World Cultural Heritage "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining" (No. 1484)

Heritage Impact Assessment Report for the Post-Disaster Recovery and Repair Project at the Terayama Charcoal Kiln in Area 2 Kagoshima (Component Part 2-2)

1. Introduction

This document reports on the Heritage Impact Assessment (hereinafter referred to as "HIA") to be conducted in connection with the post-disaster recovery and repair project for the Terayama Charcoal Kiln (Component Part 2-2), one of the 23 component parts of the World Cultural Heritage property "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining."

The recovery and repair work is to be performed on the Terayama Charcoal Kiln, which partially collapsed due to landslides triggered by heavy rainfall between June 27 and July 1, 2019. State of Conservation Report[1] was submitted to the UNESCO World Heritage Centre in November 2019 describing the state of damage to the Terayama Charcoal Kiln and the emergency measures taken.

The post-disaster recovery and repair work will be conducted while paying close attention to ensuring there is no adverse impact on the Outstanding Universal Value (hereinafter referred to as "OUV") of the Terayama Charcoal Kiln. The evidence from the end of the Edo period (1850s and early 1860s) and evidence of changes over time will be preserved, while endeavoring to secure stability in the kiln as a structure, maintaining a balance between those two considerations in restoring it.

The (1) Location and (2) Purpose of the post-disaster recovery and repair project covered by the HIA, as well as (3) Information assumed and (4) the Entity responsible for the HIA are as indicated below.

(1) Location of the project

The HIA applies to the post-disaster recovery and repair project proposal for the Terayama Charcoal Kiln (Component Part 2-2), a component part of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining," inscribed on the World Heritage List in July 2015. Its location, longitude and latitude, land area, and other details are indicated in the table below (Figures 1, 2).

Component Part Name	Location	Latitude	Longitude	Component Part Area (ha)	Buffer Zone Area (ha)
Terayama Charcoal Kiln	Yoshino-cho, Kagoshima City	31° 39' 42.3"–45.5" N	130° 36' 0.6"–4.2" N	0.64	2.01

(2) Purpose of the project

Heavy rainfall between June 27 and July 4, 2019 caused the Terayama Charcoal Kiln to partially collapse on two occasions, on June 28 and July 1 (Photos 1 to 4).

Following the collapse, the surrounding area was made off-limits to ensure the safety of visitors. To prevent further flooding and runoff on the charcoal kiln and slope, they were covered with weathered sheets as an emergency measure (Photos 5 and 6). As additional measures, sandbags and other means were used to prevent water from accumulating on the sheets at the top of the kiln by enabling drainage from both inside and outside the kiln; while on the slope, drainage was installed on the flat area at the bottom of the slope so water runs to the nearby waterway.[2]

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[1] The report is available for downloading at the following URL: http://whc.unesco.org/document/179734 (See pp. 321–330.)

[2] To ensure these measures were effective, rainfall was monitored during the rainy season in June to July 2020, and it was confirmed that they functioned properly even when rainfall exceeded 100 mm per day.

Since full-scale recovery and repair work has not been achieved at this stage, however, leaving these emergency measures in place would inevitably have a considerable adverse impact on conserving the OUV and promoting understanding by visitors. At the same time, carrying out the post-disaster recovery and repair work too hastily must be avoided.

For these reasons, we wish to conduct the HIA at the planning stage of the recovery and repair project, and to carry out the project in a way that will minimize any adverse impacts on the aboveground and buried historical and archaeological remains/objects and landscape and will contribute to promoting understanding by visitors.

(3) Information on which the HIA is to be premised

The information assumed in conducting the HIA is that in public plans and reports, including a) the ICOMOS Evaluations of Nominations of Cultural and Mixed Properties of May 4, 2015 assumed in the Decision at the time of World Cultural Heritage inscription, b) the Conservation Management Plan attached to the Nomination file for World Cultural Heritage inscription,[3] c) matters pertaining to methods for conservation of the Terayama Charcoal Kiln stipulated in the Conservation Work Programme and Implementation Programme for the Terayama Charcoal Kiln[5] drawn up after inscription, d) the results of various surveys conducted based on these, and e) the results of surveys conducted following the disaster. An overview of a) to e) is given below.

[3] The report is available for downloading at the following URL: http://whc.unesco.org/uploads/nominations/1484.pdf (See pp. 801-856.)

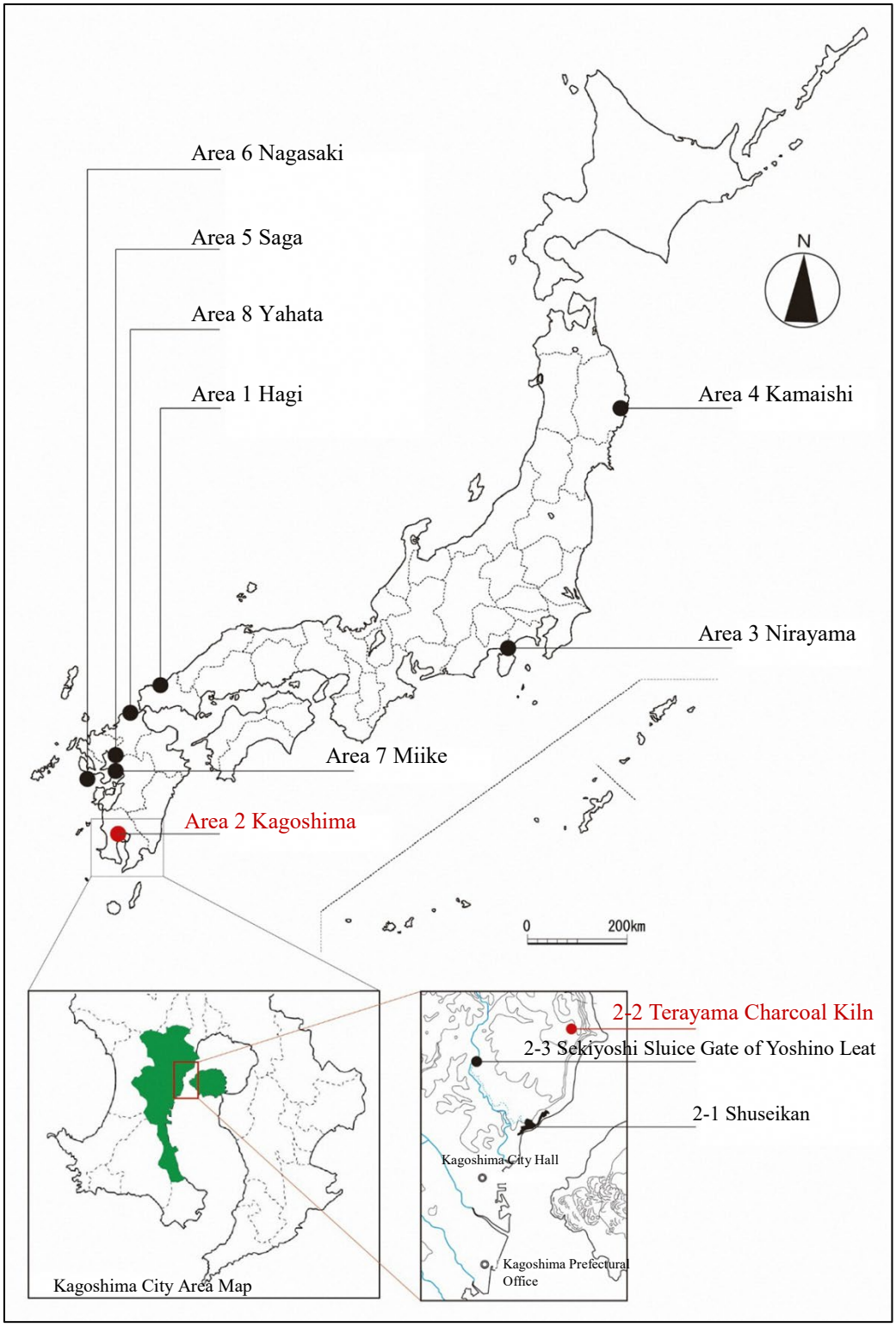


Figure 1. Position of Component Part 2-2

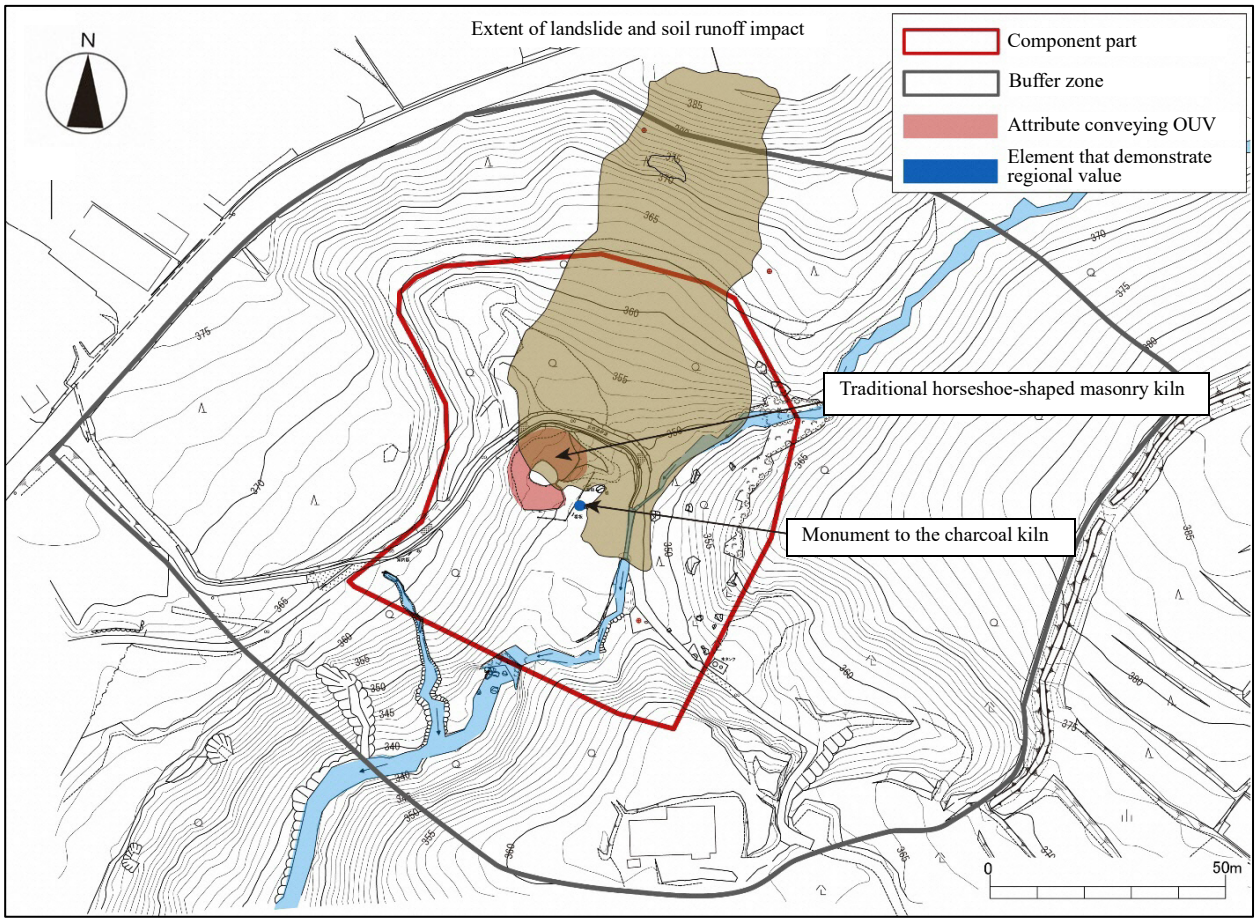


Figure 2. Component part, buffer zone, and extent of damage

Photo 1. State of damage (taken June 28, 2019)

Photo 2. State of damage (distant view; taken July 1, 2019)

Photo 3. State of damage (charcoal kiln; taken July 1, 2019)

Photo 4. State of damage (slope; taken July 1, 2019)

Photo 5. Updated state of charcoal kiln (taken March 12, 2020)

Photo 6. Updated status of slope (taken March 3, 2020)

a) Description of the component part given in ICOMOS Evaluations of Nominations of Cultural and Mixed Properties (May 4, 2015)

The industrial complex of Kagoshima is located in a garden at Shuseikan created in 1658. Its aim was to manufacture iron for cannons and shipbuilding. There are surface remains of a reverberatory furnace and its water channel, a charcoal kiln, the foundations of a spinning mill, and a sluice gate. There are also two standing buildings: a former machinery factory, 1864-5, the earliest surviving in Japan, and a house for foreign engineers involved in the spinning mill, built in 1866-7. The Shuseikan reverberatory furnace demonstrates variants from Dutch plans in terms of size and the way local traditional [approaches] such as cylindrical firebricks were used for the furnace instead of Western technology. This illustrates local experimentation and adaptation of Western prototypes. Like the Hagi furnace, it was ultimately unsuccessful.

b) Conservation Management Plan

This plan is the one attached to the Nomination file for World Cultural Heritage inscription.[4] It states that recovery and repair measures are to be implemented based on the plan in case of a natural disaster. The excerpts from the Plan given below indicate matters to be referred to in the recovery and repair work.

- **Conditions of the component parts that are to be maintained**

  The conditions of the individual attributes conveying the OUV are to be maintained into the future, from the standpoints both of the aboveground and buried historical and archaeological remains/objects and of the landscape. At the same time, the setting of the kiln as an industrial heritage is to be maintained.

- **Preservation policy**

  With the primary aim of maintaining and reinforcing the conditions at the time of inscription, maintenance, small-scale repairs, and other measures necessary for everyday maintenance will be carried out. Repairs and other preservation measures will also be carried out as needed. These measures will be limited to the minimum necessary interventions for keeping intact the Authenticity of the component part.

- **Routine maintenance and repairs**

  While regularly observing the stone masonry to check for deformation, repairs will be made as needed with the guidance and advice of domestic and international experts.

- **Repairs and other preservation measures**

  Repairs and other preservation measures for the stone masonry of the Terayama Charcoal Kiln...[omit]

[4] The report is available for downloading at the following URL: https://whc.unesco.org/uploads/nominations/1484.pdf

will be carried out in stages, starting from places having the highest urgency. In so doing, the current state of places in danger of collapse will be identified, construction methods that are suitable for permanent preservation without adverse impact on the OUV will be studied, and the work will be carried out with the guidance and advice of domestic and international experts.

- **Conditions of the buffer zone that are to be maintained**

  The buffer zone around the charcoal kiln is covered with secondary forest of Castanopsis sieboldii and tan oak from which charcoal were made. The buffer zone protects the setting that represents the traditional process of producing charcoal from the raw materials provided by the surrounding natural environment.

- **Response to natural disasters**

  If fire, wind or water damage, landslide, earthquake or other natural disaster should occur, recovery measures will be carried out in accordance with the Plan. In case the situation changes due to a natural disaster, the Plan will be modified as appropriate based on the situation.

c) Terayama Charcoal Kiln Conservation Work Programme and Implementation Programme

This Work Programme and Action Plan is the one submitted to UNESCO in 2017 as Attachment b)-7 to the State of Conservation Report.[5] While the Work Programme and Action Plan does not cover the occurrence of a natural disaster, the excerpts given below indicate matters to be referred to in recovery work.

- **Basic thinking on conservation measures**

  Regarding stone masonry from the kiln remaining above ground in the original state, results of displacement measurements will be analyzed, and repairs will be made under expert guidance as needed, to maintain the stable state. If the excavation surveys turn up remains related to hard charcoal production, appropriate underground preservation measures will be devised.

- **Direction of conservation measures**

  To maintain in good condition the stone masonry of the kiln that is an attribute of the OUV and another element of regional value, regular monitoring will be conducted by Kagoshima City; and when damage or potential damage is identified, repairs will be made in stages, assigning priorities based on the views of experts, etc., for the sake of maintaining stability of and strengthening the remains. If repairs are carried out, all due consideration will be made for retaining the originally used materials and their substance, material qualities, and structures of buildings and other structures rising above ground. As for underground remains that have so far been confirmed, protective layers of appropriate thickness will be provided and the remains will be maintained in stable state under the ground.

d) Results of various surveys conducted based on (a) and (b)

- **Displacement measurements**

  Measurement points were set at 124 places where there was a potential for bulging deformation of the stone masonry, and regular displacement measurements were conducted using survey instruments. During the period from November 2015 to December 2017, displacement exceeding 10 mm was observed at around 10 percent of the measurement points, suggesting that deformation was progressing. The following surveys were then conducted as a basis for studies on major restoration, with a view to dismantling and rebuilding the stone structure.

- **Three-dimensional measurement mapping, monitoring charts creation, analysis of deformation causes**

  For the archaeological remains of the charcoal kiln standing above ground, three-dimensional

[5] The report is available for downloading at the following URL: http://whc.unesco.org/document/165004 (See pp. 100-107.)

measurements was implemented and monitoring charts were created for the masonry to gather basic data for the schematic design of the rebuilding. Based on the results of these and past surveys, causes of deformation were analyzed. The major causes of deformation of the stone masonry were assumed to be rainfall draining into the earthen walls backing the peripheral masonry, causing soil to degrade and run off, and physical and biological degradation of the stones.

- **Excavation surveys**

  To determine the overall shape and foundational structure of the charcoal kiln, Kagoshima City had excavation surveys conducted mainly in the periphery of the kiln, with advice and guidance by the Shuseikan Area Expert Committee for the Conservation, Restoration, Presentation and Utilization established by the City, made up of experts in such fields as archaeology, heritage conservation, architecture, and landscape. The surveys revealed the existence of heretofore unknown stone masonry on the northeast side of the kiln, as well as a foundation-shaped stone structure under the front of the kiln suggesting a rectangular plane (Figure 3).

- **Vegetation survey**

  To determine the distribution of the secondary forest of Castanopsis sieboldii and tan oak from which charcoal were made at the kiln, a vegetation survey was conducted mainly in the buffer zone around the kiln.

e) Results of various surveys conducted after the disaster

- **Damage assessment survey**

  The positions of fallen stones were recorded, after which the stones were moved for safekeeping. Of the portion that has not yet collapsed, the extent of impact from the landslides was confirmed. The results confirmed that of the 667 stones in the masonry visible above ground, a total of 139 stones collapsed; on the northeast side of the masonry, 54 stones collapsed; and from the arch and on the southwest side of the masonry, 85 stones collapsed. Stones in the vicinity of the collapsed areas were also found to have shifted.

- **Structural surveys**

  Cross-sectional observation of the kiln stone masonry and earthen walls on the southwest side of the collapsed area was performed using archaeological methodology. The results showed the charcoal kiln was built using a unique construction process in which building stones and earth fill were layered repeatedly, instead of using the backfill approach often seen in stone walls of early modern Japanese castles, using gravel as a backing for the stone structure. Further, as the earth fill forming the alternating layers behind the masonry slopes from inside to outside the kiln, it is assumed that uneven land subsidence may have been one cause of the bulging. Other hints for learning about the deterioration and collapsing process that occurred after shutting down the kiln were also obtained from the surveys (Figure 4).

- **Geological surveys**

  On the slope by the Terayama Charcoal Kiln, five locations were chosen for soil boring surveys, six locations for simple dynamic cone penetration tests, and two locations for groundwater level measurement. These tests revealed the existence of a small depression under the plateau behind the slope that collapsed, and of highly water permeable sedimentary layers, such as deposits from pyroclastic surges. Given this topography compounded with approximately 180 mm of daily precipitation (total rainfall of 700-800 mm), it is likely that the landslides occurred when this heavy rainfall triggered an eruption from the slope of the rainwater that had permeated the plateau.

(4) Entity Responsible for the HIA

The Kagoshima City Government conducted the HIA and prepared this Report.

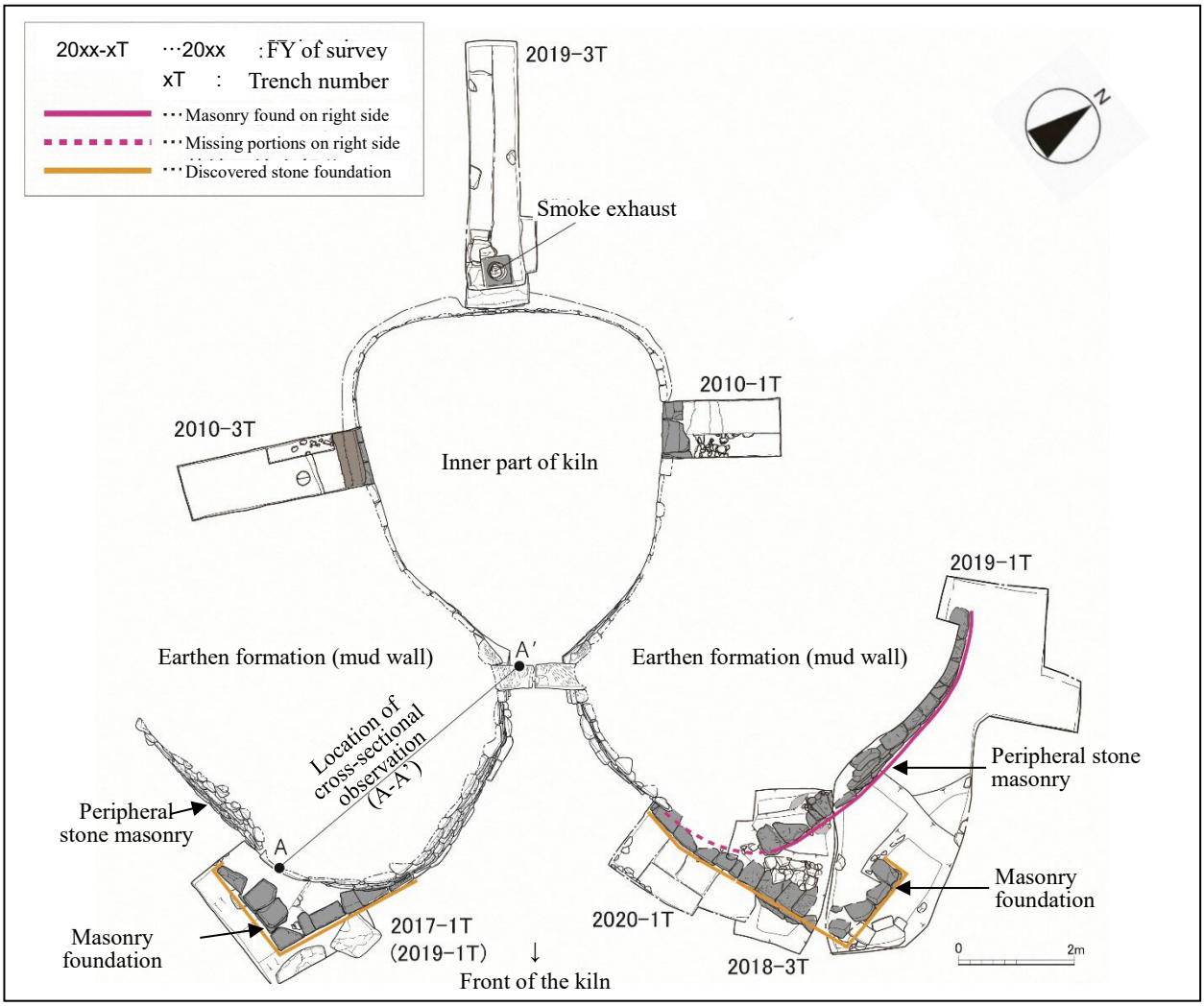


Figure 3. The main excavation survey locations and survey results

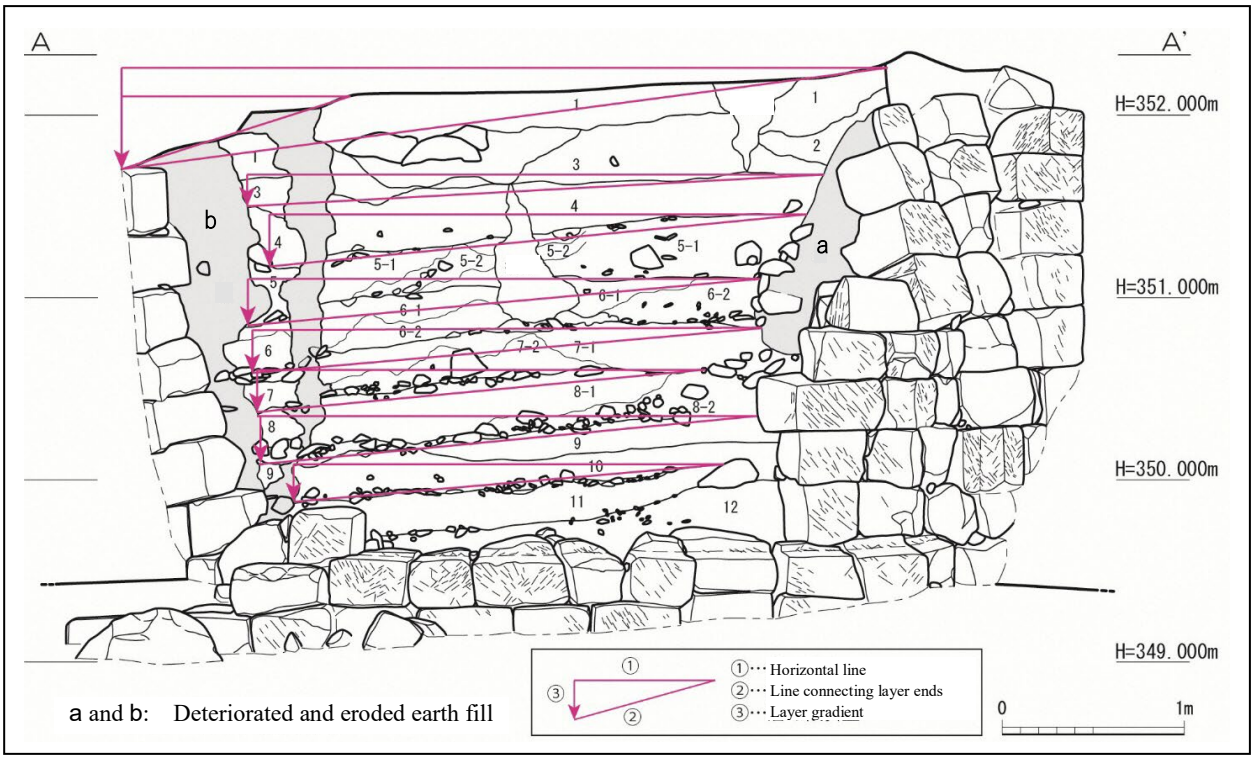


Figure 4. Cross-sectional view of the collapsed southwest side of the kiln (structural survey result)

2. Proposed plan for the post-disaster recovery and repair project

(1) Overview of the damage

The charcoal kiln suffered partial collapse on two occasions, June 28 and July 2, due to the impact of heavy rains and landslides.

