

Project on occupational accident prevention measures implemented for the construction demand related to
the Tokyo 2020 Olympic and Paralympic Games

Study of occupational accident prevention measures that should be handed down as legacy measures 2020 Report [Excerpt]

Japan Construction Occupational Safety and Health Associations

1. Project overview

Construction of competition facilities, infrastructure development, redevelopment and related projects were intensively carried out in preparation for the Tokyo 2020 Olympic and Paralympic Games. Pertaining to the investment in construction, actions have been taken to prevent occupational accidents and address various other problems at each site. In light of this, it is desirable to study the actual situation and cases, to leverage findings for future construction projects.

Based on the above reasoning, we have summarized the occupational accident prevention measures that should be handed down as legacy measures.

2. Survey method

Working groups were held with various experts to study the content of the survey itself and how each project was carried out.

A written survey was carried out on the clients and other stakeholders of the Olympic- and Paralympic-related construction projects using a survey form created by the working groups.

3. Subjects of the survey

The clients of eight companies involved in the construction of competition facilities for the 2020 Tokyo Olympic and Paralympic Games.

	Venue Name	Owner	Competition/Type
1	Japan National Stadium (Olympic Stadium)	JAPAN SPORT COUNCIL	[Olympic] Opening and Closing Ceremonies, Athletics and Football [Paralympic] Opening and Closing Ceremonies, Athletics
2	Ariake Arena	Tokyo Metropolitan Government	[Olympic] Volleyball [Paralympic] Wheelchair Basketball
3	Ariake Tennis Park	Tokyo Metropolitan Government	[Olympic] Tennis [Paralympic] Wheelchair Tennis
4	Shiokaze Park	The Tokyo Organising Committee of the Olympic and Paralympic Games	[Olympic] Volleyball (Beach Volleyball)
5	Sea Forest Cross-Country Course	The Tokyo Organising Committee of the Olympic and Paralympic Games	[Olympic] Equestrian (Eventing: Cross Country)
6	Kasai Canoe Slalom Centre	Tokyo Metropolitan Government	[Olympic] Canoe Slalom
7	Tokyo Aquatics Centre	Tokyo Metropolitan Government	[Olympic] Swimming (Swimming, Diving and Artistic Swimming) [Paralympic] Swimming
8	Olympic Village / Paralympic Village (Type 1 Urban Redevelopment Project in the West Harumi 5-Chome Districc)	11 companies including Mitsui Fudosan Residential Co.,Ltd.	

4. Survey form content

The following 11 items were included in the survey of the clients.

1. Did the Client or other involved party conduct risk assessments or take any other steps during the design stage or review hazards that must be considered during construction to reduce the risk of occupational accidents? Did the owner establish any other systems or measures? If yes, please note the specifics.
2. Was BIM/CIM used during the design and/or construction stages? If so, please provide examples of how the use of BIM/CIM contributed to health and safety during construction.
3. As the Client, are there any hazards you wish the designer had considered during the design stage? If yes, what hazards do you wish had been considered?
4. Was the issue of reducing possible hazards during construction taken into consideration during the design stage? For example, did the Client and designer meet or otherwise coordinate on this issue? In the case of an inclusive order for both design and construction or ECI (early contractor involvement) or other contract, did the Client, designer, and Contractor hold meetings or otherwise coordinate from the initial design stage? If so, what type of issues did this coordination focus on?
5. As the client, do you think that taking the elimination or reduction of risks into consideration from the design stage leads to better health and safety during construction? Please note your opinion regarding this question.
6. Please note the construction methods used and key elements adopted, including the implementation of risk assessments, to eliminate or reduce work risks during the design and/or construction stages. In these cases, please note the stage at which these methods and elements were adopted. (Give examples of constructions and methods that saved labor or mechanized process, including construction cases and new technologies.)
7. Did any measures focus on preventing the falls, collisions, or public injury that often occur during construction work? If so, please note the measures that were taken.
8. Did any measures focus on ensuring a safe, secure, and rewarding worksite for women and younger workers? If so, please note the measures that were taken.
9. Please note any other health and safety measures taken during construction on this project that seem to you, as the client, unique.
10. What occupational accident prevention measures do you wish to see the construction industry retain in the future? These do not need to be examples of measures actually taken. Please note your opinion as a client ordering construction.
11. Please note your impressions of the construction of facilities for the Olympic and Paralympic Games.

