantling Works Co., Ltd. in the same year. He was appointed as a director in 1971 and a president in 2007, and continues to this day.