The first time, the mud wall backing the stone masonry around the periphery of the kiln absorbed rainwater until the masonry could no longer bear the weight of the wall, causing a section of the masonry approximately 2.5 meters high and 2 meters wide on the northeast side of the mud kiln to collapse.

The second time, a landslide approximately 30 to 50 meters wide and extending around 100 meters occurred on the slope northeast of the kiln. Large amounts of soil and trees flowed into the component part, burying a large portion of the kiln and causing a section of the masonry approximately 2.5 meters high and 3.5 meters wide on the southwest side of the kiln to collapse from the impact.

After the disaster, emergency and safety measures were taken to clean up the environment, and basic surveys were made in preparation for recovery work. A draft recovery plan was then drawn up based on the results. In the process, the Shuseikan Area Expert Committee for the Conservation, Restoration, Presentation and Utilization carefully studied ways of proceeding without adverse impacts on the OUV.

Surveys conducted after inscription of the Terayama Charcoal Kiln on the World Heritage List, and a chronology of events relating to the disaster, are shown in Table 1.

Table 1. Chronology of the surveys conducted after inscription of the Terayama Charcoal Kiln on the World Heritage List and the events relating to the disaster

2015	July	The decision was made to inscribe the “Sites of Japan’s Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining,” including the Terayama Charcoal Kiln, on the World Heritage List.
	November	Displacement measurements of the stone masonry of the Terayama Charcoal Kiln were begun (conducted four times annually through June 2019).
2017	June	Bulging of up to 10 mm was confirmed by displacement measurements.
	December to March	Causes of deformation in the masonry were analyzed, and a three-dimensional measurement map and diagnostic report of the masonry were prepared.
2018	March	Excavation surveys confirmed the structure of the foundation of the stone masonry.
		Vegetation surveys were conducted in the buffer zone.
	May to December	An emergency design for preservation and restoration was developed in case of collapse.
	June	Displacement measurement by 3D scanning was added to the observation methods.
	September	Excavation surveys confirmed the structure of the stone masonry and foundation on the east side of the kiln.
	November	Consultations were held with international experts regarding conservation measures for the masonry, including dismantling and rebuilding.
2019	February	The Shuseikan Area Expert Committee for the Conservation, Restoration, Presentation and Utilization deliberated the course of action for dismantling and rebuilding the masonry.
	May	The Shuseikan Local Conservation Council approved the earlier-discussed approach to dismantling and rebuilding the masonry.
	June 28	Stone masonry on the northeast of the charcoal kiln collapsed due to heavy rain.

	July 1	Landslides occurred, and stone masonry on the southwest side of the kiln collapsed and became buried under inflowing soil.
	July	Photographic surveys of the damage to the kiln were made, the extent of the damage was measured, and emergency measures were taken on the slope in the vicinity of the kiln.
	August	Emergency measures were taken at the site of the kiln.
	September	Details of the damage and measures planned to be taken were reported to the 10th session of the Industrial Heritage Expert Committee (including Working Properties). Mr. Michael Pearson as a member and Mr. Duncan Marshall as an advisor of the Committee were consulted regarding recovery methods.
	November	A State of Conservation Report on the damage was submitted to the UNESCO World Heritage Centre.
	November to March	After carrying out provisional recovery work (safety measures), the damage state of the kiln was confirmed and its structure was surveyed, and geological surveys were conducted on the surrounding slope.
2020	April to November	A schematic design was prepared for recovery work on the surrounding slope.
	May	Excavation surveys confirmed the foundation of the stone masonry, which already had been missing sections before inscription as a World Cultural Heritage. Soil mechanics testing was also conducted on the soil used in building the kiln.
	June to February	Work was begun in June 2020 on drafting plans for the post-disaster recovery and repair work to be carried out on the kiln. This is to be fleshed out to a schematic design by February 2021.
	September	Strength tests were conducted on the collapsed stones. At the 11th session of the Industrial Heritage Expert Committee (including Working Properties), the HIA was deliberated and discussions with international experts were conducted in writing.

(2) Basic policies

- The recovery and repair work will be carried out from the standpoints both of preserving evidence from the end of the Edo period (1850s and early 1860s) and evidence of changes over time on the Terayama Charcoal Kiln, and of securing stability in the kiln as a structure.
- While the fundamental aim will be to restore the places damaged in the disaster, stone masonry discovered underground in the surveys will also be partially exposed and reconstructed. The masonry that had already collapsed prior to World Heritage inscription will be restored to a minimal extent, and missing sections will be replaced by new layers of stones to secure stability of the charcoal kiln as a structure.

  Based on modern-day surveys conducted in areas throughout Japan on similar cases of Kishu binchotan charcoal kilns,[6] it seems likely that a shed (tent) was used to prevent rainwater infiltrating into the charcoal kiln and the walls.[7] Considering, however, that the existence of such a shed cannot be proven at the present time, and that installing a shed would substantially alter the appearance of the kiln, it was decided not to build one. Instead, appropriate drainage measures will be implemented on the top of the walls of the charcoal kiln to reduce the amount of rainwater infiltrating into the charcoal kiln and the

[6] Hard charcoal-producing kilns in the Wakayama region on the Kii Peninsula of the main island of Japanese Archipelago. Hard charcoal has high quality and is referred to as “binchotan” charcoal. The Terayama Charcoal Kiln was built using techniques from that region.

[7] The “walls” referred to here are the portion consisting of peripheral stone masonry and an earthen (mud) backing layer.

walls. Detailed methods will be stipulated in the schematic design to be completed by February 2021 and at each phase of the design development, scheduled for the next fiscal year and after.

- Recovery and repair work is to be carried out mainly using traditional construction methods, limiting the intervention of modern methods to the minimum extent needed for stabilisation of the structure.
- In cases where it becomes necessary to dismantle existing masonry and mud walls on the periphery of the charcoal kiln, archaeological structural surveys will be conducted and the masonry and mud walls will be reconstructed based on the results.
- The slope on the site where the landslides occurred will be graded, with no major changes made to the topology. Drainage measures for rainfall accumulating on the slope as well as slope erosion control measures will be taken. As a slope erosion control measure, out of consideration for the impact on the landscape and preservation of the ecosystem, seeds of the local Castanopsis sieboldii and tan oak collected in the vicinity of the Terayama Charcoal Kiln will be raised as seedlings and used for tree planting. It is expected to take around ten years for the planted trees to recover as full-fledged foliage.
- The slope in the buffer zone where the landslides occurred is steep and unstable. To prevent further collapse, it will be reformed into a more stable incline. As measures against underground seepage water, which is a cause of the collapse, and drainage of rainwater accumulating on the slope will be improved, and slope erosion control will be implemented. For greening of the embankment, vegetation mats will be used, and a natural vegetation dispersal method will be adopted, by which seeds carried by the wind from nearby vegetation are relied on for recovery.

(3) Project Implementation

After conclusion of the World Heritage Committee session in 2021, Kagoshima City will begin work on a detailed design development for the charcoal kiln post-disaster recovery and repair project. At the same time, the City will begin restoration work on the buffer zone slope, aiming for completion during fiscal 2021, preparing an environment in which the charcoal kiln recovery and repair work can be carried out safely and effectively.

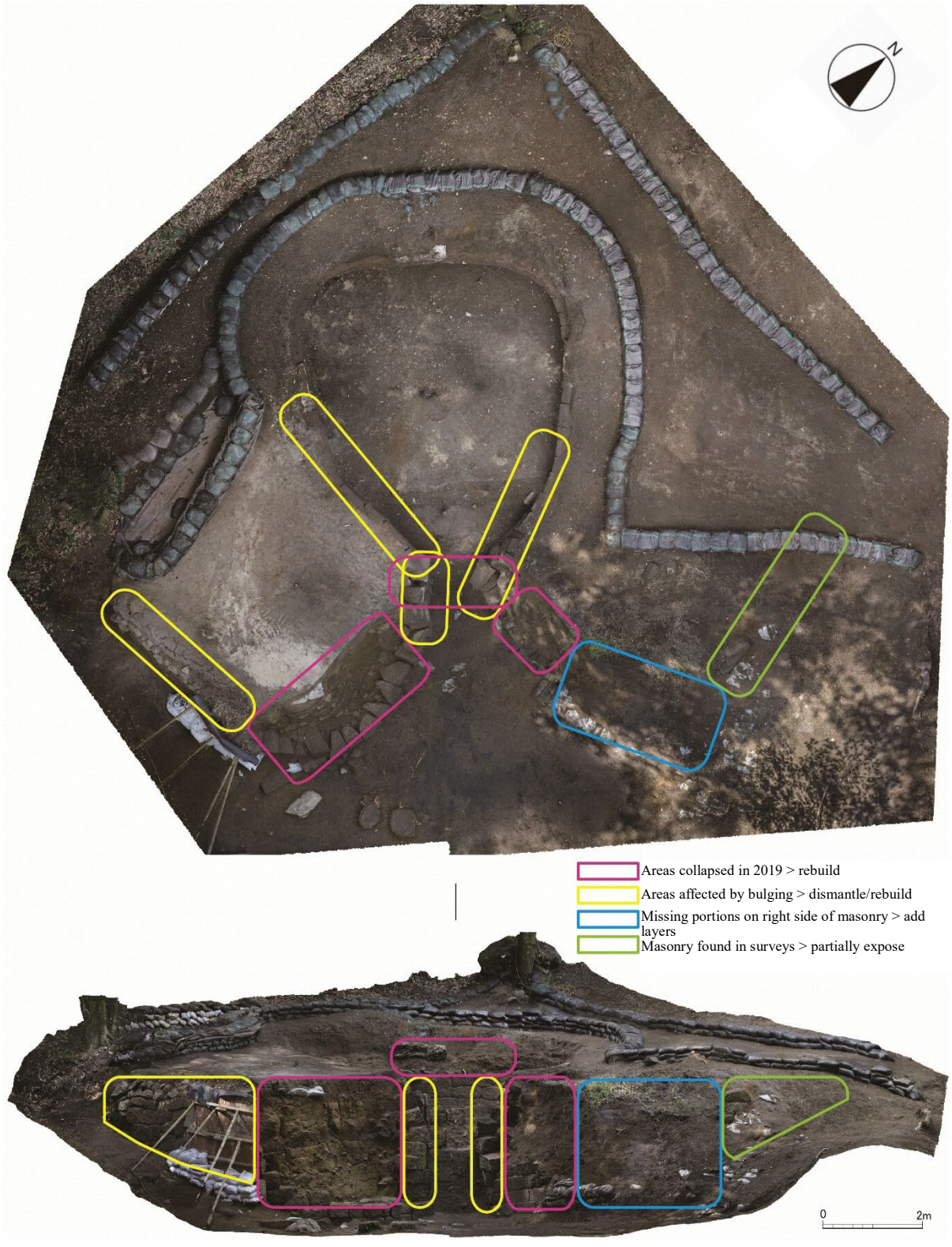
At this time, the City is aiming to complete all phases of the recovery, repair and restoration work by 2022.

(4) Current issues

The current main issue is that simply putting back in place the stones that collapsed will not ensure a stable structure. Along with putting these in place, it will be necessary also to use new stone materials to fill in missing sections in the masonry that were confirmed before the disaster, and to dismantle and rebuild places where bulging occurred. Otherwise it will be difficult to restore the masonry to a stable structure.

Places where the stone masonry has missing sections were found on the northeast side of the kiln, and periodic displacement measurements revealed that the stones surrounding that area are shifting, causing an unstable state. The foundation of the relevant area was identified in the excavation surveys conducted in 2020, and there is clear archaeological evidence for filling in the missing sections with new stones on top of the foundation.

Analysis to determine the cause of bulging was conducted before the disaster occurred. The bulging was found to be caused by deterioration of masonry stones and infiltration of rainwater into the upper portion of the masonry, which led to deterioration of the earthen layer backing the masonry walls. It was planned to dismantle and rebuild the structure in fiscal 2019 and after. The collapse of the masonry of the charcoal kiln caused by the heavy rainfall led to the conducting of various surveys to understand the construction of the masonry backing, and in turn to the discovery that the bulging of the masonry may have been caused by uneven land subsidence due to differences in the foundational layers of the charcoal kiln.



This figure includes additional zoning information on the photographic survey figure created in March 2020.

Figure 5. Approach to post-disaster recovery and repair of each portion of the charcoal kiln

3. OUV and the attribute that convey the OUV

(1) Aspects of OUV demonstrated in the Statement of Outstanding Universal Value (SOUV)

A Statement of Outstanding Universal Value (SOUV) was included in the World Heritage Committee Decision in 2015 approving inscription of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining" on the World Heritage List. Below are excerpts from the Brief synthesis at the beginning of the SOUV.

> A series of industrial heritage sites, focused mainly on the Kyushu-Yamaguchi region of south-west Japan, represent the first successful transfer of industrialization from the West to a non-Western nation. ...[omit] The sites in the series reflect the three phases of this rapid industrialization achieved over a short space of just over fifty years between the 1850s and 1910.
>
> The first phase, in the pre-Meiji Bakumatsu isolation period, at the end of Shogun era in the 1850s and early 1860s, was a period of experimentation in iron making and shipbuilding. ...[omit]
>
> The second phase, from the 1860s accelerated by the new Meiji Era, involved the importation of Western technology and the expertise to operate it ; while the third and final phase, in the late Meiji period (between 1890 to 1910), was full-blown local industrialization achieved with newly-acquired Japanese expertise and through the active adaptation of Western technology to best suit Japanese needs and social traditions, on Japan's own terms....[omit]
>
> Collectively the sites are an outstanding reflection of the way Japan moved from a clan based society to a major industrial society with innovative approaches to adapting western technology in response to local needs and profoundly influenced the wider development of East Asia.
>
> After 1910, many sites later became fully fledged industrial complexes, some of which are still in operation or are part of operational sites.

The aspects of OUV of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining" pointed out in the above "Brief synthesis" consist of the following two points.

The 23 component parts collectively represent:

- The three-phased process of rapid development in each of three industrial typologies; and
- the process of qualitative change that turned Japan into a major industrial society and profoundly influenced the wider development of the East Asian region.

The Terayama Charcoal Kiln belongs to the Iron and Steel industrial classification, and is one of the component parts demonstrating the first phase of trial and error experimentation. Further, as it shows the process of qualitative change which turned Japan into a major industrial society having a material impact on the wider development of the East Asian region, it is an indispensable component part in demonstrating OUV of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining."

(2) Attribute in the component part that conveys the OUV

The two aspects of OUV above are reflected in the attribute in the component part. A written response the Government of Japan submitted on November 5, 2014 in answer to the questions asked by the International Council on Monuments and Sites (ICOMOS) clarified that the following attribute of the Terayama Charcoal Kiln conveys the OUV.

■ **Response to a request from ICOMOS for additional information (submitted on November 5, 2014) (excerpt of portion relevant to the Terayama Charcoal Kiln)**

Area/Component Part	Attribute
Area 2 Kagoshima/Terayama Charcoal Kiln	Charcoal kiln made of traditional horseshoe-shaped stone masonry

■ **Nature of the attribute**

The above attribute of the Terayama Charcoal Kiln that conveys the OUV is of the following two kinds.

- **Historical and archaeological remains/objects of the charcoal kiln**
  The Terayama Charcoal Kiln consists of the remains of a facility built with the aim of mass-producing hard charcoal with strong caloric force, for supplying fuel needed in the Shuseikan Enterprise in the end of the Edo period (1850s and early 1860s). It includes related historical and archaeological remains/objects. The historical and archaeological remains/objects of the hard charcoal production facility consist of the topography showing the location of the kiln, the remains of stone masonry and mud showing the aboveground structure of the kiln, and the historical and archaeological remains/objects of the facility that are buried underground.
- **Historical and archaeological remains/objects showing the hard charcoal production system**
  The aboveground and buried historical and archaeological remains/objects on the site of the Terayama Charcoal Kiln from the end of the Edo period (1850s and early 1860s), besides showing the hard charcoal production system of the time, are part of the overall industrial system of the Former Shuseikan component part from the standpoint of supplying fuel to the Shuseikan Enterprise of the same period. The historical and archaeological remains/objects that show the hard charcoal production system are the aboveground kiln structure made of stone masonry and mud, the remains showing the operation processes involved in hard charcoal production, and the related historical and archaeological remains/objects that are buried underground. Also included are the trees in the surrounding area, from which the charcoal fuel was made.

(3) State of legal protection of the OUV and its attribute

The site of the Terayama Charcoal Kiln is designated as a Historic Site under the Law for the Protection of Cultural Properties and is therefore fully covered by legal protection measures. The Law imposes various restrictions on recovering, repairing and restoring the attribute on the site contributing to the OUV.

The buffer zone surrounding the Terayama Charcoal Kiln is designated as a Class II Special Zone of Kirishima Kinkowan National Park under the Natural Parks Act, and as the Terayama Scenic District under the City Planning Act. The two laws restrict new edifices exceeding a certain scale from being built that would damage the landscape or scenic area of the vicinity, and also limit changes to the shape or characteristics of the land and felling of trees or bamboo.

The buffer zone is further designated as a Natural Green Zone under the Kagoshima City Landscape Plan based on the Kagoshima City Landscape Ordinance and Landscape Act. When building a new edifice or other facilities in the Natural Green Zone, the shape, design, color, height, and other specifications must be in harmony with the surrounding natural environment and rural landscape.

In addition, the buffer zone is designated as a residential land development construction regulation area according to the Act on Regulation of Residential Land Development. When developing land for residential use, a permit from the Kagoshima City mayor is required, as a check on disorderly development that may cause landslides or sediment runoff during land development.

As outlined above, there are ample legal protective measures for the attribute that conveys the OUV located on the site of the Terayama Charcoal Kiln, and for the buffer zone that is its setting.

4. HIA concerning the proposed plan for the post-disaster recovery and repair project

(1) Impact on the attribute that conveys the OUV

a) Authenticity of the historical and archaeological remains/objects

The stone materials making up the masonry of the kiln that collapsed due to heavy rainfall in 2019 did not flow outside the component part and are all preserved inside the site. Thanks to the displacement measurements and three-dimensional laser measurements carried out on the masonry before the disaster, there are full records of detailed positional information of the individual stones. Accordingly, since it is possible to restore the stones based on this information, the Authenticity in terms of form/design and materials/substance of the historical and archaeological remains/objects has not been compromised.

The original construction methods that were used for the stone masonry and earthen walls, as determined from excavation surveys, will be followed to the extent possible in the rebuilding necessary to fix bulging and in adding new materials to fill in missing portions, keeping to a minimum any intervention by more modern methods. Stones for filling in or replacement will be chosen that are in harmony with the material quality of the remaining original stones. Marking will be inscribed on the new materials used for filling in, to demarcate them from the original stones. In such ways, the Authenticity in terms of form/design and materials/substance of the historical and archaeological remains/objects will not be compromised.

The historical and archaeological remains/objects of the foundation of the stone masonry and walls, preserved underground, will likewise be left essentially unchanged, so that their Authenticity in terms of form/design and materials/substance will not be impacted.

By using new stone materials to fill in sections that were missing from the stone structure before World Cultural Heritage inscription, and by dismantling and rebuilding the extent of the stone masonry that led to bulging over the years, the stones and walls of the charcoal kiln remains will be made more stable than before the disaster, increasing the Authenticity in terms of form. Since it was decided that ground improvement using contemporary methods as a measure against uneven land subsidence would not be carried out, it is not possible to completely deter bulging of the masonry. However, after the post-disaster recovery and repair project is completed, fixed-point observation of the behavior of the masonry and walls will be conducted periodically to collect data for use in future countermeasures.

To minimize the flow of rainwater inside the earthen wall portion of the kiln, appropriate drainage measures will be taken at the top of the wall; moreover, the portion of the stone masonry that will have missing sections filled in with new material is to be connected to the buried masonry discovered in the excavation surveys, and to be partially exposed and reconstructed. Note that detailed methods will be stipulated in the schematic design to be completed by February 2021, and at each phase of the design development, scheduled for the next fiscal year and after.

b) Appearance of the charcoal kiln remains

Masonry on the outer east side will be filled in with new building stones; and in places where bulging is found, dismantling and rebuilding will take place only to the minimum necessary extent, so that changes to the appearance of the charcoal kiln will be limited.

c) Impact on the hard charcoal production system

Adverse impacts on the hard charcoal production system of the end of the Edo period (1850s and early 1860s), shown by the aboveground and buried historical and archaeological remains/objects on the site of the Terayama Charcoal Kiln, cannot be estimated. As a result, adverse impacts on the overall iron and steel industry system of the Shuseikan Enterprise in the same period cannot be estimated.