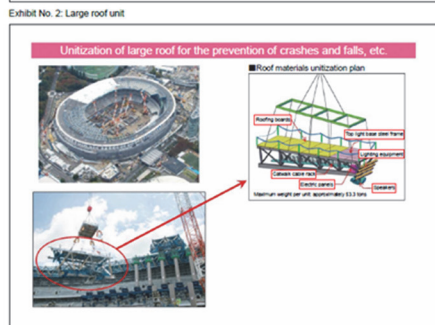
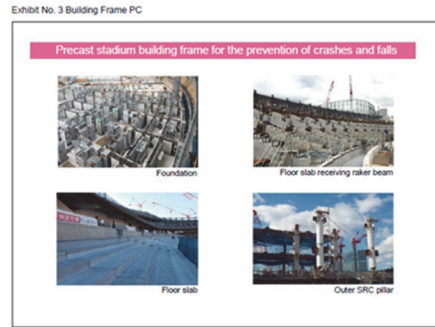
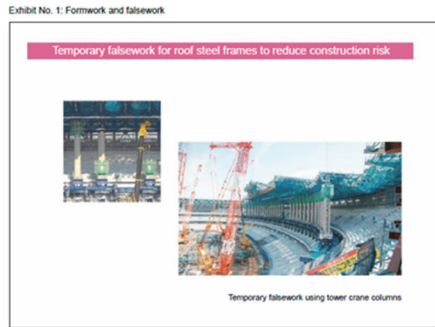
5. One example from the survey result (Japan National Stadium)

1. Japan National Stadium
 Construction Project Name: New National Stadium Development Project
 Construction Site: 10-1 Kasumigakka-machi, Shijuku-ku, Tokyo
 Client: Japan Sport Council
 Designer: Taisei Corporation, Azusa Sekkei Co., Ltd., Kengo Kuma and Associates Joint Venture
 Builder: Taisei Corporation, Tokyo Branch
 Construction Period: December 1, 2016 - November 30, 2019 (Main construction period excluding preparation time)

1	Did the Client or other involved party conduct risk assessments or take any other steps during the design stage or review hazards that must be considered during construction to reduce the risk of occupational accidents? Did the owner establish any other systems or measures? If yes, please note the specifics.	<p>→Yes</p> <p>For the Japan National Stadium Development Project, the Design-Build was utilized. Further, consideration for workability and safety (elimination and reduction of occupational accident risks) based on construction method proposals from the construction team were incorporated during the design stage based on knowledge of construction work (construction technology investigations). In addition, those opinions were proactively incorporated into the actual design.</p> <p>In addition, discussions were held with the contractor to confirm that the construction schedule would not hinder safety, and the expenses required for various safety measures during construction have been added to the budget in accordance with the "Basic Policy for Health and Safety Measures in the Construction of Facilities for the Tokyo 2020 Olympic and Paralympic Games."</p>
2	Was BIM/CIM used during the design and/or construction stages? If so, please provide examples of how the use of BIM/CIM contributed to health and safety during construction.	<p>→Yes</p> <p>In order to speed up communication and improve drawing efficiency during the design stage, shapes that were difficult to draw in 2D were drafted using models, and their attributes were checked for inconsistencies. Further, virtual reality technology was used to visualize the design content.</p> <p>During the construction stage, 3D construction steps and virtual reality were used to investigate various construction plans to improve productivity and safety quality. Also, construction stakeholders were kept informed of the same. In addition, pre-construction was employed to investigate details of each of the construction materials and to confirm construction procedures.</p>
3	As the Client, are there any hazards you wish the designer had considered during the design stage? If yes, what hazards do you wish had been considered?	→No
4	Was the issue of reducing possible hazards during construction taken into consideration during the design stage? For example, did the Client and designer meet or otherwise coordinate on this issue? In the case of an inclusive order for both design and construction or EC (early contractor involvement) or other contract, did the Client, designer, and Contractor hold meetings or otherwise coordinate from the initial design stage? If so, what type of issues did this coordination focus on?	<p>The project utilizes the Design-Build. In the 1st phase of the contract (investigation of basic design, detailed design, and construction technology), meetings with the clients, designers and contractors, as well as specialized subcommittees, were held regularly. Verification was conducted for the construction processes and construction plans being considered by the business operator, to ensure that the proper process settings and safety would be in place for the more complicated and higher risk operations. In this way, it was confirmed that cooperation content was suitable, and where necessary, revisions were made to ensure that it was. This was all done by based on consensus among the three parties.</p>
5	As the client, do you think that taking the elimination or reduction of risks into consideration from the design stage leads to better health and safety during construction? Please note your opinion regarding this question.	<p>It is our opinion that the use of various construction methods that take health and safety into consideration from the design stage will greatly contribute to the reduction and elimination of danger at the site.</p> <p>It is our opinion that the creating a design drawing that incorporates health and safety measures during the design stage, eliminates the need for excessive health and safety management during the construction stage, which in turn will provide the added benefit of the site management operations being more productive and more streamlined.</p>