(2) Impact on the setting, including the buffer zone

In the buffer zone and areas inside the component part affected by landslides and soil runoff, measures that are unavoidable from a safety standpoint will be taken in line with the extent of damage, including slope

grading, measures to deal with underground seepage that caused the collapse, and measures for draining water accumulating on the slope. The measures will involve artificial shaping and building of new structures. Recovery of vegetation will be carried out with due consideration for the impact on landscape and conservation of the local ecosystem, so that the impact on the setting including the buffer zone will be limited.

(3) Impact on visitor interpretation and utilization

On-site presentations are planned to convey to visitors the information learned from the buried historical and archaeological remains/objects. It will thus be possible to provide visitors with accurate information on the scale and structure of the kiln and on the process by which it was built.

Furthermore, in recovering vegetation on the slope inside the component part, seeds of the local Castanopsis sieboldii and tan oak, trees used as raw material for making hard charcoal, will be collected in the vicinity, raised as seedlings, and used for tree planting. This will help visitors understand that the surrounding natural environment is part of the setting showing the traditional charcoal production process.

5. Process for managing consensus building among related parties

(1) Governance

a) Shuseikan Local Conservation Council

In the management structure of the World Cultural Heritage property "Sites of Japan's Meiji Industrial Revolution," local conservation councils have been established for each of the Areas consisting of the property, based on the "General Principles and Strategic Framework for Conservation and Management for the Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining." For Area 2 Kagoshima as well, the Shuseikan Local Conservation Council has been established, which will exchange information and views and make decisions concerning the basic policy and methods of post-disaster recovery and repair work for the Terayama Charcoal Kiln. Consensus on the contents of this Report was reached at the Area 2 Shuseikan Local Conservation Council meeting of September 2020.

b) Expert Committees

In the process of advancing the post-disaster recovery and repair project, the Shuseikan Area Expert Committee for the Conservation, Restoration, Presentation and Utilization established by Kagoshima City discussed and studied the approach from a specialized viewpoint, with guidance and advice from the Cabinet Secretariat and Agency for Cultural Affairs of the Government of Japan, while also seeking advice from the Industrial Heritage Expert Committee (including Working Properties) established by the Cabinet Secretariat. Due to the spread of COVID-19, overseas members were not able to attend the Expert Committee meeting in September 2020. In preparing this Report, however, their views collected in writing thereafter were taken into account.

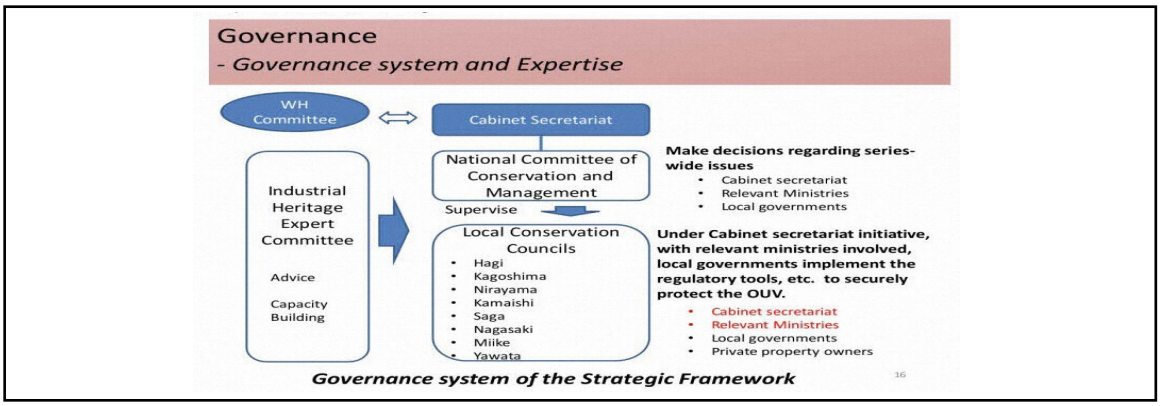


Figure 6. Governance system for the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining"

(2) Decision on recovery and repair methods and the management process

From immediately after the disaster and up to the present time, the post-disaster recovery and repair project has been deliberated carefully in the above two expert committees, with guidance and advice of the Cabinet Secretariat and Agency for Cultural Affairs, on the way to drafting of a plan. Likewise, in drawing up the schematic design to be completed by February 2021 and at each phase of the design development in the following fiscal year, detailed methods for recovery and repair will be selected through careful deliberation, with the guidance and advice of the Cabinet Secretariat and Agency for Cultural Affairs.

6. Conclusion

The draft plan for the Terayama Charcoal Kiln post-disaster recovery and repair project is being advanced on the premise of stably maintaining the attribute conveying the OUV of the World Cultural Heritage property "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining." The project will greatly contribute toward visitor understanding of the OUV.

Status of Heavy Rain Damage to the Coal Railway of the Miike Coal Mine and Miike Port (Area 7/Component Part 7-1), and Measures to Be Taken

Heavy rains on July 6, 2020 caused damage to the Coal Railway (Omuta City, Fukuoka Prefecture) that is a component element of the Miike Coal Mine and Miike Port (Component Part 7-1), a component part of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining." The damage status and measures to be taken including for restoration are to be reported as follows to the UNESCO World Heritage Centre.

Cause of the damage

Record rain fell over a wide area from July 6 to 8. According to rain gauge measurements taken in Omuta City, approximately 450 mm of rain fell in one day, exceeding the average monthly rainfall for July. It included a period of around two hours during which the rain fell at a rate of nearly 100 mm per hour, breaking all-time records.

State of damage and impact on elements contributing to OUV

The heavy rainfall on July 6 resulted in partial collapse at the Miike Coal Railway, a component element contributing to the Outstanding Universal Value (OUV). This was mostly limited, however, to runoff of topsoil that had accumulated on the ground surface. While the Meiji-era slope preserved under the topsoil (surface of remains dug into the bedrock) became exposed, almost no direct damage to the Meiji-era slope itself has been identified.

Moreover, three-dimensional laser measurements of the Miike Coal Railway had been carried out from 2018 to 2020, and the geometric and structural characteristics of the earthen structures were recorded. In addition, through excavation surveys, information had been collected on the original Meiji-era structure and construction methods.

Based on the above, while the damage this time had a major impact on the slope of the Miike Coal Railway, it was limited to the topsoil layer that has accumulated in later years; moreover, restoration of the slope to a stable state at the same incline as before the damage is possible, based on the past measurement survey results and other records.

Also of note is that mitigation measures will be taken in the recovery work, such as stabilizing the slope and making water drainage more efficient, so that the restoration should further improve stability, helping to maintain and strengthen elements contributing to the OUV.

Schedule

Measures taken immediately after the damage: Emergency measures; covering with sheets, preventing rainwater infiltration

Temporary placement of large retaining wall sandbags for preventing further

damage to the slope

Oct. 2020 to Jan. 2021: Engineering design; conducting surveys, deciding restoration methods

Feb. to Oct. 2021: Recovery work; construction work on affected places, water channel dredging, etc.

Under the direction and advice of the Agency for Cultural Affairs, Cabinet Secretariat, and Fukuoka Prefecture, specialized discussions and studies will be carried out, while taking into account also the views of international experts in the area of industrial heritage.

Miike Coal Railway: Photo of damage status

Miike Coal Railway: Photo of emergency measures in place

Heritage impact assessment report of the Manda Pit (Component Part 7-1) Storage and Pumping Station as well as Safety Lamp Room and Bathroom conservation/earthquake-proofing works

Outline

This document is a heritage impact assessment report of the conservation/earthquake-proofing works of the Manda Pit Storage and Pumping Station as well as Safety Lamp Room and Bathroom, the constituent elements of the Miike Coal Mine (Component Part 7-1), which is a component part of the World Heritage Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining.

Given that the buildings are significantly deteriorated and that Japan is a quake-prone country, the conservation/earthquake-proofing works of these buildings are necessary to preserve these components permanently in the future.

The conservation works of the buildings are limited to replacing minimal members to preserve original members to the extent possible. Meanwhile, the earthquake-proofing works make minimal changes to the appearance; careful consideration is given to the impact on the site by, for example, placing reinforcement members along pillars and beams to make them as inconspicuous as possible in placing them indoors.

Therefore, the conservation/earthquake-proofing works of the Manda Pit Storage and Pumping Station as well as Safety Lamp Room and Bathroom in the Miike Coal Mine do not adversely impact the Outstanding Universal Value (OUV) and the property: Sites of Japan's Meiji Industrial Revolution.

1. Introduction

(1) The object of this heritage impact assessment is the Manda Pit, a constituent element of the Miike Coal Mine and Miike Port (7-1), which is a component part of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining"* that was inscribed on the World Heritage List in July 2015.

(2) This heritage impact assessment was made on the basis of the Conservation and Management Plan (CMP), the Conservation, Restoration, Presentation and Public Utilization Plan for Miike Coal Mine developed in 2019, and the research work (field work for conservation) of former Manda Pit Storage and Pumping Station as well as Safety Lamp Room and Bathroom in the Mitsui Coal Mining Co., Ltd. Miike Coal Mine, designated as Important Cultural Property, which was conducted as a subsidy project of the Agency for Cultural Affairs.

(3) The main organization that prepared this heritage impact assessment report is Arao City.

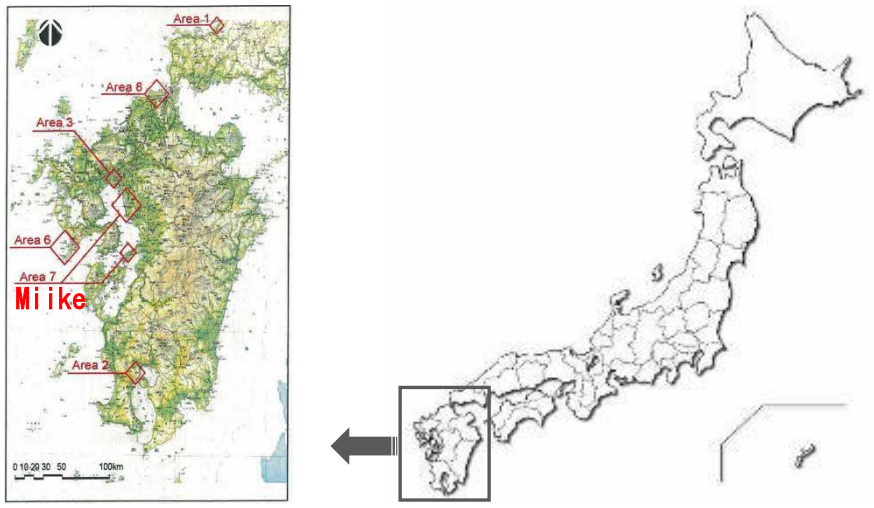


Figure 1 Component Location Map

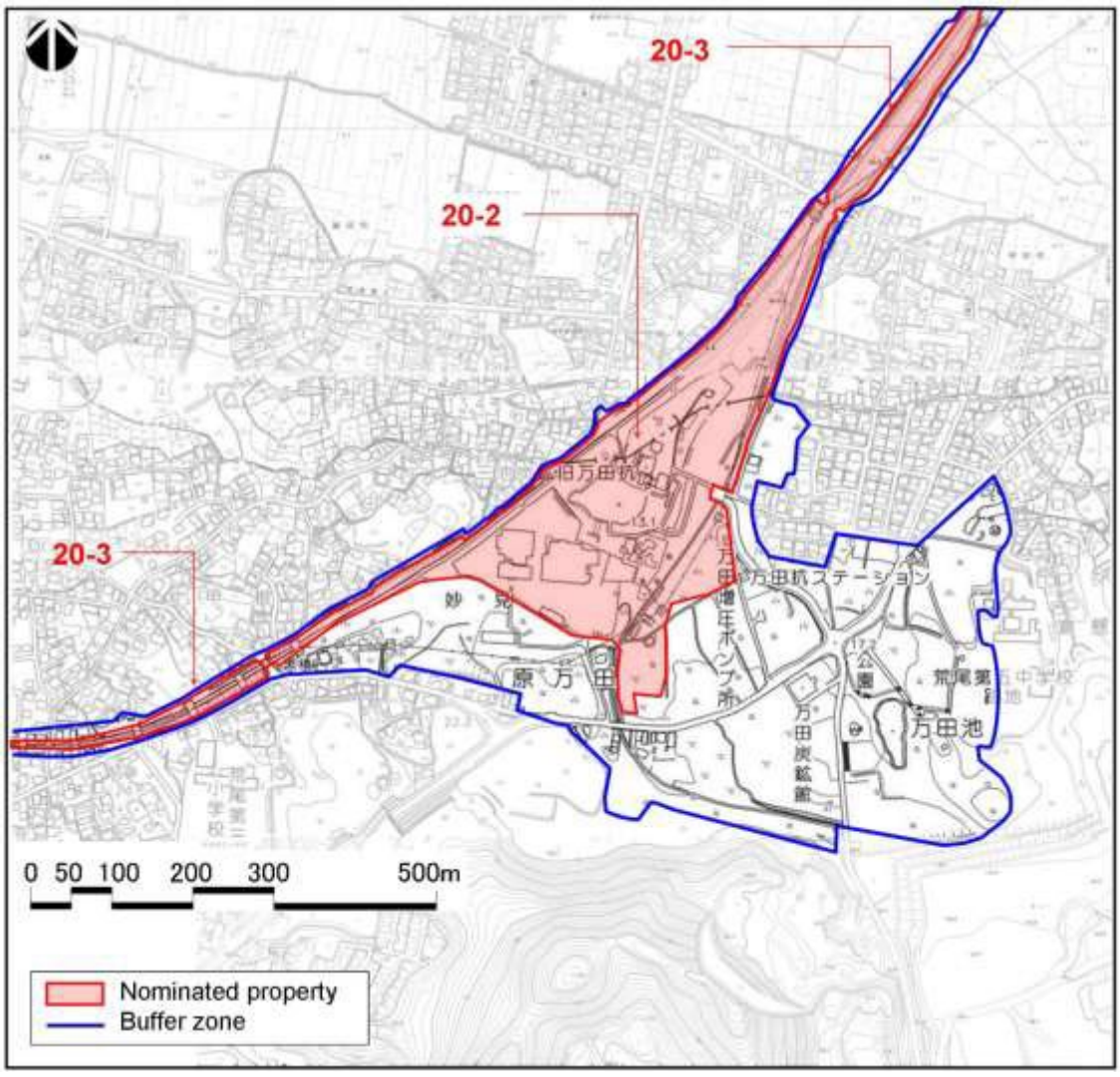


Figure 2 WHP and BZ (excerpt)

2. Outline of the conservation/earthquake-proofing works of the buildings

(1) Outline of the buildings

For about 90 years from their completion in 1905 until 1997, the buildings of the Miike Coal Mine Manda Pit have gone through repeated modifications to adapt to changes in machines and mechanical power as a coal mining facility, under the management of Mitsui Coal Mining. The Storage and Pumping Station, a brick single-storied building, was a fan room to ventilate Pit No.2 in early years after its construction in 1905. At that time (1906 to 1914), it was equipped with a steam-powered Walker-type Fan, and later it was used as a storage to store mainly spare fire extinguishers and as a pumping station to send water pumped up in the pit. Thus, it has a water tank facility underground. Even today, the vestiges of the fan and a brick exhaust air chimney remain. The inside was drastically modified to divert functions.

The Safety Lamp Room and Bathroom, a brick single-storied building, was used as a machine room to run a Walker fan, which was installed in the adjacent fan room, in early years after its construction in 1905. Many vestiges (vestiges of the circular window of a machine drive shaft and steam piping) remain on the wall surface. After the Manda Pit was closed in 1951, it was used as the Safety Lamp Room and Bathroom. The safety lamp room is equipped with a charger for safety lamps (a lamp attached to a hard hat) used in a dark pit. Since it was used as a bathroom, a bathtub, among others, remains today.

Both the buildings have many damaged or missing bricks. The top of the arch also has some missing bricks, posing the risk of collapse. The decayed roof has caused major leaking of rain, with rainwater running down along brick walls. This caused salts to precipitate, and there are many sections where joint filler has been lost or damaged. The exterior wall section is thickly covered with plants. The inside of the exhaust tower is exposed to wind and rain as the upper roof is missing, leading plants to flourish notably. Because these are adversely affecting the conservation of the buildings, immediate action is required.

(2) Outline of conservation/earthquake-proofing

Concerning the implementation of the works, the Conservation, Restoration, Presentation and Public Utilization Plan for Miike Coal Mine, which was submitted on the basis of the recommendation “b) Developing a prioritised conservation work programme for the property and its component sites and an implementation programme,” clearly states, under the heading of Preserving, strengthening, and stabilizing the buildings and remains in terms of material, substance, and structure, “The cities will scrutinize any instabilities that monitoring reveals by leveraging expert opinions and findings from studies, undertaking systematically restoration for reinforcement and stabilization” specifying that conservation/seismic reinforcement works will

be conducted for the Storage and Pumping Station and the Safety Lamp Room and Bathroom, for which earthquake vulnerabilities have been identified, and the Office Building, for which measures will be taken later.

In this conservation, conservation and structural reinforcement works are conducted with the principle of maintaining the condition at the time of coal mine closure, which represents its last years as an industrial heritage.

The buildings have long been neglected and severely deteriorated over time; particularly in the wooden roof with tiles, many sections have gone missing due to the damage of typhoon, the roof truss has been badly decayed by water leakage, and there is severe termite damage. Therefore, reroofing and partial repair works are carried out.

In the conservation works, dismantling is conducted at sections, including the roof, wooden parts, fittings, bricks, steel materials, concrete, concrete blocks, plastering, painting, wire nets, sheet metal, and facilities. However, although work items range widely, their scopes of dismantling are not the same, with dismantling and non-dismantling sections coexisting. Dismantling works in each section are conducted after making careful preparations to ensure non-dismantling sections will not be affected. Matters, such as moving/organizing fixtures stored in the building, cleaning/transporting waste disposed of underground, and dredging drains around the building, are planned as miscellaneous works associated with dismantling. In order to prevent bricks and steel materials from degrading in the future and inherit the value as a building, protective coating materials are applied to each member to maintain the present condition.

For the seismic reinforcement works, a seismic diagnosis was made before planning. The seismic diagnosis has identified structurally vulnerable parts (the former exhaust tower part in the Storage and Pumping Station and the wall stagger part between the bathroom and the changing room in the Safety Lamp Room and Bathroom) as well as the part in which out-of-plate breaking, which is a weak point of brick buildings, is expected to occur (the top of the end panel of the gable roof).

To reinforce the sections concerned, the prevention of out-of-plate breaking and the strengthening of the wall are planned. As a mechanism for preventing out-of-plate breaking, installing steel frames is planned, while inserting reinforcing bars is planned to reinforce the wall.

The structural reinforcement design is specific to each section. For the former exhaust tower part of the Storage and Pumping Station, reinforcing bars will be inserted to reinforce the wall and then steel frames will be placed to complement proof stress. For the gable roof of the part where

the fan used to be put in the Storage and Pumping Station, taking its appearance into consideration, it is planned to place steel frames along the roof surface to prevent out-of-plate breaking. In the wall stagger part between the bathroom and the changing room in the Safety Lamp Room and Bathroom, a rigid-framed structure will be adopted to prevent the walls of the stagger part from collapsing, by inserting reinforcing bars to reinforce the wall and placing steel frames to connect the walls of the stagger part. For the gable roof of the Safety Lamp Room and Bathroom, it is planned to place steel frames along the roof surface to prevent out-of-plate breaking, as in the case of the Storage and Pumping Station. In the drying room of the Safety Lamp Room and Bathroom, there are floors/walls for which methods of their connection to the wall have yet to be identified and their strength has not been confirmed exactly. However, they are expected to collapse in the future because creep is found on the floors. To address this, the plan includes the minimization of the impact on the building at the time of collapse by putting a falling prevention device in addition to structural reinforcement.

3. Value as a heritage

(1) OUV of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining*

(Excerpt from the OUV statement resolved at the World Heritage Committee)

A series of industrial heritage sites, focused mainly on the Kyushu-Yamaguchi region of south-west of Japan, represent the first successful transfer of industrialization from the West to a non-Western nation. The rapid industrialization that Japan achieved from the middle of the 19th century to the early 20th century was founded on iron and steel, shipbuilding and coal mining, particularly to meet defence needs. The sites in the series reflect the three phases of this rapid industrialisation achieved over a short space of just over fifty years between 1850s and 1910.

The first phase in the pre-Meiji Bakumatsu isolation period, at the end of Shogun era in the 1850s and early 1860s, was a period of experimentation in iron making and shipbuilding. Prompted by the need to improve the defences of the nation and particularly its sea-going defences in response to foreign threats, industrialisation was developed by local clans through second hand knowledge, based mostly on Western textbooks, and copying Western examples, combined with traditional craft skills. Ultimately most were unsuccessful. Nevertheless this approach marked a substantial move from the isolationism of the Edo period, and in part prompted the Meiji Restoration.

The second phase from the 1860s accelerated by the new Meiji Era, involved the importation of Western technology and the expertise to operate it; while the third and final phase in the late Meiji period (between 1890 to 1910), was full-blown local industrialization achieved with

newly-acquired Japanese expertise and through the active adaptation of Western technology to best suit Japanese needs and social traditions, on Japan's own terms. Western technology was adapted to local needs and local materials and organised by local engineers and supervisors.

The 23 components are in 11 sites within 8 discrete areas. Six of the eight areas are in the south-west of the country, with one in the central part and one in the northern part of the central island. Collectively the sites are an outstanding reflection of the way Japan moved from a clan based society to a major industrial society with innovative approaches to adapting western technology in response to local needs and profoundly influenced the wider development of East Asia.

After 1910, many sites later became fully fledged industrial complexes, some of which are still in operation or are part of operational sites.

(2) Constituent elements contributing to the OUV

After introducing Western technology and beginning mechanical coal mining, the Miike Coal Mine continued to increase and maintain its coal output by digging several new pitheads. There are distinct remains in multiple existing pitheads, and multiple structures at the time of establishment remain in good condition; they exhibit an important interchange of human values (Criterion ii) and illustrate a significant stage in human history (Criterion iv), among the *Sites of Japan's Meiji Industrial Revolution.* Particularly, facilities related to Shaft No. 2 that remain in the Manda Pit, and continuous landscapes of the remains of Coal Railway, which extend from the Miyanohara Pit to the Manda Pit to the Miike Port, create a technological ensemble and mining landscape (Criterion iv); their values as cultural properties have been recognized at the national level and properly preserved.

The attribute that represents the OUV of the Manda Pit is a modernized coal mine equipped with a Davey pump drainage device, which was the world's most powerful one at that time, and two large Western shafts exist. It also includes a steel tower, a brick winding engine house (including a winch existing in the original location), a brick fan room, and attached buildings and structures.

Specifically, it consists of Shafts No. 1 and No. 2; Shaft No. 1/tower was completed in 1899 and Shaft No. 2 tower in 1908. With the construction of these pit facilities, various facilities were built, including a winding engine house, a boiler place, a coal washery, and an office. Although the facilities were upgraded, including electrification, from the Taisho to the early Showa period, coal mining was stopped in 1951 due to decreased efficiency in coal mining, resulting in the dismantling of Shaft No. 1 and other facilities. Concerning the buildings within the Manda Pit facility, the Shaft No. 1 tower was dismantled (reused by Hokkaido Ashibetsu Coal Mine in 1954), and the winding engine house was also demolished; today, the foundations of the shaft and the

tower as well as underground remains such as facilities related to Shaf No. 1 remain. Around the Shaft No. 2 tower and the Shaft No. 2 winding engine house, there exist many buildings including the office, the Safety Lamp Room, the Storage and Pumping Station, and the facility to enshrine Yamanokami.

(3) Present state of preservation

The Shaft No. 2 winding engine house consists of two connected, brick single-storied buildings with a gabled roof, and is equipped with two winches inside. The Shaft No. 2 tower, which is made of steel and as high as 18.9 m, and the Shaft No. 2 winding engine house had their conservation and earthquake-proofing works completed in 2010.

The Storage and Pumping Station and the Safety Lamp Room and Bathroom, the objects of the works, are brick buildings from the Meiji period. Initially, they were indispensable facilities as they housed the ventilation fan and machines critical for operation in the pit which had become long and large. Although they are important elements to prove the existence of the coal mine, the buildings are severely damaged.

The condition of damage of these two buildings, the objects of the works, is as outlined below.

□ Storage and Pumping Station

Brick walls have many sections damaged or missing, including openings that were created by later indiscreet modifications. The top of the arch also has some bricks missing, posing the risk of collapse. The decayed roof has caused major leaking of rain, with rainwater running down along brick walls. This caused salts to precipitate, and there are many sections where joint filler has been damaged. The exterior wall section is thickly covered with plants. The inside of the exhaust tower is exposed to wind and rain as the upper roof is missing, leading plants to flourish notably. Steel materials clinging to the brick walls, which are traces of functional members from the time when the building housed a fan, show severe damage by explosive fracture. Steel materials in the top of the exhaust tower are particularly severely deteriorated due partly to the influence of rainwater entry, significantly affecting brick walls and causing cracks in joints.

In the floor framing, rails inserted into brick walls are used as sleepers, and a little smaller rails are used as joists. The underground space is in wet condition at all times due to rain leakage and drainage water, and the rails are severely corroded and decomposed/flaking in layers, which is beyond the condition that allows the shape to be maintained by surface scrubbing. For the flooring, a mortar finish is given after laying PC (precast concrete) boards on the rails. Some sections have exposed PC boards and laid wood. The PC boards show sections where the reinforcing bars have fractured. Wooden floor boards/joist members are severely damaged by termites and seriously

decayed, with noted falling alongside the wall. Part of the floor is a floor of plain concrete, which was integrally placed with rails inserted into brick walls and used as sleepers. The underlying basement storage is in wet condition at all times due mainly to water leakage, and the rails that were integrally placed with the plain concrete floor were fractured and exposed.

In most roof truss members for structures, such as the roof purlin and ascending beams, the intrusion of termites is observed, which was caused by decay due to rain leaking through the roof; the members are severely decayed.

In the flat roof part, a mortar finish is given to bricks, and mortar is used as a waterproof measure. Mortar shows unevenness due to cracks and peeling, leading to poor drainage and rain leakage. Most roof board members of the pantile roofing part are observed to notably have decay due to rain leakage and the intrusion of termites; the members are severely decayed. This condition caused roof boards and tiles to fall, and parts with holes are confirmed. The top of the exhaust tower had a roof slated with corrugated iron sheets, which had gone missing because of wind damage and rain leakage as well as the associated decay.

On the north side, steel-framed lean-to eaves were attached, and vinyl chloride corrugate sheet roofing was changed to wood shingle roofing. Roofing materials remain only partially due to decay, and steel materials constituting the frame are confirmed to have rusting. Reinforced concrete eaves on the east side have some reinforcing bars that are exposed due to the explosive fracture.

Exterior wooden fixtures have gone missing due to decay. Interior wooden fixtures are confirmed to have sections damaged/missing due to decay. Exterior steel sashes are confirmed to have rusting, which was caused by peeling of painting. In most wood backing parts, peeling of painting is seen. In most steel substrate parts, peeling of painted surfaces due to rusting is noted.

Plastering at the circular cross section wall in the center of the former fan room and at the inclined wall in the exhaust tower flaked off entirely due to the intrusion of rainwater, with only its trace remaining. Plants are flourishing notably. It is recorded that the underground wall surfaces were given a mortar finish, which however shows peeling everywhere.

□ Safety Lamp Room and Bathroom

Brick walls have many sections damaged or missing, including openings that were irregularly created by later indiscreet modifications. Some openings do not have a lintel, and brick walls are formed only by adhesion force of joints in some sections, posing the considerable risk of brick

walls collapsing. Other openings have sections that are put between bricks replaced for the construction of wooden fixtures. The sections with replacement bricks are notably weathered due to precipitation of salts. The exterior wall section is thickly covered with plants. The sections that have lost the roof around the eaves are particularly thickly covered. At the part near the cornice of the top of brick walls, some inner part brick walls were chipped away by a later modification of the roof. In the drying room, brick walls were added to this part, and due to this influence, a jut is seen in the periphery of brick walls.

The mortar dirt floor shows peeling of mortar. In the bathroom/changing room, a trench created to drain water is intercepted by sediment.

The ceiling of the bathroom part shows progressing corrosion/decay due to rainwater that entered after the monitor roof had collapsed. The damage is particularly noticeable at the ceiling part of the monitor roof. The ceiling of the changing room shows progressing soiling/decay due to the influence of rain leaking through the roof. At the ceiling of the drying room, a galvanized plate has fallen due to weight after the plastered wall of the end panel had collapsed. Decay is progressing in the members around the eaves, including the flat beam, the pole place, and the roof purlins due to rainwater that entered through the lost part of the roof.

The roof is a slate roof with cement corrugated sheets, which have noticeable cracks. The roof used to be a pantile roof at the time of the construction, which was later reroofed using corrugated iron sheets, and the height of the roof truss was changed and raised. In the part connecting to the end panel, rainwater entered due to poor construction, causing the decay of roof truss members and the collapse of the plastered wall. The monitor roof has only part of the roof truss and ceiling left after roofing materials had fallen due to damage by strong wind. This condition has been allowing rainwater to enter considerably, contributing to the decay of monitor roof materials.

The Safety Lamp Room and Bathroom has steel-framed lean-to roofs attached on the south and the west sides. Both have undergone a modification to change vinyl chloride corrugate sheet roofing to wood shingle roofing. Due to decay, roofing materials only partially remain in part of the lean-to roof on the south side. Steel materials constituting the framework are confirmed to have rusting.

Exterior wooden fixtures have gone missing due to decay. Interior wooden fixtures are confirmed to have sections damaged/missing due to decay. Exterior steel sashes are confirmed to have rusting which was caused by peeling of painting. Aluminum sashes in the bathroom have gone missing.

Peeling of painting is seen in most wood backing parts. In most steel substrate parts, peeling of painted surfaces due to rusting is noted. The plastered wall in the drying room show noticeable peeling/flaking due to rainwater that entered through the roof, and the most part of it flaked off. In the end panel of the safety lamp room, traces of flaked plaster are confirmed.

The bathroom has many piping including hot-water/water piping and drainage piping. In most of them, coating materials have fallen off and rusting is confirmed in piping materials. Electric light fixtures also show progressing rusting; they have broken/fallen.

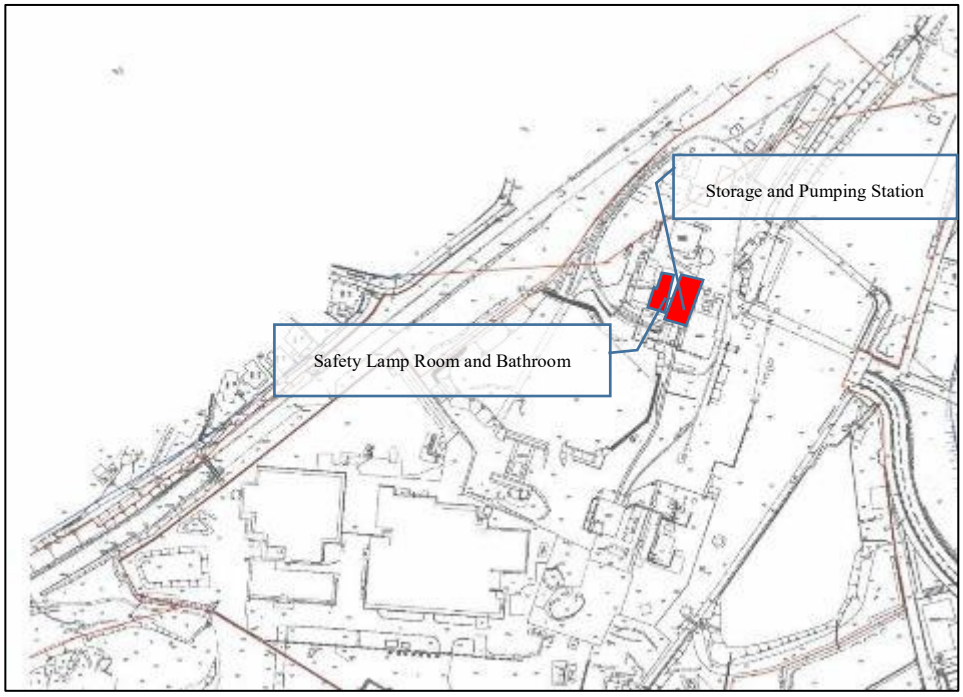


Figure 3 Location of buildings for works

Figure 4 Storage and Pumping Station

Figure 5 Safety Lamp Room and Bathroom

4. Assessment of the overall impact of conservation/earthquake-proofing works

The conservation/earthquake-proofing works are aimed at conserving the two deteriorated buildings

permanently and contributing to the promotion of their interpretation through disclosure to visitors after the works have been completed.

The basic policy stands by the fundamental assumption that existing members of the buildings are preserved to the extent possible and they are conserved so that their shapes remain as they have been, on the basis of the idea of "what can be preserved" instead of "what should be preserved."

Members that are too deteriorated to be used may be replaced inevitably, but as a policy, old members to be replaced will be scrutinized and preserved as well to the extent possible.

In addition, the earthquake-proofing works do not make changes to the appearance; in placing reinforcement members indoors, consideration is given to make them as inconspicuous as possible by, for example, attaching them along a pillar or a beam.

5. Management process

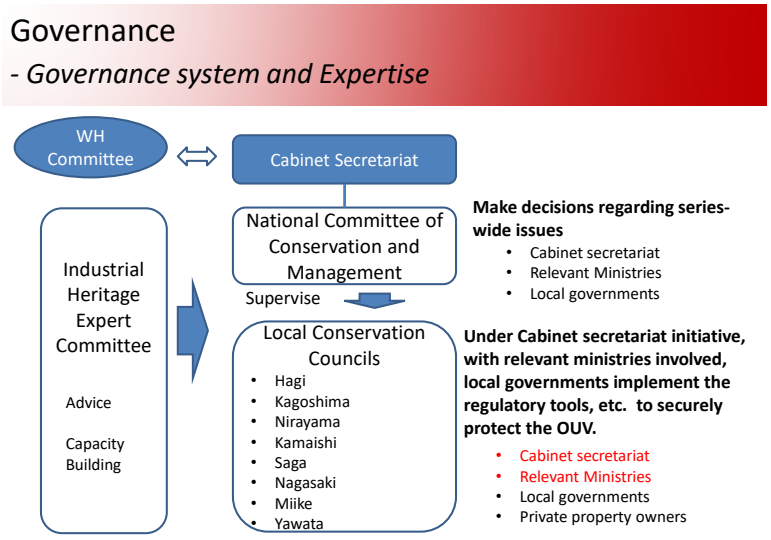
Before the basic design of the works was decided through two years of cautious discussions at the Conservation Expert Committee consisting of members of the Agency for Cultural Affairs and experts from various fields.

The works have been reported at the Area 7 Miike Local Conservation Council in 2019.

As for the management standards of the works, reference is made to the Cultural Assets Preservation Act, the Act on Regulation of Execution of Budget Pertaining to Subsidies and the Order for Enforcement of said Act, the rules of the Agency for Cultural Affairs/related laws and regulations, and related ordinances of Kumamoto Prefecture/Arao City, among others.

Regarding the organization for the works, the secretariat is established in the World Heritage and Cultural Exchange Office, Cultural Affairs Division, Arao City. In addition, a Conservation Expert Committee is organized to seek discussion and advice on the project.

Design and supervision are entrusted to Japan Cultural Heritage Consultancy, which specializes in the conservation of important cultural properties of Japan, and a chief engineer is assigned, who holds a professional qualification related to the conservation of important architectural monuments and buildings that is authorized by the Agency for Cultural Affairs.



Governance system of the Strategic Framework

6. Work schedule

September 2016 to March 2018: Research for conservation/earthquake-proofing

May 2019 to March 2020: Demolition work, temporary work, execution design, etc.

April 2020 to March 2021: Carpenter's work, joiner's work, brick work, painter's work, etc.

April to October 2021: Completion

7. Conclusion

The conservation/earthquake-proofing works of the Miike Coal Mine Manda Pit Storage and Pumping Station as well as Safety Lamp Room and Bathroom are planned and carried out by respecting the OUV of the World Cultural Heritage: Sites of Japan's Meiji Industrial Revolution, including its integrity and authenticity; therefore, the works do not adversely impact the value of this site.

Conducting the conservation/earthquake-proofing works is a project necessary for the preservation and utilization of the sites because they do not diminish the OUV value as heritage but rather significantly contribute to assuring the OUV preservation and promoting the understanding of the value among visitors.

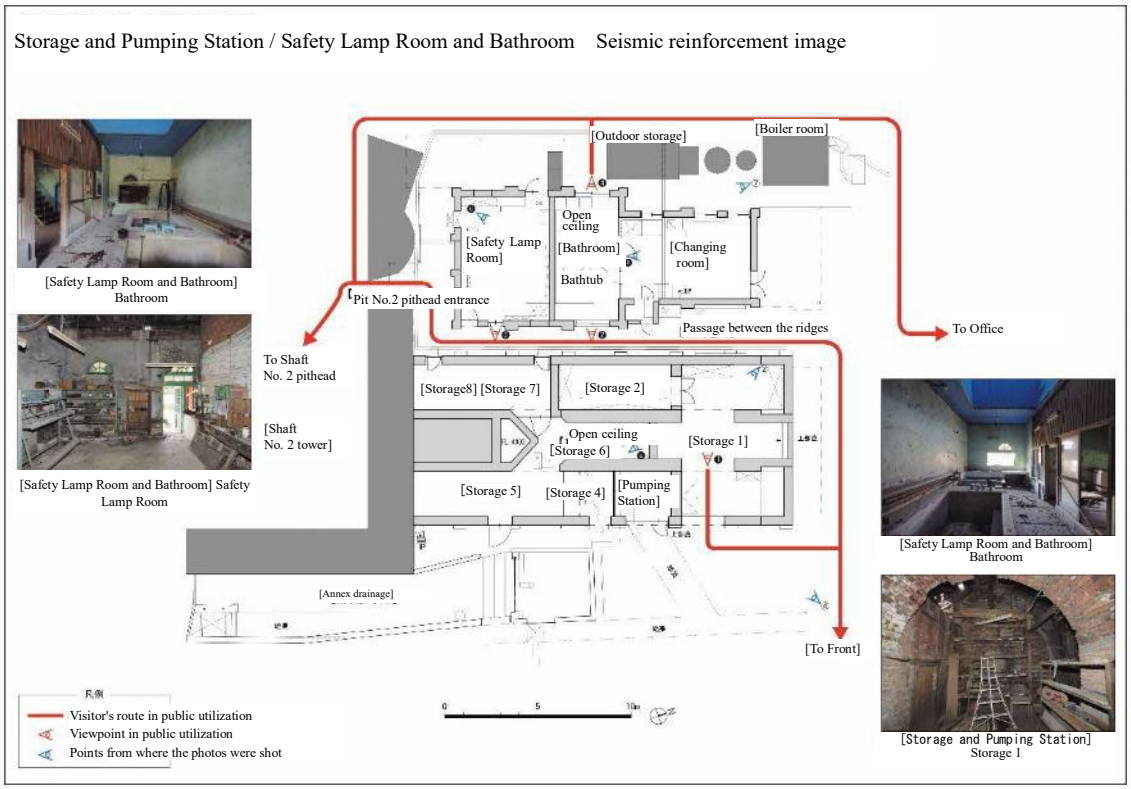


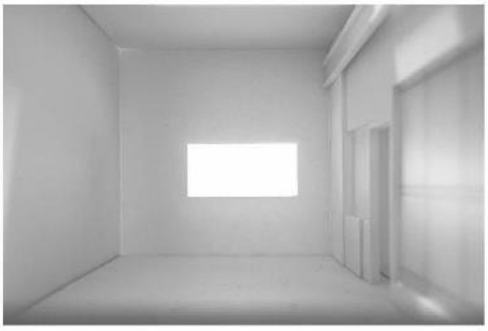
Figure 6 Legend of the seismic reinforcement image

Storage and Pumping Station / Safety Lamp Room and Bathroom　Seismic reinforcement image

1.　Appearances from the viewpoint in public utilization

(1) Storage 1 (the former fan room) side bay viewed from the venter (invisible from Front)


(2) Bathroom viewed from the passage between the two buildings

(3) Safety Lamp Room viewed from the passage between the two buildings


Figure 7　Seismic reinforcement image 1

(4) Bathroom viewed from the opening on the west side

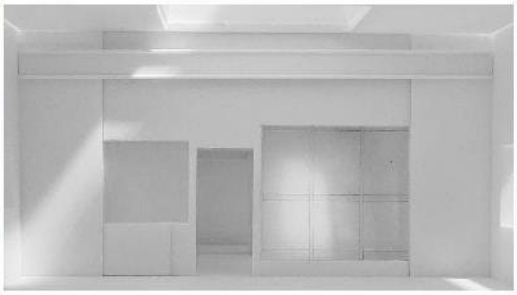
2. Appearances from special viewpoints not opened to the public

(a)(b) Exhaust tower frame reinforcement looked up at from just under the tower

(c) Roof structure plane on the upper part of Safety Lamp Room looked up at from Safety Lamp Room

Figure 8 Seismic reinforcement image 2

(d) X4 lane frame reinforcement viewed from Bathroom



(e) Falling prevention device under the drying room viewed from the changing room

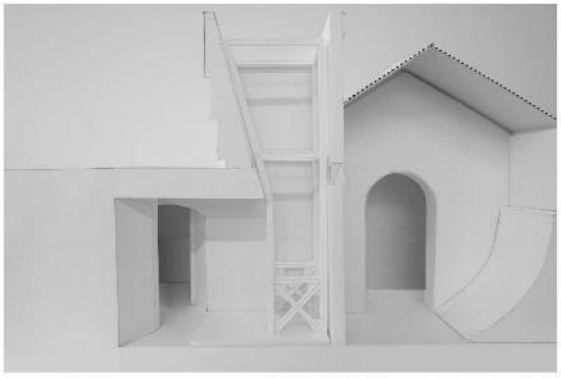
3. Appearances from viewpoints that provide an overview of reinforcement

(1) Reinforcement of the roof structure plane of the Storage 1 (former fan room) side bay, looked down from the above

(2) Reinforcement of the roof structure plane of the Storage 1 (former fan room) side bay, looked up from the passage between the two buildings

Figure 9　Seismic reinforcement image 3

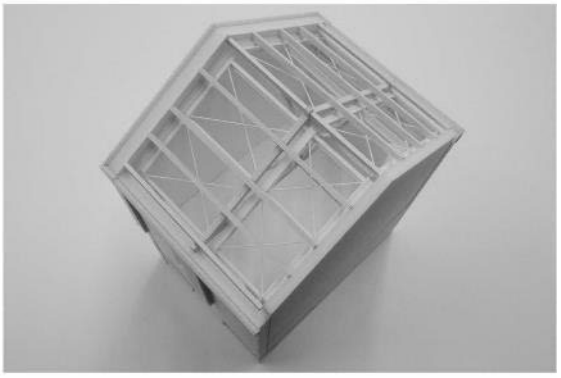
(3) Exhaust tower reinforcement viewed from the side



(4) Reinforcement members cannot be seen from the exterior

(5) Roof structure plane of Safety Lamp Room looked up from inside of the room

(6) Roof structure plane of Safety Lamp Room looked down from the above



(7) X4 lane frame reinforcement viewed from the boiler room

(8) X4 frame viewed from inside of the room. ⬭ shows the indoor side of (7)

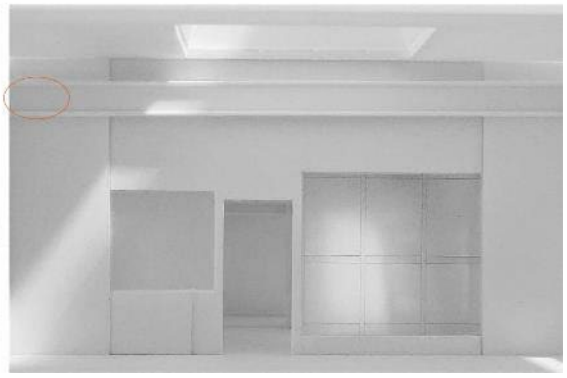


Figure 10 Seismic reinforcement image 4

Appendix 2-3

Heritage impact assessment report of Miyanohara Pit (Component Part 7-1) Shaft No. 2 Winding Engine House conservation/earthquake-proofing works

Outline

This document is a heritage impact assessment report of the conservation/earthquake-proofing works of the Miike Coal Mine Miyanohara Pit Shaft No. 2 Winding Engine House, a constituent element of the Miike Coal Mine (Component Part 7-1), which is a component part of the World Heritage Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining.

Given that the building is significantly deteriorated and that Japan is a quake-prone country, the conservation/earthquake-proofing works of the building are necessary to preserve the site permanently in the future.

The conservation works of the building are limited to partially repairing members of fixtures, such as windows and doors, to preserve original members to the extent possible. Meanwhile, the earthquake-proofing works do not change the appearance. In placing reinforcement members indoors, careful consideration is given by, for example, placing them along pillars and beams to make them as inconspicuous as possible.

Therefore, conducting the works will enhance the contribution of the building to the Outstanding Universal Value (OUV).

1. Introduction

(1) The object of this heritage impact assessment is the Miyanohara Pit, a constituent element of the Miike Coal Mine and Miike Port (7-1), which is a component part of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining* that was inscribed on the World Heritage List in July 2015 (Figures 1 and 2).

(2) In the assessment, reference was made to matters stipulated in the Conservation and Management Plan (CMP) for the site as well as opinions of Japanese and non-Japanese experts.

(3) The main organization that prepared the assessment report is Omuta City.

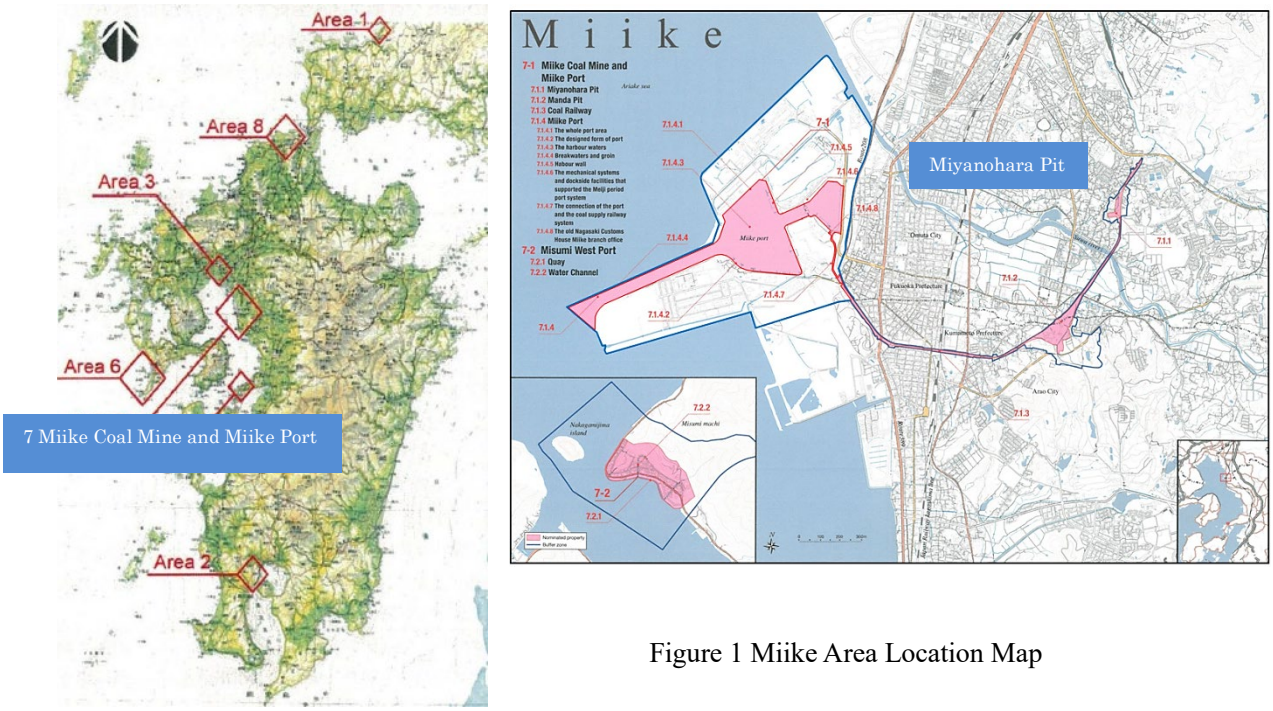
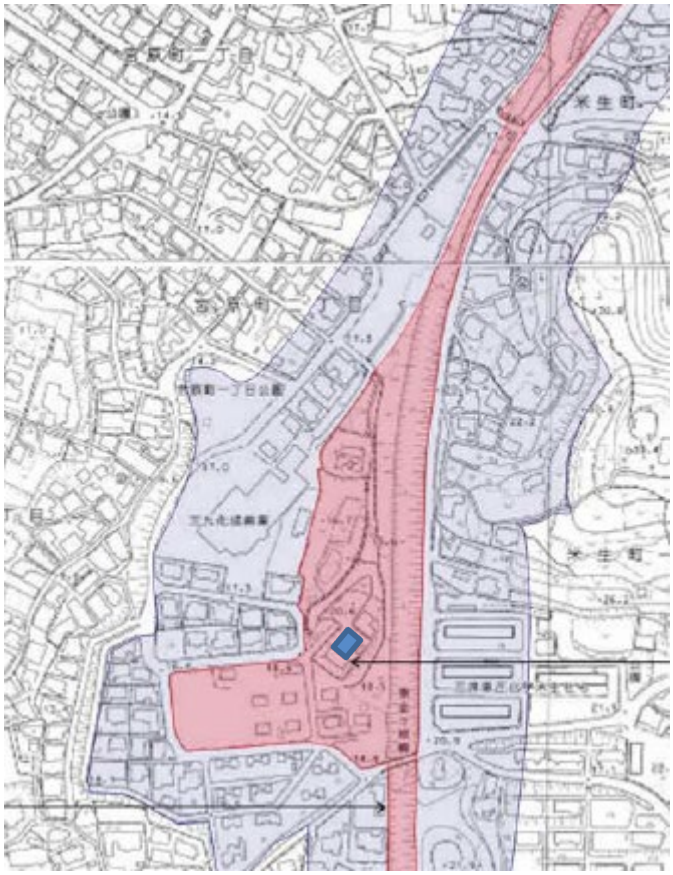


Figure 1 Miike Area Location Map



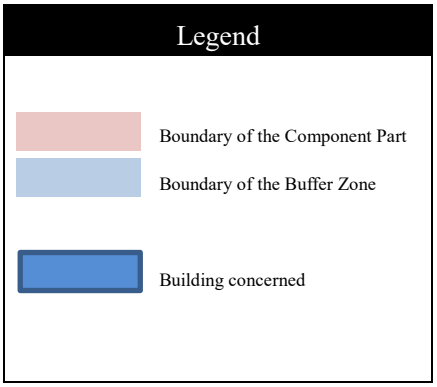


Figure 2 Boundaries of the component part/buffer zone, and location map of the building concerned

2. Outline of conservation/earthquake-proofing works of building

(1) Outline of building

From its completion in 1898 until 1997, the Miike Coal Mine Miyanohara Pit had gone through modifications to adapt to changes in the machines and power source used as a coal mining facility as well as desired functions, under the management of Mitsui Mining Co., Ltd. The facilities stopped coal mining in 1931 but continued to be used as facilities for drainage and management until 1997. Among the facilities, the inside of the building of the Shaft No. 2 Winding Engine House, the object of the conservation/earthquake-proofing works, was drastically modified to divert facilities when the power was changed from steam to electricity.

Meanwhile, internal and external surfaces have many damaged or missing bricks. The top of the arch also has some missing bricks, posing the risk of bricks falling. The corroded roof has caused major leaking of rain, with rainwater running down along brick walls. This caused salts to precipitate, and there are many sections where joint filler has been lost or damaged. These are adversely affecting the conservation of the building, and the 39th World Heritage Committee Decision states, “At the Miike Coal Mine and Miike Port, some of the physical fabric is in poor condition.” To address this, immediate action is required (Attachment-1).

(2) Conservation and management policy

With regard to the conservation of the Miike Coal Mine (Miike Coal Mine Miyanohara Pit, Manda Pit, and remains of Coal Railway), the Conservation and Management Plan states the following principle and policies:

（1） Conservation principle

The present condition should basically be preserved for the sites. For all the sites, efforts should be made to preserve the present condition by using condition at the time of closure in 1997 as the base. Conservation works should use materials and construction methods based on the results of resource research and excavations but not on speculations. Reconstruction works should not be conducted as a rule. (The rest is omitted)

（2） Basic policies

- Preservation should properly be carried out in accordance with the Cultural Assets Preservation Act and the Landscape Act.
- After the registration as world heritage, proper preservation as world heritage should be ensured in accordance with the government's preservation policy for world heritage, in addition to by following domestic policies for the preservation of remains.
- For the elements at the time of operation of the Miyanohara Pit, the Manda Pit, and the Coal Railway, which directly represent the OUV, value as world heritage should properly be preserved.
- Within the boundary of this component part, there are buildings and archaeological remains. Each of them should be under proper conservation and management, while considering the surrounding environment as well to maintain the historical context of this component and taking adequate measures to preserve the cultural landscape through the operation of the Landscape Act and other laws.

On the basis of the principle and policies shown above, measures necessary for preservation, including conservation and reinforcement, are taken with the basic goal of preserving the present condition of the Miyanohara Pit Shaft No. 2 Winding Engine House, which is an element representing the OUV and contributing to the value as the country. Measures necessary for preservation involve minimal intervention, and consideration is given to maintain the authenticity of the sites. In addition, proper preservation is ensured in accordance with the Cultural Assets Preservation Act for the elements designated as a cultural property in Japan, and in accordance with the Landscape Act for the elements designated as a structure of landscape importance.

（3） Outline of the conservation/earthquake-proofing works

In the conservation works, seismic reinforcement and repair works are conducted with the basic goal of preserving the condition at the time of closure, which is condition at the time of registration as world heritage (Attachment-2).

First, the following seismic reinforcement works are carried out:

(i) Insert reinforcement members into brick walls, and partially reinforce the concrete foundation

(Attachment-3)

(ii) Newly place steel beams inside the top of brick walls (Attachment-2)

(iii) Insert aramid fiber rods into the joints of brick outer surfaces (Attachment-4)

The primary purpose of each work is to improve the flexural capacity of brick wall surfaces for (i), to enhance the horizontal stiffness of the roof surface for (ii), and to reinforce the upper part of the opening and improve out-of-plane bending capacity for (iii).

The roof and the wood of the roof are temporarily removed for earthquake-proofing works and rain leakage repair works on the roof. However, members removed are returned to their original positions after earthquake-proofing works are completed. In removing them, sufficient preparations are made so as not to affect parts that are not dismantled.

In some repair works, sections with severe corrosion or cracks in wooden parts of doors and window frames are repaired. Here again, it is a prerequisite to partially repair original members without replacing them. In addition, for parts that are deteriorated and heavily damaged in the exterior wall of bricks, bricks are partially added to damaged sections, and near-empty joints between bricks are filled (Attachment-5). In these works too, it is a prerequisite to partially repair original members without replacing them. This way, through the conservation works aimed at preserving the condition at the time of closure, partial repair works are conducted using existing members.

3. Value as a heritage

（1）The OUV of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining* is as described below (Excerpt from the statement of the OUV resolved at the World Heritage Committee) .

A series of industrial heritage sites, focused mainly on the Kyushu-Yamaguchi region of south-west of Japan, represent the first successful transfer of industrialization from the West to a non-Western nation. The rapid industrialization that Japan achieved from the middle of the 19th century to the early 20th century was founded on iron and steel, shipbuilding and coal mining, particularly to meet defence needs. The sites in the series reflect the three phases of this rapid industrialisation achieved over a short space of just over fifty years between 1850s and 1910.

The first phase in the pre-Meiji Bakumatsu isolation period, at the end of Shogun era in the 1850s and early 1860s, was a period of experimentation in iron making and shipbuilding. Prompted by the need to improve the defences of the nation and particularly its sea-going defences in response to foreign threats, industrialisation was developed by local clans through second hand knowledge, based mostly on Western textbooks, and copying Western examples, combined with traditional craft

skills. Ultimately most were unsuccessful. Nevertheless this approach marked a substantial move from the isolationism of the Edo period, and in part prompted the Meiji Restoration.

The second phase from the 1860s accelerated by the new Meiji Era, involved the importation of Western technology and the expertise to operate it; while the third and final phase in the late Meiji period (between 1890 to 1910), was full-blown local industrialization achieved with newly-acquired Japanese expertise and through the active adaptation of Western technology to best suit Japanese needs and social traditions, on Japan's own terms. Western technology was adapted to local needs and local materials and organised by local engineers and supervisors.

The 23 components are in 11 sites within 8 discrete areas. Six of the eight areas are in the south-west of the country, with one in the central part and one in the northern part of the central island. Collectively the sites are an outstanding reflection of the way Japan moved from a clan based society to a major industrial society with innovative approaches to adapting western technology in response to local needs and profoundly influenced the wider development of East Asia.

After 1910, many sites later became fully fledged industrial complexes, some of which are still in operation or are part of operational sites.

（2）The Miike Coal Mine and Miike Port, a site representing the coal industry in the third phase, is remains in the Meiji Era when Japan established its industrial base through the active introduction and adaptation of Western technology to best suit Japanese needs.

After introducing Western technology and beginning mechanical coal mining, the Miike Coal Mine continued to increase and maintain its coal output by digging several new pitheads. There are distinct remains in multiple existing pitheads, and multiple structures at the time of establishment remain in good condition; they exhibit an important interchange of human values (Criterion ii), and illustrate a significant stage in human history (Criterion iv), among the *Sites of Japan's Meiji Industrial Revolution.*

The attribute that represents the OUV of the Miyanohara Pit is a large Western shaft (featuring an existing steel tower), which was equipped with a drainage pump that was the world's most powerful one at that time and a modern winch. The brick winding engine house exists (the second winch has been installed in the original position). A huge Davey pump drainage pipe exists. Archaeological remains of other coal mine facilities, including the Davey pump room, also remain.

Concerning the state of preservation of the Miike Coal Mine Miyanohara Pit, the Shaft No.1

facilities had the building dismantled, but underground remains exist.

For the Shaft No. 2 facilities, the winding engine house, a brick single-storied building with a gabled roof, is equipped with two winches inside. The steel Shaft No. 2 tower, which is as high as 22 m, had its repainting completed in 2002.

Around the Shaft No. 2 tower and the Shaft No. 2 Winding Engine House, there exist the wall of the Davey pump room, a spur line, and buildings such as a staff lounge, as well as underground remains including a boiler chimney.

4. Decision on construction methods and management process

（1）Decision on construction methods

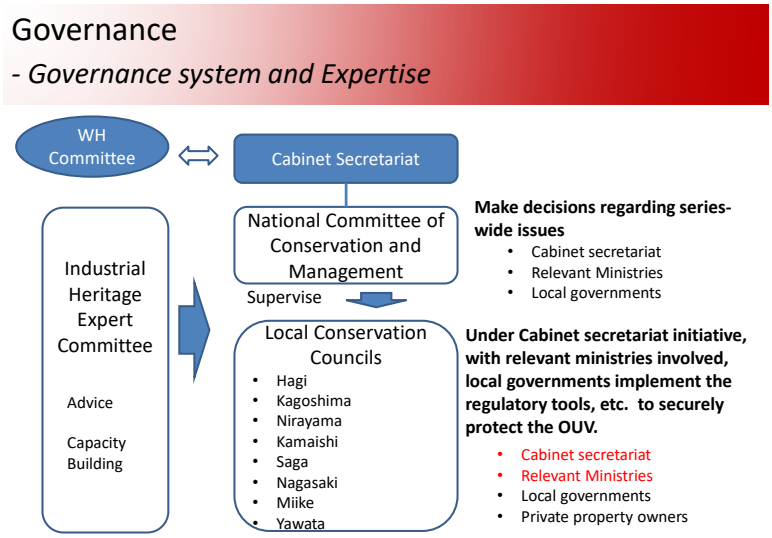
For the building concerned, research work, including structural diagnosis, was conducted with support from the government in 2010 and 2011, and construction methods for conservation/ earthquake-proofing works were discussed and decided. After that, in 2019, the appropriateness of construction methods used at that time and innovative technologies were confirmed at an expert committee comprising experts in modern architecture and structural work methods as well as preservation and reinforcement of historic structures. Discussions were held in parallel with the Agency for Cultural Affairs, and the decision was made to adopt the construction methods described above.

The decision was explained to foreign ICOMOS experts and approved by them.

（2）Management standards of the works and the organization for the works

Regarding the management standards of the works, the works are managed in accordance with Japan’s Cultural Assets Preservation Act, the Act on Regulation of Execution of Budget Pertaining to Subsidies and the Order for Enforcement of said Act, the rules of the Agency for Cultural Affairs/related laws and regulations, and related ordinances of Fukuoka Prefecture/Omuta City.

As for the organization for the works, the secretariat is established in the World Heritage and Cultural Property Office, Planning and General Affairs Division, Omuta City. In addition, an advisory committee consisting of experts is organized to seek discussion and advice. Design and supervision are entrusted to a company with a chief engineer authorized by the Agency for Cultural Affairs of Japan, and carried out in consultation with the City, the Prefecture, and the government as needed.



Governance system of the Strategic Framework

5. Work schedule

July 2010 to September 2019: Research/discussions/consideration for conservation/earthquake-proofing

May 2019 to March 2020: Reconfirmation of the contents of the works

June 2020 to February 2021: Execution design

March to October 2021: Temporary work, removal of the roof

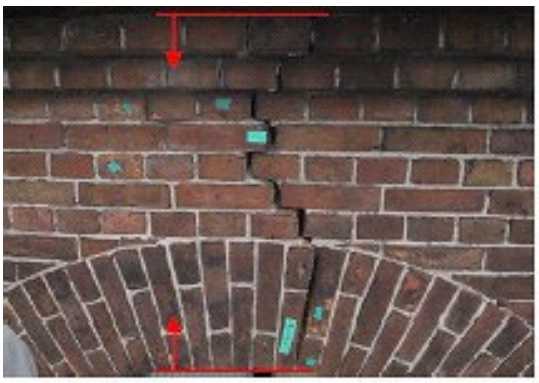
November 2021 to June 2022: Conservation works, earthquake-proofing works

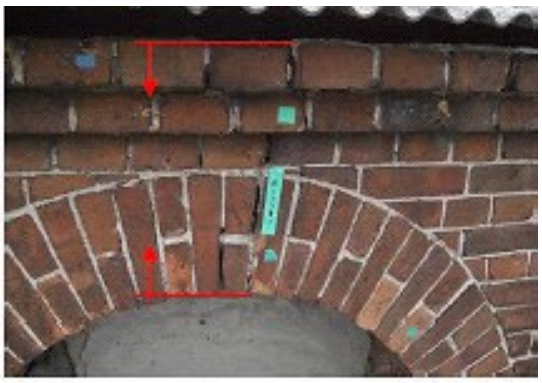
July 2022 to March 2023: Printing and bookbinding of the report

6. Assessment of the overall impact of conservation/earthquake-proofing works

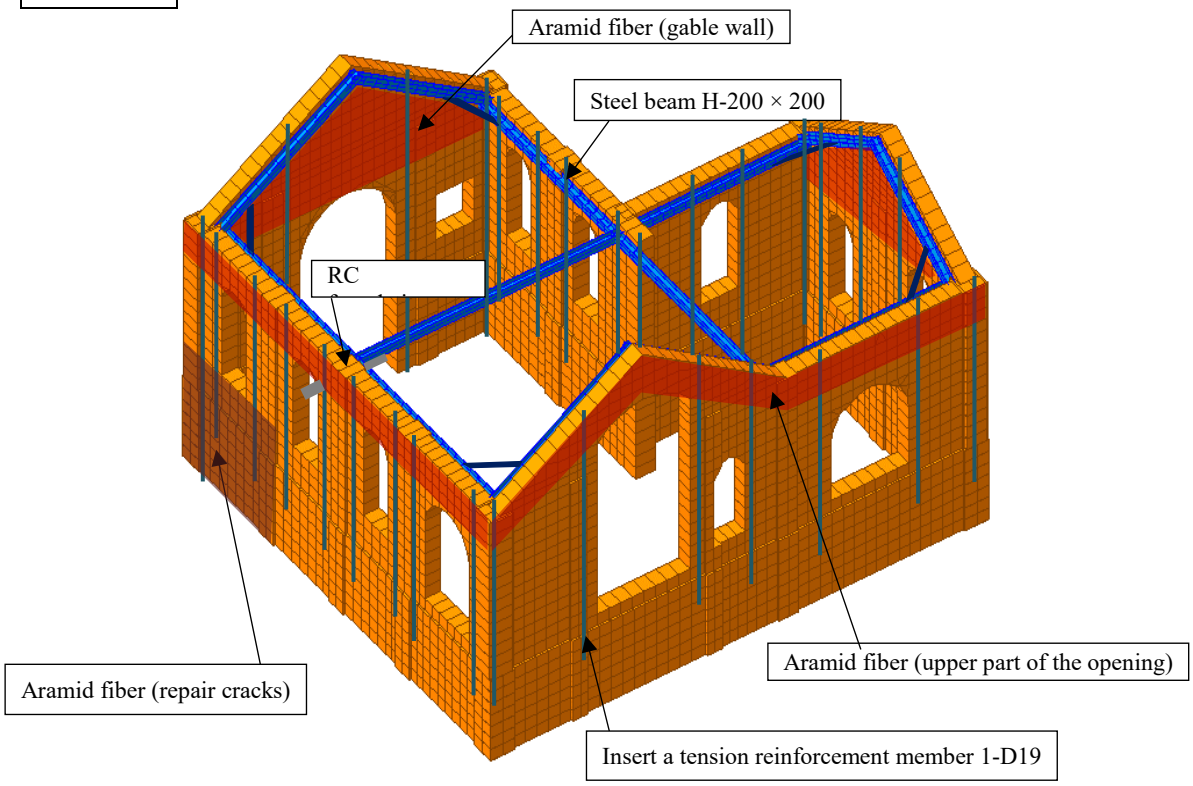
As described above, the conservation/earthquake-proofing works of the Miike Coal Mine Miyanohara Pit Shaft No. 2 Winding Engine House are conducted in such a way that existing members of the building are preserved to the extent possible, minimal changes are made to the appearance, and unnecessary designs are not brought in. Carrying out the works by respecting the OUV of the World Cultural Heritage: *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining*, including its integrity and authenticity, will enhance the contribution of this building to the OUV without adversely affecting the value of this site.

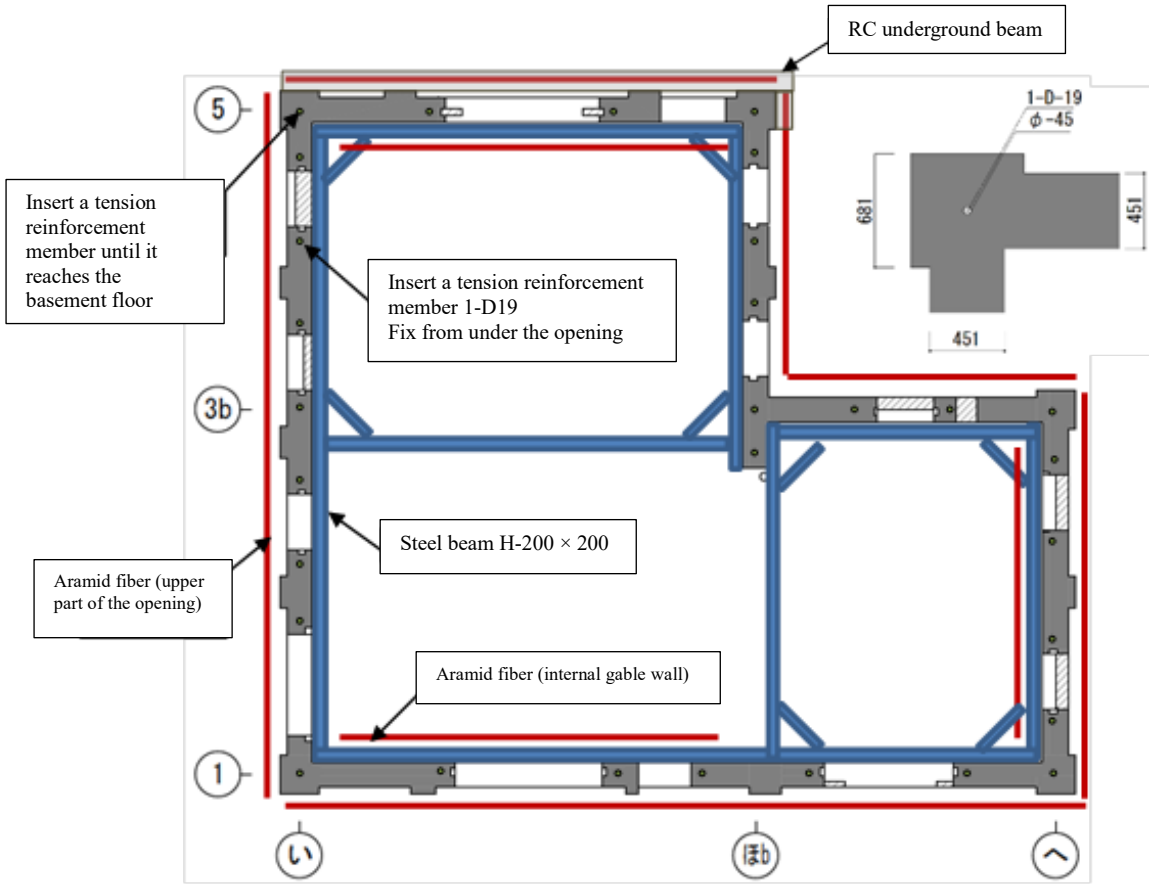
Attachment-1





Attachment-2

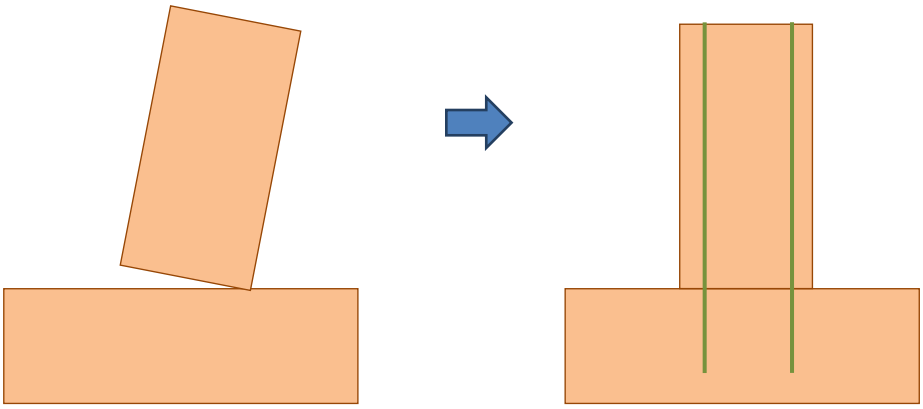




Attachment-3

3. Construction methods for reinforcement

a) Reinforcement by inserting a tension reinforcement member



Conceptual diagram of reinforcement by inserting a tension reinforcement member

Drill a reinforcing bar insertion hole (42 φ, 3.8–7.0 m)

Insert a reinforcing bar (brick width: 333 mm, 1-D22)

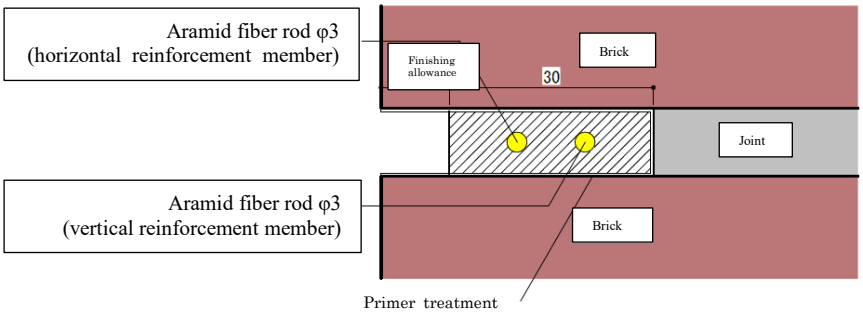
Pour cement slurry

Completed pouring

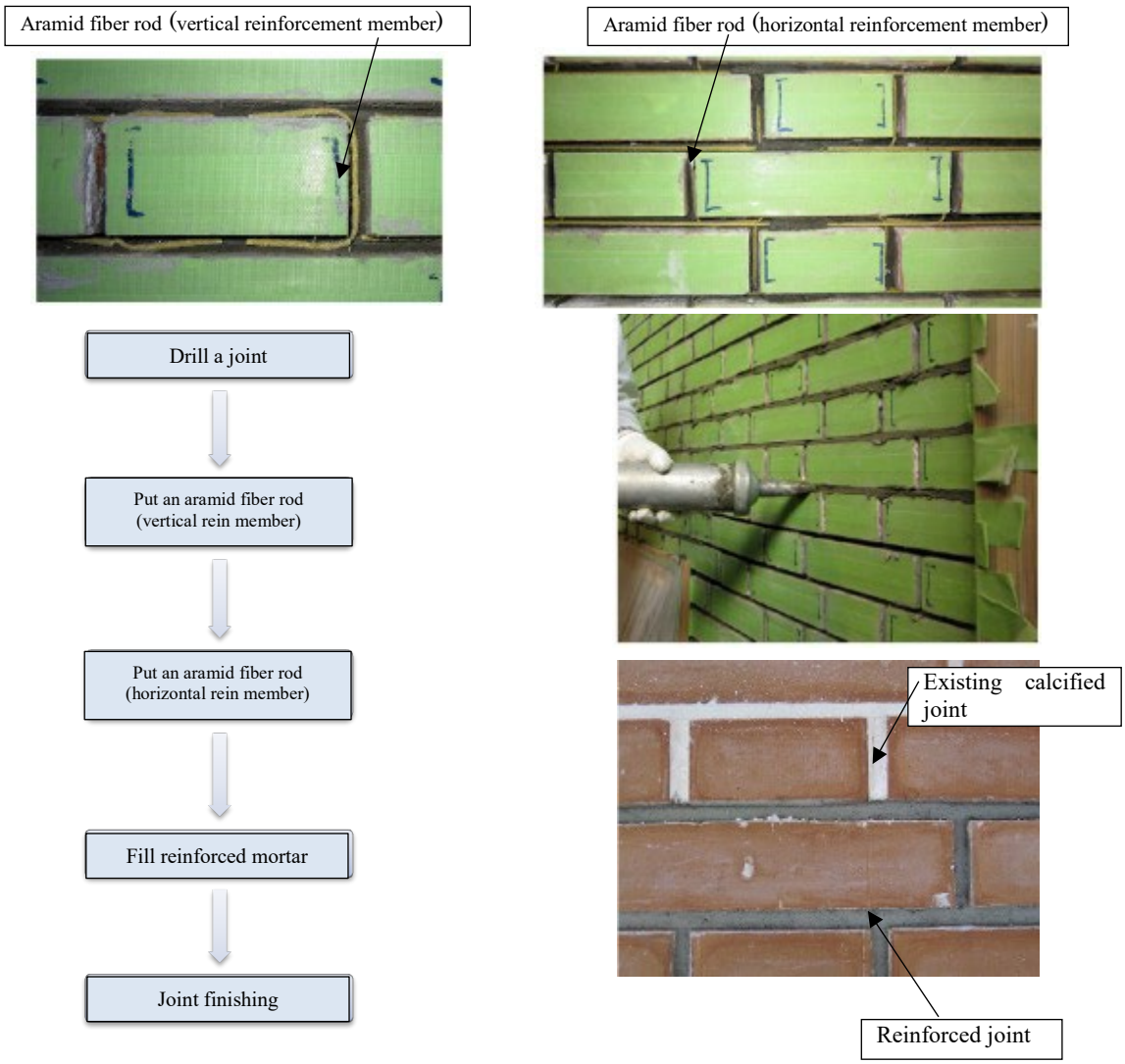
Photos showing an example of insertion of a tension reinforcement member

Attachment-4

b) Joint replacement through aramid fiber rod insertion



Reinforcement cross section



Photos showing an example of aramid fiber rod insertion into a joint

Attachment-5

Repair bricks: Place supplementary bricks on a section where the bricks have been deeply deteriorated and lost, as seen in this photo

1. Chip away bricks deteriorated more than half

2. Remove carefully

3. Fill mortar

4. Put a brick on the part

Summary of the Heritage Impact Assessment for a Route Change of the City Planning Road in Miike Coal Mine and Miike Port (Area 7/Component Part 7-1) and Its Buffer Zone

This document is a summary report on the Heritage Impact Assessment (hereinafter referred to as "HIA") conducted regarding a change in route of the previously decided city planning road Manda-Shimoide Line that would have passed through the Miike Coal Mine and Miike Port (Area 7/ID 7-1), which is a component part of the World Cultural Heritage "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining," and its buffer zone. The (1) Location and (2) Purpose of the project covered by the HIA, as well as (3) the Entity responsible for the HIA, are as indicated below.

(1) Location of the Project

The scope of Miike Coal Mine and Miike Port inscribed on the World Heritage List extends across two cities in two prefectures, namely, Arao City, Kumamoto Prefecture and Omuta City, Fukuoka Prefecture. Of these, the places relating to the route change on the city planning road covered by this document are Manda Pit and its buffer zone, located in Arao City, Kumamoto Prefecture (Figures 1 and 2).

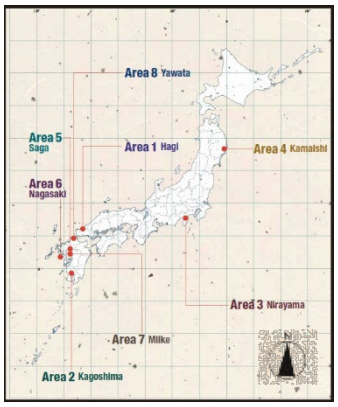


Figure 1: Location of Miike Coal Mine and Miike Port (Area 7/Component Part 7-1)

(2) Purpose of the Project

The city planning road Manda-Shimoide Line, in addition to its function as an access road to the Manda Pit that is one of the component parts of the World Cultural Heritage property, is a road of the highest importance positioned as part of the loop trunk road connecting the outskirts of Arao City in the 5th General Plan adopted

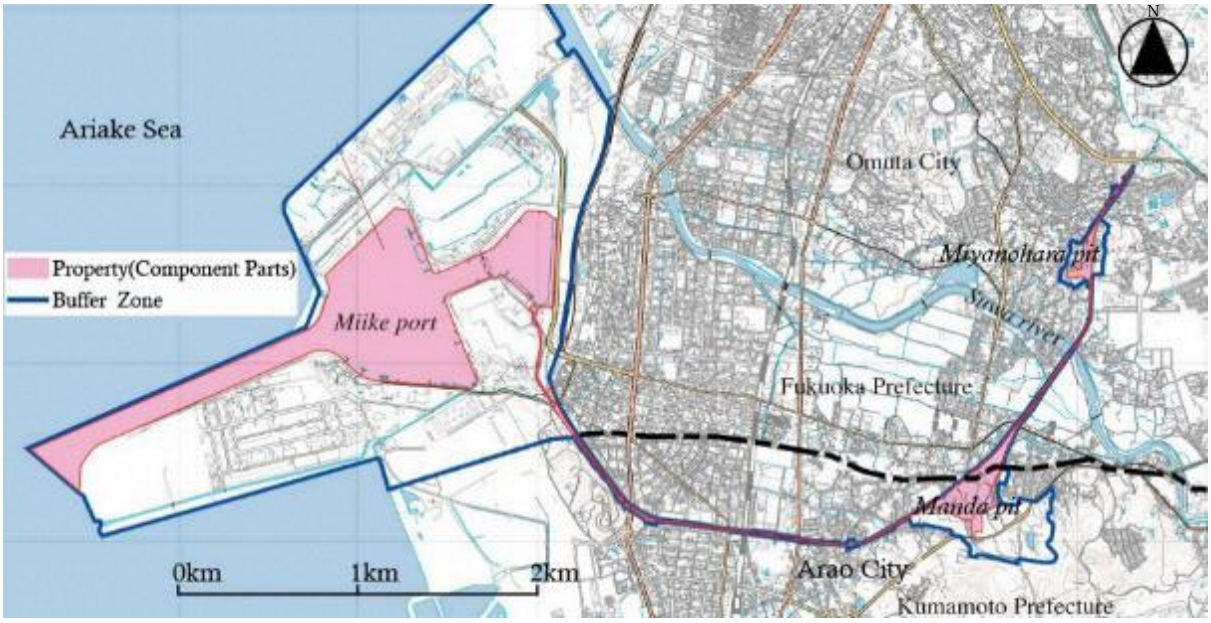


Figure 2. Miike Coal Mine and Miike Port (Area 7/Component Part 7-1) and its Buffer Zone

by the Arao City Government in 2018. Currently the further west section from a point approximately 1,000 meters west of Manda Pit has already been completed and begun service.[1] This is to be extended aiming for early completion of the entire road (Figures 3 and 4).
Since, however, the route for the uncompleted sections decided in the city plan of 1944, which remains unchanged from that plan, intersects the scope of the Manda Pit of the World Cultural Heritage component part and its buffer zone, we would like to change the route of the city planning road, through the HIA, to avoid crossing the component part, as well as to minimize to the extent possible any impact on the historical and archaeological remains and artifacts and landscape of Manda Pit and the coal railway.
Note that Kumamoto Prefectural Government plans to decide on the city planning road route change, and to begin detailed surveying and design work, in August 2021 and after.

(3) Entity Responsible for the HIA

The HIA was conducted by the City Planning Road Department and World Heritage Department of Kumamoto Prefectural Government and Arao City Government, which drew up this written summary of the HIA.

1. Development Projects Covered by the HIA

(1) Summary

The HIA applies to the route change draft to the city planning road Manda-Shimoide Line in the city plan adopted in 1944.
The city planning road Manda-Shimoide Line has important functions, being located on the loop trunk road network interconnecting two central points in Arao City, the area around Japan Railways (hereinafter referred to as "JR") Arao Station and the Midorigaoka district. Moreover, being an arterial road linking north and south between Arao City and Omuta City, Fukuoka Prefecture, it is necessary for enhancing the role of the Manda Pit, the component part of Miike Coal Mine, as an interpretation center for visitors to the World Cultural Heritage property, and as a hub for Arao City community planning and human exchange in its tourism culture. (Figure 3)
The proposed changes to the city planning road Manda-Shimoide Line in the city plan adopted in 1944, as shown in Figures 3 and 5, apply to the places where the route intersects the component part and its buffer

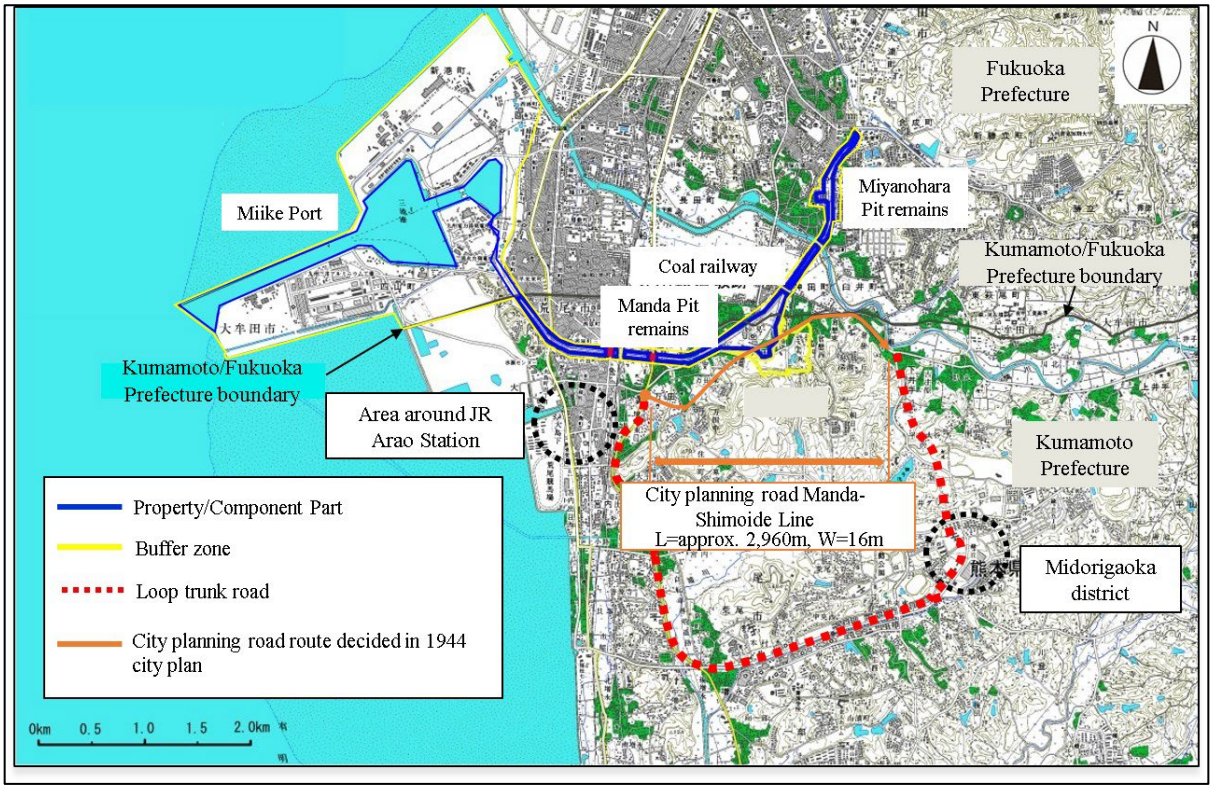


Figure 3. Relation of City Planning Roads to the Component Part and its Buffer Zone

[1] While World Heritage inscription of the "Sites of Japan's Meiji Industrial Revolution" took place in 2015, the completion and start of service of the further west section of the city planning road Manda-Shimoide Line from a point approximately 1,000 meters west of Manda Pit happened prior to that, in 2008.

zone. In deciding the changes, a "Study Committee on City Planning Road Development in the Area around Manda Pit of Miike Coal Mine" was established, and studied ways of proceeding without adverse impacts on the Outstanding Universal Value (hereinafter referred to as OUV) of the property.
Based on the HIA, assuming completion in the future of the new construction of the city planning roads of new-route Manda-Shimoide Line and Kuramitsu-Manda Line as well as of accompanying changes to the width of and improvements to existing roads, the roads other than city planning roads including Kumamoto Prefecture Road 29 and Arao City roads (Figure 4) will essentially remain as they are, maintaining their functions for movement of vehicles and people.

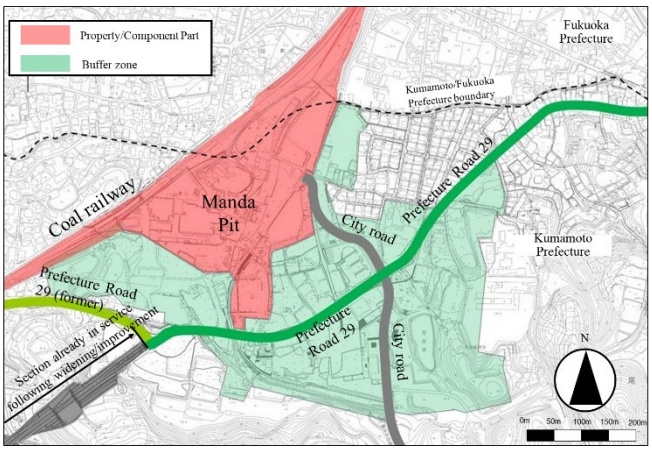


Figure 4. Relation of Existing Roads to Component Part and Buffer Zone

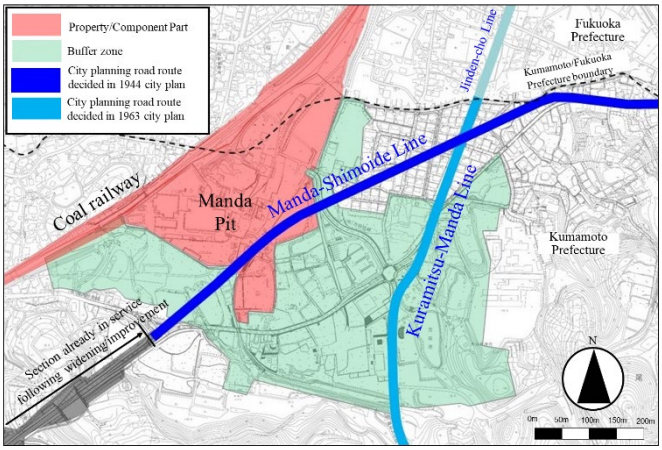


Figure 5. Relation of City Planning Road Route Decided in City Plans of 1944 and 1963 to Component Part and Buffer Zone

a. Road Specifications
- Planned length: Total of 3,060 meters (of which the section passing through the buffer zone will be 660 meters long)
- Planned width: Total width of 16 meters, including two vehicle lanes with pedestrian walkways, bicycle lanes, and planting strips on both sides

  Each side: 1 lane (vehicle lane width; 3.0 meters, bicycle lane width; 1.5 meters, planting strip width; 1.5 meters, pedestrian walkway width; 2.0 meters)
- Planned traffic volume: 6,100 vehicles/day
- Designed speed: 50 km/hour

b. Future Steps
Kumamoto Prefectural Government plans to decide on the city planning road route change, and to begin detailed surveying and design work, in August 2021 and after. At this time, the aim is to complete all work by 2031.
In case detailed survey and design work make it likely that the heritage impact will be greater than assumed in this report, an HIA will be conducted anew, and an information report summarizing the results will be submitted to the World Heritage Centre.

(2) Chronology

The chronology from the decision on the city planning road Manda-Shimoide Line in the city plan until the present is summarized in Table 1.

March 1944	Arao City Government adopted a city plan including construction of the city planning road Manda-Shimoide Line.
March 1963	Arao City Government adopted a city plan including construction of the city planning road Kuramitsu-Manda Line.
January 2000	The Miike Coal Mine site (Miyanohara Pit, Manda Pit, and coal railway) was designated as a National Historic Site as a whole.
March 2013	The area around the Manda Pit remains was given additional National Historic Site designation. (This additional designation meant the city planning road Manda-Shimoide Line would pass through the scope designated as a National Historic Site.)
July 2015	The decision was made to inscribe the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining," including the Manda Pit, on the World Heritage List.

November 2015 and following	Arao City Government set up a "Study Committee on City Planning Road Development in the Area around Manda Pit of Miike Coal Mine", which began considering changes to the route of the city planning road Manda-Shimoide Line.
December 2017	After four plenary meetings of the Study Committee and five working group meetings under it, a report on the study results was drawn up.
December 2017 and following	Kumamoto Prefectural Government and Arao City Government began deliberating route changes to the city planning road Manda-Shimoide Line together with the Agency for Cultural Affairs and Cabinet Secretariat of the Government of Japan.
May 2020	"The Miike Local Conservation Council of the World Heritage Sites of Japan's Meiji Industrial Revolution (non-working properties)" approved the contents of the HIA report.
October 2020	The HIA report was further approved by the "National Committee of Conservation and Management of the World Heritage Sites of Japan's Meiji Industrial Revolution" established by the Cabinet Secretariat.

Table 1. Chronology from the Decision on the City Planning Road Manda-Shimoide Line in the City Plan to the Present

2. OUV and the Attributes that Convey the OUV

(1) Aspects of the OUV demonstrated in the Statement of Outstanding Universal Value (SOUV)

Statement of Outstanding Universal Value (SOUV) was included in the Decision 39 COM 8B.14 made by the World Heritage Committee in 2015 approving inscription of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining" on the World Heritage List.[2] The aspects of the OUV of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining" indicated in the "Brief synthesis" of the SOUV consist of the following two points.

The 23 component parts of the property collectively represent:

- The three-phased process of rapid development in each of three industrial classifications; and
- the process of qualitative change that turned Japan into a major industrial society and profoundly influenced the wider development of the East Asian region.

Based on the two aspects above, the Manda Pit (1) belongs to the coal industrial classification and is one of the component parts showing third development phase, and (2) demonstrates the process of qualitative change that turned Japan into a major industrial society as well as had a material impact on the wider development of the East Asian region. Mand Pit is therefore indispensable in demonstrating the OUV of the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining."

(2) Attributes in the component part that convey the OUV

The two aspects of the OUV above are reflected in each of the attributes included in the component part. A written response the Government of Japan submitted on November 5, 2014 in answer to the questions asked by the International Council on Monuments and Sites (ICOMOS) clarified as follows the attributes of the Miike Coal Mine and Miike Port conveying the OUV.

■ Response to a request from ICOMOS for additional information (submitted on November 5, 2014) (excerpt of portions relevant to the Manda Pit and Miike Coal Railway)

Area 7 Miike	Attributes
7-1 Miike Coal Mine and Miike Port	7.1.2 Manda Pit –Two shafts, steel headframe, brick winding house (winding equipment in situ), brick fan houses, workshop and ancillary buildings and structures, standing and archaeological.
	7.1.3 Coal Railway – Track bed, embankments and bridges.

■ Attributes

The above attributes of the Manda Pit that convey the OUV are of the following two kinds.

- Historical and archaeological remains and artifacts of coal mining and coal transport facilities
- Historical and archaeological remains and artifacts showing the coal industry system

[2] The Decision on inscription of "The Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining" on the World Heritage List (39 COM 8B.14) can be downloaded from the following site: http://whc.unesco.org/en/decisions/6364

3. HIA on proposed route changes to the city planning road decided in 1944

(1) Presentation of basic framework of HIA

a. Impact on historical and archaeological remains and artifacts of coal mining and transport facilities
b. Impact on historical and archaeological remains and artifacts showing the coal industry system
c. Impact on views and landscape
d. Impact on related cultural properties (those not directly related to OUV but having regional value)
e. Impact on visitor interpretation and utilization
f. Sufficiency of function as city planning road

(2) Comparative Analysis of Route Proposals

In light of the basic HIA framework in (1) above consisting of six items, each of multiple route proposals were assessed by comparative analysis, after which the plan that diverts the road far to the south (hereinafter referred to as "change draft"; Figure 6) was adopted.

The reason for this choice is that the change draft avoids the component part and diverts the road all the way to the southern edge of the buffer zone, so that there will be no adverse impacts on the attributes conveying the OUV inside the component part. At the same time, while the route avoids passing through the historical and archaeological remains and artifacts as a World Heritage component part and the scope within which the coal mining and transport system is complete, it is also well able to achieve the functions for vehicle and pedestrian traffic.

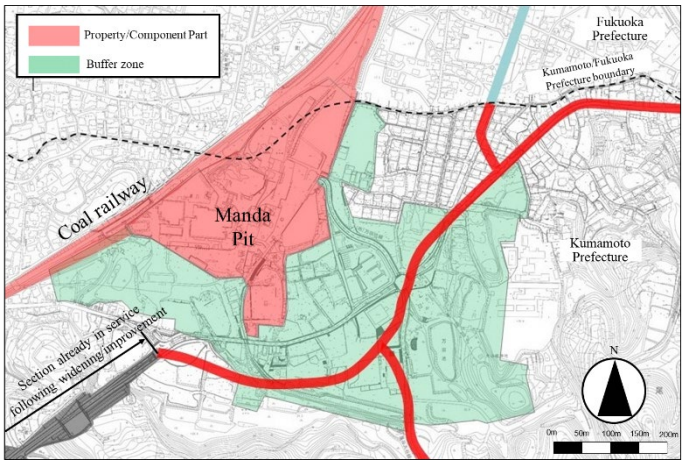


Figure 6. Proposal Diverting the Road Far to the South (Change Draft)

Furthermore, telling the history of the Miike Coal Mine, related cultural properties indicating the everyday life of coal mine workers, including mine housing mainly from 1910 and after, remain on both sides of the current Kumamoto Prefecture Road 29; and the change draft can be appraised as one that avoids direct adverse impacts on these.

In the case of the change draft, the adverse impacts on the views and landscape from viewing points inside

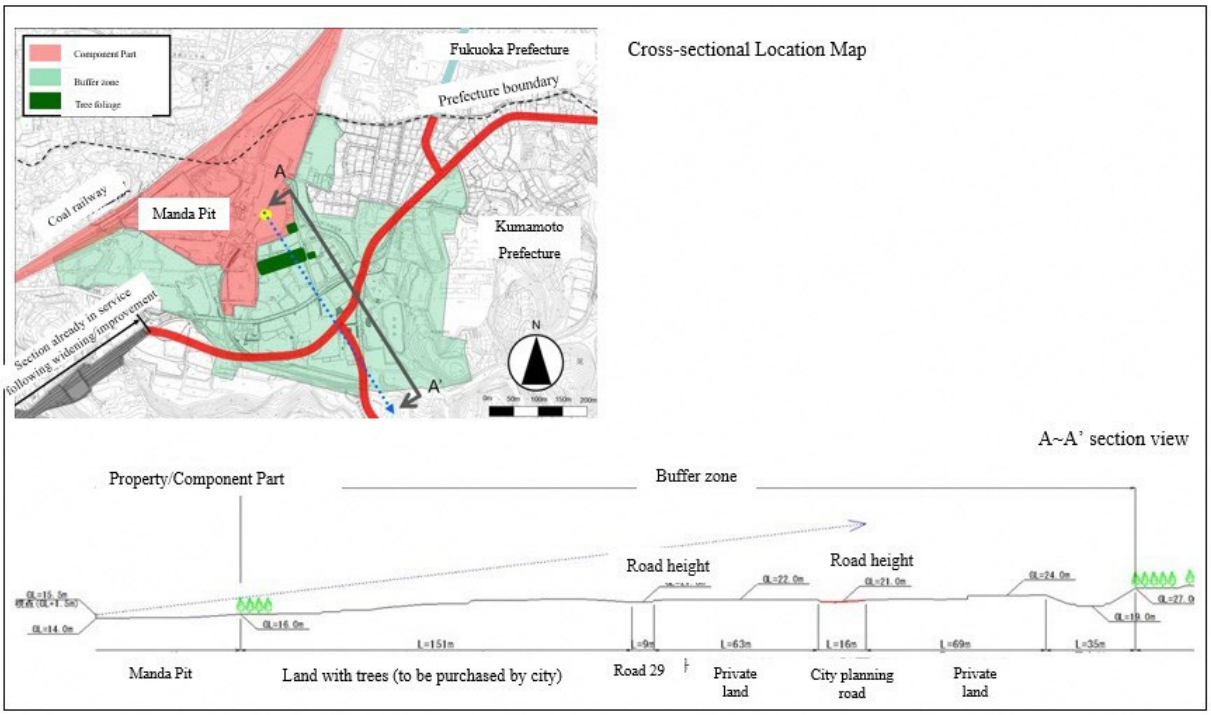


Figure 7. Cross-Section Drawing and View Lines of the Direction of the City Planning Road from the Inside of the Component Part

the component part are extremely minimal. The reason is that the forest on the line of sight to the southeast of the component part conceals the existence of the city planning road (Figure 7). Although the trees are currently on land owned by a private company, Arao City Government is negotiating on purchasing the land; and after it becomes city-owned land, from the standpoint of maintaining favorable views and landscape as a World Cultural Heritage, the City Government plans to prune existing trees, replace withered trees, and continue with other appropriate treatment for the trees.

The road route in the change draft does not impede the flow lines of visitors coming to the Manda Pit from the Manda Pit Station visitor center, and is not seen as having adverse impacts on interpretation and utilization from the World Cultural Heritage standpoint. Moreover, by separating pedestrian walkways and vehicle lanes, visitor safety and comfort should be improved while also making access by vehicle more convenient. Necessary roadside information will be provided properly, helping to enhance interpretation as a World Cultural Heritage.

4. Process for Managing Consensus Building among Related Parties

The City Planning Department of the Arao City Government, responsible for preparing the change draft to the road route, in November 2015 set up a "Study Committee on City Planning Road Development in the Area around Manda Pit of Miike Coal Mine", made up of officials of Arao City Government and Kumamoto Prefectural Government and experts, which met four times. Working Group meetings of the Committee were also held five times (Table 1).

The approach drawn up by the Committee was approved by the Arao City Planning Council in July 2018. Then in May 2020, the "Miike Local Conservation Council of the World Heritage Sites of Japan's Meiji Industrial Revolution (non-working properties)" approved the contents of the HIA report. The HIA report was further approved in October 2020 by the "National Committee of Conservation and Management of the World Heritage Sites of Japan's Meiji Industrial Revolution" established by the Cabinet Secretariat.

Kumamoto Prefectural Government plans to decide on the route change to the city planning road Manda-Shimoide Line, and to begin detailed surveying and design work, in August 2021 and after. At the detailed design stage, every effort will be made to maintain and preserve the historical and archaeological remains and artifacts of attributes conveying the OUV, including the coal industry systems, and to adopt style designs and structures in the road and adjunct facilities that take all due consideration for the coal industrial landscape of the Miike Coal Mine.

As the project is carried out going forward, from the standpoint of a World Cultural Heritage, advice will be sought from the "Industrial Heritage Expert Committee (including Working Properties)" established by the Cabinet Secretariat; and from the standpoint of nationally designated cultural properties, advice will also be obtained from the "Council for Cultural Affairs, Subdivision on Cultural Properties" established by the Agency for Cultural Affairs.

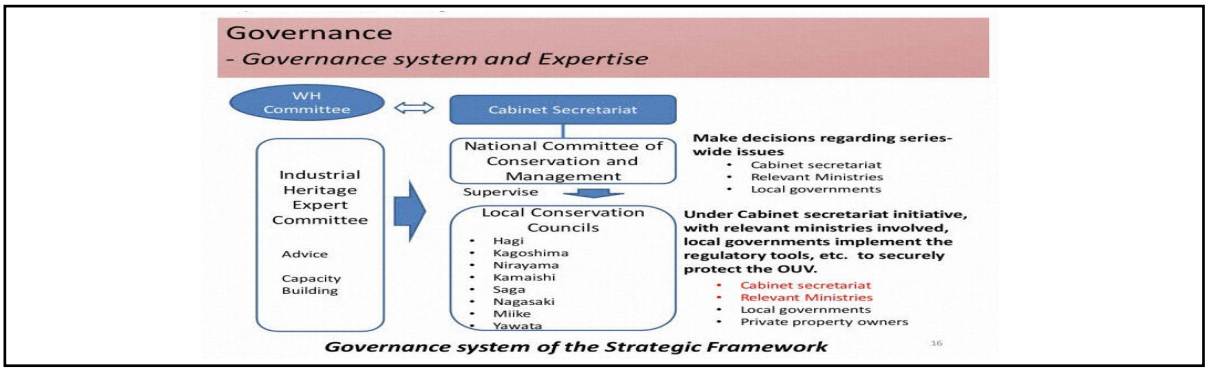


Figure 8. Governance System for the "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining"

5. Conclusion

The route of the city planning road Manda-Shimoide Line adopted in the original city plan crosses the Manda Pit, a component part of the World Cultural Heritage "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining," and its buffer zone. By adopting a plan that diverts the road far to the south, the attributes conveying the OUV can be preserved and adverse impacts on the regional value of related cultural properties remaining outside the component part can be minimized. The change draft will further be effective for enhancing the safety and comfort of visitors and for energizing flow lines on the OUV interpretation and utilization.

PROGRESS STATUS OF PROJECT PROPOSALS CONCERNING THE IMPERIAL STEEL WORKS (COMPONENT PART 8-1) AND ONGA RIVER PUMPING STATION (COMPONENT PART 8-2)

Project proposals for the Imperial Steel Works and Onga River Pumping Station, which are the component parts of the Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining.

PREFACE

The purpose of this report is to give an update on the report given to the World Heritage Committee in 2019 concerning the project proposals in 2017 for the Imperial Steel Works and Onga River Pumping Station, which are the component parts of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining.* While these projects are not regarded as having an adverse impact on the Outstanding Universal Value (OUV) of these properties, this report is submitted to notify the World Heritage Committee of possible impacts, including positive ones, on conservation of the OUV in response to the technical review given by the World Heritage Centre in April 2018 and in accordance with the stipulation in paragraph 172 of Operational Guidelines for the Implementation of the World Heritage Convention.

1. PROJECT PROPOSALS PREVIOUSLY REPORTED

These project proposals have an effect on four buildings belonging in two component parts of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining.* Everything in the projects concerns preservation and exhibition of assets inside the steelworks, to which entry by the general public is currently restricted.

The two component parts noted above are the Imperial Steel Works and Onga River Pumping Station. The four buildings noted above are the First Head Office, the Former Forge Shop, and the Repair Shop of the Imperial Steel Works, and the Onga River Pumping Station.

Project outline

First Head Office: Conduct interior restoration (recovery and improvement) following the major seismic reinforcement completed in March 2014. This will also contribute to the understanding of values of historical buildings as World Heritage.

Former Forge Shop: Conduct exterior improvement works and seismic reinforcement works of the building.

Repair Shop: Conduct exterior improvement works and seismic reinforcement works of the building.

Onga River Pumping Station: Conduct exterior improvement works and seismic reinforcement works of the building.

2. PROJECT PROGRESS STATUS

First Head Office: Interior restoration (recovery and improvement) begun in May 2018, and the east side of the first floor was completed at the end of July 2019 (approximately one-fourth of the work in terms of total floor space). The remaining west side of the first floor and the second floor were completed at the end of September 2020.

Former Forge Shop: Aseismic design work was carried out in FY2018 based on the results of the aseismic diagnosis of the building performed in FY2017 and was reported to the World Heritage Centre in 2019.

Repair Shop: Aseismic design work was carried out in FY2018 based on the results of the aseismic diagnosis of the building performed in FY2017 and was reported to the World Heritage Centre in 2019.

Onga River Pumping Station: Aseismic design work was carried out in FY2019 based on the aseismic diagnosis of the building performed in FY2018. (Matters reported in this report)

Conservation and management of the buildings of the Imperial Steel Works and Onga River Pumping Station are carried out in cooperation with stakeholders, based on the "General Principles and Strategic Framework for Conservation and Management" formulated by the Cabinet Secretariat. Nippon Steel Corporation (renamed from Nippon Steel & Sumitomo Metal in April 2019), the owner of the property, drew up policies and plans in consultation with experts. After having obtained approval from the Yawata Local Conservation Council (Kitakyushu City and Nakama City, Cabinet Secretariat, etc.), they reported the project proposals to the World Heritage Centre and are now proceeding in response to the technical review they received from the Centre.

Thereafter, they will carry out the projects while reporting work progress to and gaining approval from the Yawata Local Conservation Council on a timely basis.

Representatives of these institutions as well as of the owner, Nippon Steel Corporation, are the members of the planning group responsible for drafting these project proposals.

3. SUPPLEMENTARY MATERIALS

3.1 Project description (progress)

These project proposals impact four buildings in two component parts of the *Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining,* namely, the First Head Office, the Former Forge Shop, and the Repair Shop of the Imperial Steel Works, and the Onga River Pumping Station. The progress of each project is as follows:

First Head Office: Interior restoration (recovery and improvement) begun in May 2018, and the east side of the first floor was completed at the end of July 2019 (approximately one-fourth of the work in terms of total floor space). The remaining west side of the first floor and the second floor were completed at the end of September 2020. The public display of the buildings is carefully studied and discussed, including ways of

avoiding any hindrance to the business activities of the owner, since the buildings are located in the steelworks in operation. There are many issues to be solved for public showing, however, detailed studies are therefore being conducted concerning methods for public showing within the scope that does not hinder the owner's business activities.

Former Forge Shop: Aseismic design work was carried out in FY2018 based on the results of the aseismic diagnosis of the building performed in FY2017 and was reported to the World Heritage Centre in 2019. The design limits the number of columns to be reinforced to the minimum necessary, considering interior reinforcement of this building for preserving the internal steel frame and exterior appearance, safety, usability, mitigation of quake damage, and provision of reinforcement methods enabling quick restoration in case of damage.

It should be noted that exterior improvement work of the building (reported in 2017 and approved by UNESCO in 2018) will be performed in synchronization with the seismic reinforcement work.

Repair Shop: Aseismic design work was carried out in FY2018 based on the results of the aseismic diagnosis of the building performed in FY2017 and was reported to the World Heritage Centre in 2019. The design limits the number of columns to be reinforced to the minimum necessary, considering interior reinforcement of this building for preserving the internal steel frame and exterior appearance, safety, usability of the interior of the building for operations and of the central wing crane (the cranes in the south and north wings and at the west in the annex will become inoperable, but the existing cranes with high historical value located in the south and north wings will be retained, while the three hoist cranes in the south wing and at the west in the annex which are relatively new and believed to be of low historical value will be removed to enable continuation of operations in the building), mitigation of quake damage, and provision of reinforcement methods enabling quick restoration in case of damage.

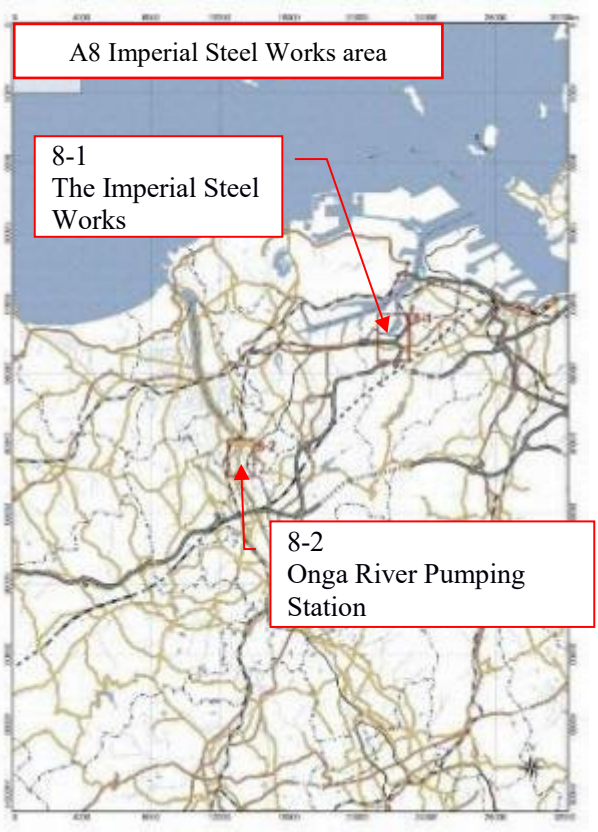
It should be noted that exterior improvement work of the building (reported in 2017 and approved by UNESCO in 2018) will be performed in synchronization with the seismic reinforcement work.

Onga River Pumping Station: Aseismic design work was carried out in FY2019 based on the aseismic diagnosis of the building performed in FY2018. Designing was done in consideration that this is an important facility in operation, so the reinforcement should not damage the value as a historical building. The design will be a plan with “safety level” that readies the building against earthquakes and will feature a reinforcement structure with priority to the reinforcement of the building and the inside of the bricks to preserve the building bricks, truss, and exterior view, safety, and usability at time of operation, and the preservation of the important building itself (the added-on south eave does not show relations with the main aspects of the history of steel works operation such as transition to the industrialization and will be removed considering the deteriorated condition of the eave and the impact the connection between the eave and the building gives to the building itself).

Exterior improvement work of the building is being considered to be performed in synchronization with the seismic reinforcement work (reported in 2017 and approved by UNESCO in 2018).

First Head Office
(north side exterior view)

Former Forge Shop
(west side exterior view)



Repair Shop
(west side exterior view)

Onga River Pumping Station
(west side exterior view)

3.1.1. First Head Office (excerpted from report by Nippon Steel Corporation)

FY2019 project (progress report on interior improvement work in First Head Office)

I. Reported matters

The interior improvement work that started in May 2018 proceeded while receiving technical support by engineering advisors introduced by domestic experts and instruction by the site manager, confirming approaches, observing the site, and filing progress reports together with domestic and local experts, and was completed in September 2020.

The second interim and final reports were made to the municipalities on June 1, 2020 and September 28, 2020, respectively.

II. Work Descriptions

1. Basic policies

(1) As a rule, the exterior (roof, walls) and existing seismic reinforcement members are to be retained as is.

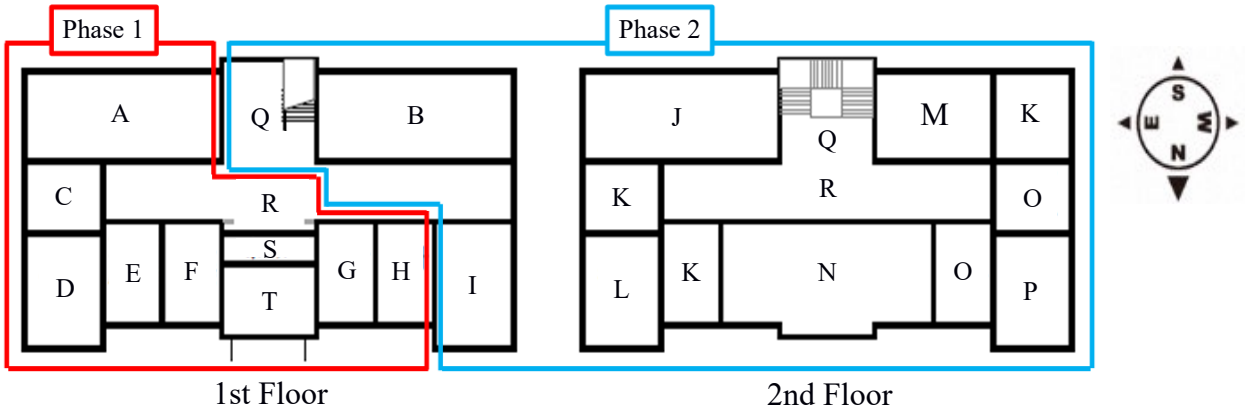
(2) The restoration work is to be based on remaining parts and materials, old photos, old drawings, and the initial First Head Office study report (September 1998, Dr. Hiroshi Katano, Kyushu Institute of Design, Department of Environmental Design). For portions for which such evidence is unclear, recovery, repair, and improvement will be carried out with reference to examples of buildings from the same era.

(3) Certain functional measures will be reflected for the sake of readiness for facility maintenance and public utilization.
(waterproofing and anti-condensation measures, facility maintenance, exhibits, safety measures, etc.)

2. Scope of work and construction period

(1) Phase 1: completed in July 2019, observation of east side of 1st floor resumed from September 2019 (not open to public) *reported in the previous SOC.

(2) Phase 2: completed in September 2020.



A: General Affairs Section
B: Procurement Section
C: Director General Secretariat
D: Director General's Office
E: First Reception Room
F: Second Reception Room
G: Accounting Manager's Office
H: Accounting Section
I: Treasurer's Section

J: Drafting Room
K: Engineer's Office
L: Chief Engineer's Office
M: Clark's Room
N: Conference Room
O: Foreign Engineer's Office
P: Foreign Consultant Engineer's Office
Q: Staircase R: Corridor
S: Hall T: Entrance

III. Work completion status (as of the end of September 2020)

Exterior view (north side)

Exterior view (south side)

Exterior view (west side)

Exterior view (east side)

Entrance porch

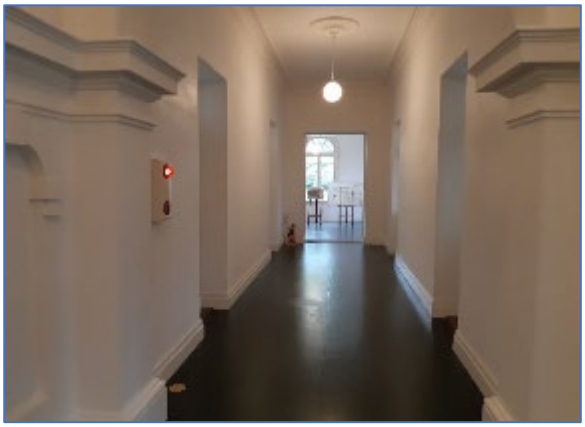
Entrance

Entrance hall

Entrance hall

Entrance hall

1st Floor East Corridor



General Affairs Section

General Affairs Section

Director General Secretariat

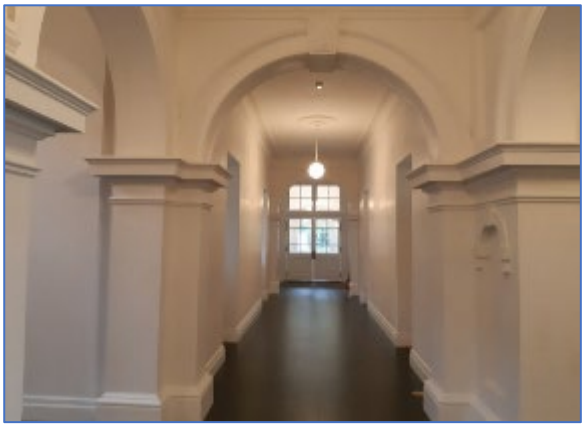
Director General's Office

First Reception Room

First Reception Room (with an exhibition of foundation structure under the floor)

Second Reception Room

1st Floor West Corridor



Procurement Section

Procurement Section

1st Floor West Corridor (door)

Treasurer's Section (simple finish: use of stockroom)

Accounting Section
(simple finish: use of staff room)

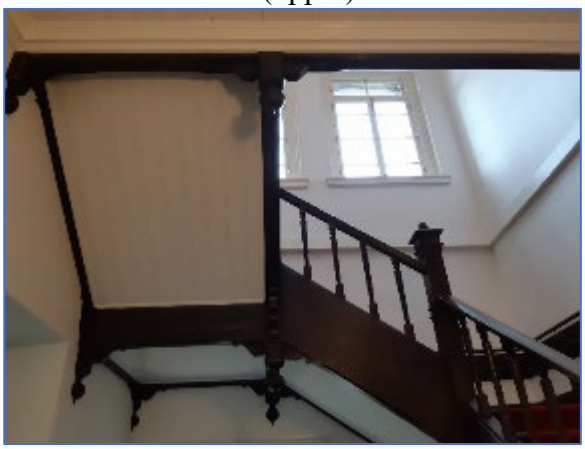
Accounting Manager's Office
(simple finish: use of electric room)

1st Floor Staircase

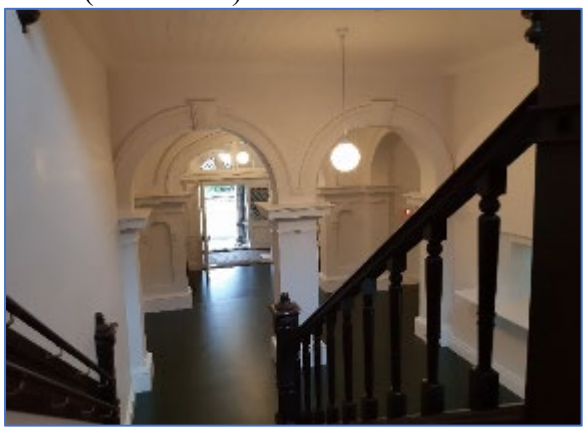
1st Floor Staircase

1st Floor Staircase (understair stockroom)

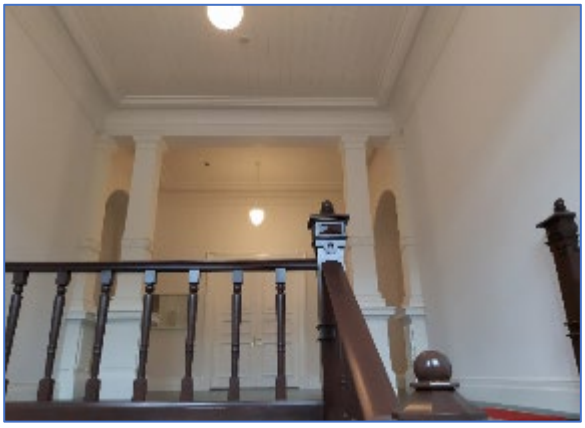
1st Floor Staircase (upper)



Stairs (downstairs)

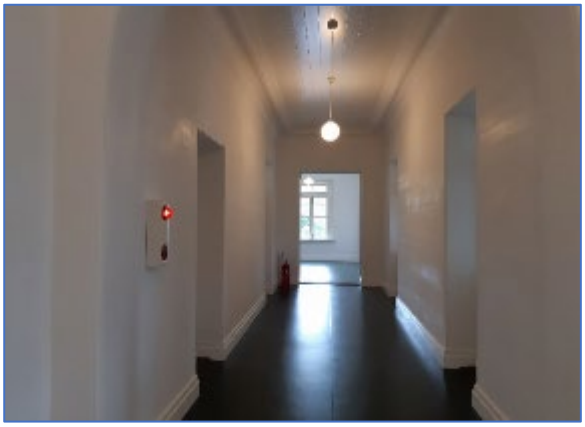


2nd Floor Stairs Landing

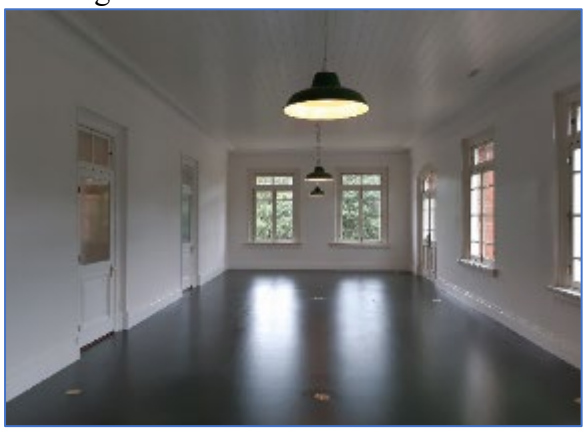


2nd Floor Stairs Landing

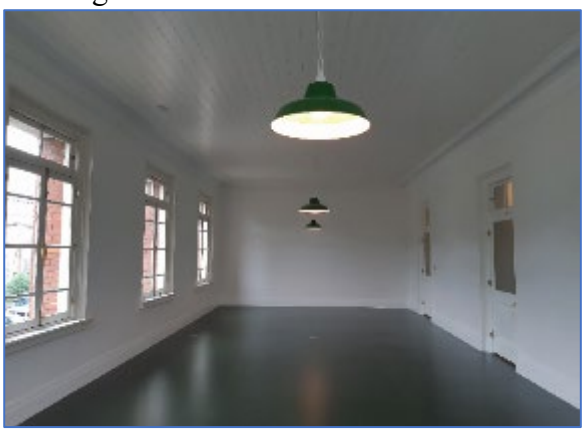
2nd Floor East Corridor



Drafting Room



Drafting Room

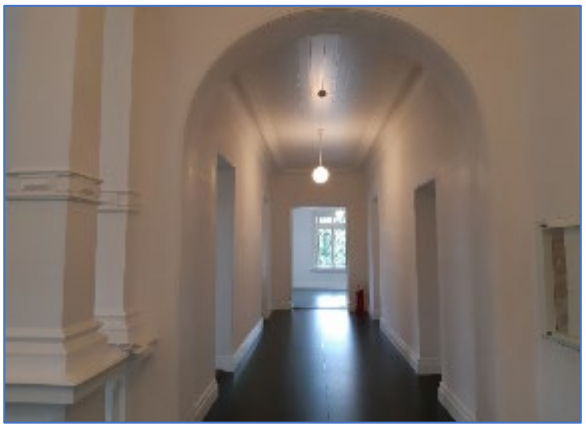


Engineer's Office (east)

Chief Engineer's Office

Engineer's Office (northeast)

2nd Floor West Corridor



Clark's Room

Engineer's Office (southwest)

Foreign Engineer's Office (west)

Foreign Consultant Engineer's Office

Foreign Engineer's Office
(northwest: exhibition of structure)

Foreign Engineer's Office
(northwest: exhibition of plaster wall finishing process model)

Foreign Engineer's Office
(northwest: exhibition of original cedar flooring)

Foreign Engineer's Office
(northwest: exhibition of original roof truss)

In front of the Conference Room

In front of the Conference Room
(exhibition of original trench cut in plaster wall)

Conference Room

Conference Room

Conference Room (exhibition of original pillar)

Stoop Roof

Attic (inspection corridor, waterproof pan, etc.)

3.1.2. Onga River Pumping Station (from report by Nippon Steel Corporation)

FY2019 project (aseismic design of Onga River Pumping Station)

1. Timeline and objectives

This facility was found to have inadequate aseismic performance as a result of building surveys in FY2016 and aseismic diagnosis in FY2017. Accordingly, additional detailed aseismic diagnosis for the brick structure properties was conducted in FY2018, and based on that, seismic reinforcement methods were studied with public funding in FY2019.

A reinforcement plan was drawn up through consultation with domestic experts on the study policy and proposed reinforcement methods, and the plan outline will be reported in this committee. The detailed plans have been reported to the municipalities. (Reported on January 27, 2020)

2. Basic policies

Taking into consideration that this is an important facility in operation, the reinforcement should not damage the value as a historical building.

(1) Level of reinforcement

- Since this is a remotely operated work facility, the workers come and go infrequently. But it is an important facility that provides water to about 70% of the Yawata and Tobata areas, so it should be reinforced to a "safety level" that readies the building against large scale earthquakes.

(2) Extent of reinforcement/plan

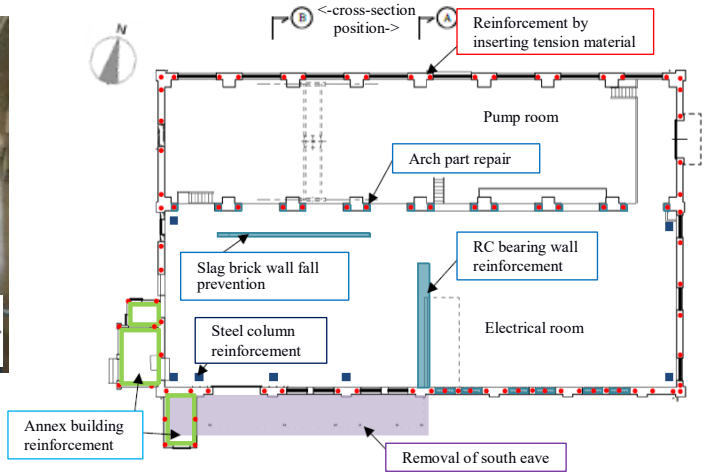
- Add reinforcements to the inside of buildings and bricks to preserve the "exterior view" while preserving the especially important building bricks and truss.
- Feature a reinforcement structure that considers the continued use of crane for north side pump maintenance and control panel for south side pump.
- South side eave part should be reinforced prioritizing preservation of the important building itself by taking into consideration the deteriorated condition of the eave and the impact the connection between the eave and the building gives to the building itself.
  (The eave was added later for carrying out miscellaneous items, so there is no historical value showing transition to the industrialization. It will be removed while keeping a record of it.)
- Conduct reinforcement works to enhance the proof stress of the entire building and prevent brick walls from falling by replacing the openings of windows on the east side of the south wall, which were blocked later, with an earthquake-resisting wall. Replacement with the earthquake-resisting wall is limited within the area of the openings that were blocked later. Preserve the original design and changes over time, and avoid the impact on the structural and visual proofs and the historical value of transition to industrialization, which the existing openings of windows have.
- Reinforcement should consider the continued use of machinery and the original design of the interior of the building itself. Place an RC bearing wall in the central part of the building, use a steel truss to connect it to a horizontal plane of structure placed at the roof truss lower chord, and thereby transmit seismic force. This is to reinforce the central part of the building, which does not have adequate earthquake resistance as north-south brick walls are only in the two gable walls, and to preserve existing slag

brick walls; this reinforcement structure preserves both the interior view of the building and the important building itself.

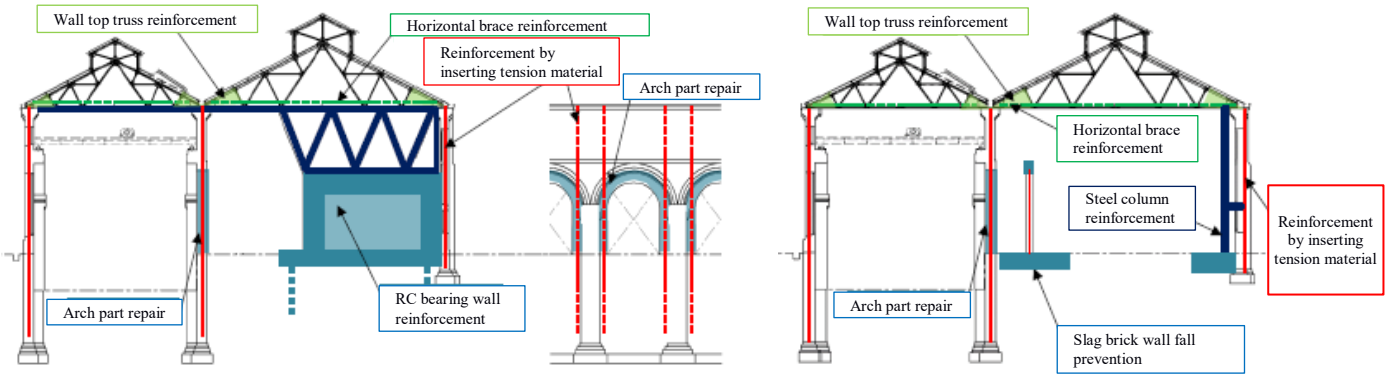
3. Proposed reinforcement method (Work period: to be decided later)

(1) Current status photo (east->west)

(2) Reinforcement schematic diagram (floor plan)

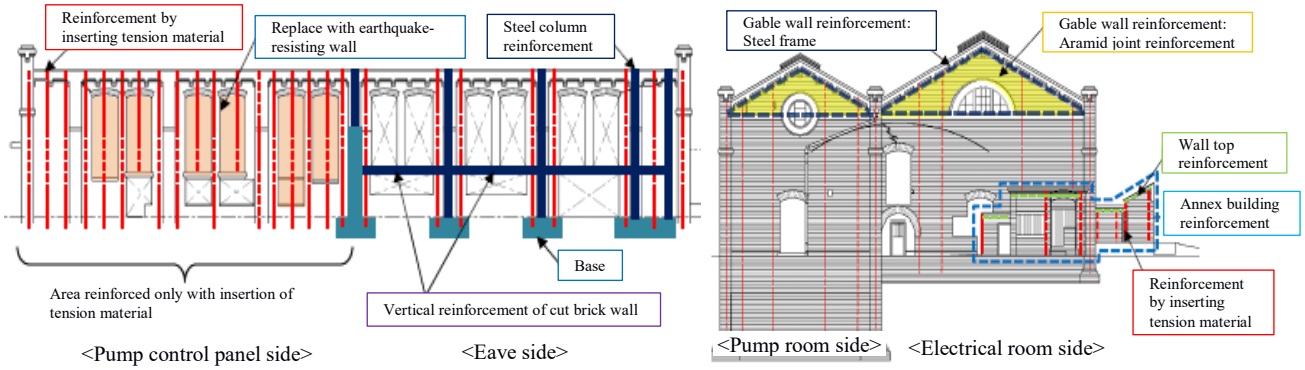


(3) Reinforcement schematic diagram (A cross-section) (B cross-section)



<Pump room side> <Electrical room side> <Boundary surface between pump room and electrical room> <Pump room side> <Electrical room side>

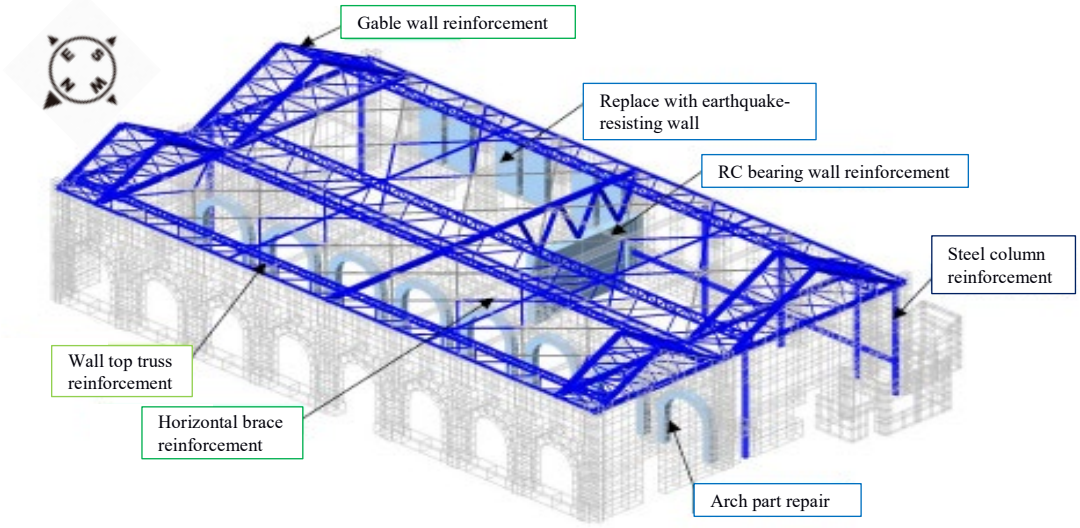
(4) Reinforcement schematic diagram (south wall) (5) Reinforcement schematic diagram (west wall)



<Pump control panel side> <Eave side> <Pump room side> <Electrical room side>

Note: The coloring of reinforcement sections is to make it easy to understand work areas in the diagrams. The final color design will adopt colors that minimize the visual impact of reinforcement works.

(6) Reinforcement schematic diagram (overall construction)



(7) Reinforcement schematic diagram (electrical room perspective diagram)

Note: The coloring of reinforcement sections is to make it easy to understand work areas in the diagrams. The final color design will adopt colors that minimize the visual impact of reinforcement works.

4. Remaining issues

- Details of exterior improvement (approved by UNESCO in July 2018) are now under study to conduct it in synchronization with seismic reinforcement work for the purpose of keeping down costs.
- Details of realizing the work will be studied, such as the size of cost and the operation during the construction period for seismic reinforcement.
- Taking into consideration the conservation of World Heritage value and the positioning of important buildings necessary for business activities, burden of costs will be discussed with local municipalities.

3.1.3. Consultations with Experts (excerpted from Report by Nippon Steel Corporation)

Status of consultations with experts held between May 10, 2019 (the 7th Yawata Local Conservation Council) and September 2020 (work completion) are as follows:

1. Status of consultations with domestic and local experts

1st meeting
Friday, November 22, 2019
Consultation with: Domestic expert (university director)
Engineering advisor on cultural properties (first-class registered architect/company CEO)
Agenda: Confirmation of seismic reinforcement methods for Onga River Pumping Station
Confirmation of specifications for interior improvement work in First Head Office

2nd meeting
Wednesday, January 15, 2020
Consultation with: Local expert (emeritus professor at university)
Engineering advisor on cultural properties (representative of first-class registered architect office)
Agenda: Observation of site of interior improvement work in First Head Office

3rd meeting
Wednesday, February 12, 2020
Consultation with: Local expert (industrial heritage researcher, Ph.D.)
Engineering advisor on cultural properties (representative of first-class registered architect office)
Agenda: Observation of site of interior improvement work in First Head Office

4th meeting
Friday, May 29, 2020
Consultation with: Domestic expert (university director)
Agenda: Second interim report on progress status of interior improvement work in
First Head Office

5th meeting
Monday, June 1, 2020
Consultation with: Local expert (emeritus professor at university)
Agenda: Second interim report on progress status of interior improvement work in
First Head Office

6th meeting
Monday, June 1, 2020
Consultation with: Local expert (industrial heritage researcher, Ph.D.)
Agenda: Second interim report on progress status of interior improvement work in
First Head Office

7th meeting
Wednesday, September 23, 2020
Consultation with: Local expert (industrial heritage researcher, Ph.D.)
Agenda: Observation of completed interior improvement work in First Head Office

8th meeting Monday, September 28, 2020
Consultation with: Domestic expert (university director)
Agenda: Final report on interior improvement work in First Head Office
(Observation of completed site to be planned separately)

9th meeting Monday, September 28, 2020
Consultation with: Local expert (industrial heritage researcher, Ph.D.)
Agenda: Final report of interior improvement work in First Head Office

10th meeting Monday, September 28, 2020
Consultation with: Local expert (emeritus professor at university)
Agenda: Final report of interior improvement work in First Head Office

11th meeting Tuesday, September 29, 2020
Consultation with: Local expert (emeritus professor at university)
Agenda: Observation of completed interior improvement work in First Head Office

2. Status of studies with engineering advisors on cultural properties

1) Interior improvement work in First Head Office
- Regular meetings 15 meetings (starting May 2019 until completion at the end of September 2020)

(May 8, June 12, July 17, Aug. 21, Sep. 11, Oct. 9, Nov. 13, and Dec. 11 in 2019
Jan. 15, Feb.12, Mar. 11, Apr. 8, June 10, July 8, and July 21 in 2020)

Engineering advisor on cultural properties (representative of first-class registered architect office)
On-site survey, construction policy, decision of specifications, topics on recording and reporting, and other matters

2) Studying seismic reinforcement of Onga River Pumping Station
- Special meetings 4 meetings (July 4, Sept. 20, and Oct. 31 in 2019, and Jan. 27, 2020)
Engineering advisor on cultural properties (first-class registered architect/company CEO)
On-site survey and confirmation of seismic reinforcement methods and influence on operation

4. ASSESSMENT OF POTENTIAL IMPACT ON OUV BY MEANS OF HERITAGE IMPACT ASSESSMENT (HIA)

4.1. Contribution to the Outstanding Universal Value (OUV)

All four of the buildings that are objects of the projects are related to the establishment of the Imperial Steel Works, the first fully integrated steel works that was built successfully in Asia. These sites comprise two of the 23 component parts of the World Heritage "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding, and Coal Mining." These World Heritage sites clearly show the first successful wave of industrialization from the West to a non-Western country and relate to accomplishments known as the Meiji Industrial Revolution.

The component parts of Yawata and the Onga River relate to the "iron and steel" aspects of this industrial revolution. Steelmaking took place in these facilities at the time Japan was emerging in the world as an industrial nation in the last stage of its ongoing industrial revolution.

As shown in Table 1, the management plans for these component parts make clear their contribution to the Outstanding Universal Value (OUV) of the properties.

Table 1 Elements of the Imperial Steel Works that show OUV

Element	Contribution to OUV
First Head Office	Demonstrates the adoption and adaptation of Western architectural technology and construction techniques in Japan. Reflects the nature of technological exchanges that underpinned the development of Japan's industrial transformation. It also demonstrates (as the headquarters of the Yawata Steel Works) the organizational style adopted by Japanese steel makers to achieve the local development of an integrated steelworks.
Repair Shop	Demonstrates the transfer of German technology, followed very rapidly by the extension of the building in the same style using Japanese materials and design skills. This is reflected particularly in the progression of steel framing, where the earliest frames have the label of Gutehoffnungshutte (GHH) and the subsequent expanded sections are labelled with Yawata nameplate.
Former Forge Shop	Reflects one of the original functions of the steelworks, the foundry function, necessary to the autonomous development of the steelworks, and the subsequent adaptation to products testing. While its structure changed over time, the core building can still be recognized. The changes of the building demonstrate the history of the continuing expansion and refinement of the steelworks and the adaptation of transferred technology to evolving local needs.
Onga River Pumping Station	Demonstrates the rapid growth of the steelworks and the increasing demand for water for steel managing purposes. The pumping station is an accomplished "modern" industrial design reflecting the rapid development of design skills within the steelworks based on Western precedents but modified to meet Japanese conditions.

4.2. Potential Impact of the Project Proposals on OUV

In the interior improvement work of the First Head Office, the same decoration that was implemented in the Meiji era and the subsequent important period will be applied, and the structure of the building, evidence of the fusion of techniques and skills between Japanese and Western architecture, will be restored. Therefore, there is no adverse impact on the OUV. Since the building is located in the working steelworks, the municipalities and property owner will carefully study and consult on how the asset will be used and the extent to which it should be shown to the public, within the scope that no hindrance arises to the business activities of the owner.

The seismic reinforcement work on the Former Forge Shop and the Repair Shop takes into account the usage by the owner as an operating facility and the exterior appearance as well as the conservation of the building. Such considerations will be efforts not to harm the buildings' contribution to OUV.

In light of the fact that Onga River Pumping Station is an important facility in operation, the reinforcement method is designed not to damage the value as a historical building and to consider the usage by the owner as an operating facility and the exterior appearance as well as the conservation of the building. Such considerations will be efforts not to harm the buildings' contribution to OUV.

4.3. Assessment of Impact on the World Heritage

In the project for the First Head Office, the decoration of the interior was restored to that of the Meiji era and the subsequent important periods so that this project conserves OUV and thus helps people to understand its values.

The work on the Former Forge Shop, the Repair Shop, and the Onga River Pumping Station is being conducted to conserve the value of the buildings as World Heritage. All the projects, by implementing conservation work to the extent no hindrance arises to the business activities of the owner so as to maintain the value as a working property, are necessary to receive proper recognition as showing the contribution to OUV.

The project proposals will by no means narrow the extent of the buildings' values as World Heritage nor will they reduce the contribution to OUV of the properties. Rather they are a sound foundation for conservation of the buildings and their use hereafter. Handling of visitors is currently being studied and discussed carefully between the local municipalities and the owner.

5. POLICY ON THESE PROJECTS AND MANAGEMENT PLANS AND SYSTEMS OF PROPERTIES

The projects to be implemented this time, in accordance with the *Conservation Management Plan: Imperial Steel Works* (Nippon Steel & Sumitomo Metal, Kitakyushu City, Nakama City, 2014), will be carried out while favorably conserving the component parts and respecting the heritage value of the component parts. The projects that may affect the component parts will be taken forward by asking for advice from experts with appropriate experience of management and conservation of the heritages and receiving technical support and carried out through a process of decision-making by the Local Conservation Council. Records will be kept of

substantial modifications to or interventions in the component parts, and of maintenance actions.

Appendix 2-6