6	Please note the construction methods used and key elements adopted, including the implementation of risk assessments, to eliminate or reduce work risks during the design and/or construction stages. In these cases, please note the stage at which these methods and elements were adopted. (Give examples of constructions and methods that saved labor or mechanized process, including construction cases and new technologies.)	<p>The following construction method will be adopted during the construction stage:</p> <p>1. Development of large-scale falsework that utilizes the columns of a tower crane as a temporary falsework that is used to support the unit steel frame. This will make the assembly and disassembly of the temporary falsework of the roof steel frame more efficient, as well as enable the assembly of a steel frame for the stand roof unit that will in turn reduce construction work in high places.</p> <p>*P31 Exhibit No. 1</p>
7	Did any measures focus on preventing the falls, collisions, or public injury that often occur during construction work? If so, please note the measures that were taken.	<p>→Yes</p> <p>The following construction methods will be adopted during the design stage:</p> <p>1. Unitization of the large roof division of the roof steel frame that reduces the danger of construction work in high places into three parts, assembly of structures on the ground level (installation of inspection corridor, lighting units, etc.), and then lifting those structures into place.</p> <p>2. Precasting of the stadium frame, reducing risk by improving the efficiency of site operations. Foundation, stand floor slab, outer circumference SRC pillar (SRC), etc.</p> <p>*P31 Exhibit No. 3</p> <p>Creation of a full-scale mockup during the construction stage</p> <p>1. A mockup of the full-scale roof steel frame will be used on the ground to check assembly, work procedures, etc., in advance to reduce the danger of work in high places and the large roof unit.</p> <p>*P31 Exhibit No. 4</p>
8	Did any measures focus on ensuring a safe, secure, and rewarding working for women and younger workers? If so, please note the measures that were taken.	<p>*P31 Exhibit No. 2</p> <p>Women-Oriented Initiatives</p> <p>→Yes</p> <p>In connection to the initiatives to more fully use female employees on the project, the contractor implemented its "Jingu Komachi" initiative that was created by its female employees to aid in improving the working environment from a female perspective (e.g., installation of powder rooms, etc.). Also, the "Rikochaku" aimed at 4th to 12th grade female students and sponsored by the Japan Federation of Construction Contractors was held at the site (August 27, 2018). In this way, the contractor has been engaged in public relations activities for women and youth.</p> <p>Youth-Oriented Initiatives</p> <p>→Yes</p> <p>Another activity of the contractor was to display a panel of photos of the workers working with enthusiasm at the site. They also included such photos of their workers in awards and other materials to present to the workers and their families (such as The Craftsman Award). In addition, the contractor has been actively engaged in activities that are rewarding for working colleagues and youth who will lead the future, such as support for acquiring qualifications and recognition awards for young leaders for the purpose of developing youth.</p>

9	Please note any other health and safety measures taken during construction on this project that seem to you, as the client, unique.	<p>The construction project had the mission of completing a large-scale stadium by the deadline on a limited site in an urban area while taking into consideration the surrounding environment. During peak hours, the involved more than 2,000 operation workers a day. It is our opinion that one critical challenge was that of creating a comfortable working environment where the workers could work safely and comfortably. In awareness of this, the prime contractor proactively addressed health and safety at the site by devising temporary facility plans before the start of construction, tracking daily labor plans, etc., and maintaining a comfortable working environment throughout the entire construction period. In order to maintain and provide the above, the contractor implemented specific health and safety measures for each construction period in advance, and actively incorporated the voices and opinions of the workers working at the site in foreman's meetings, etc. Such feedback was used to make revisions to the original plan and add safety measures where necessary. (Example: Comfortable worker rest area, health counseling room with resident nurses, health counseling office, heat stroke prevention, mental health measures, etc.)</p> <p>It is our opinion that it is necessary for both the client and the contractor to actively work on prevention of occupational accidents by further embodying the efforts so far:</p> <ul style="list-style-type: none"> • Maintaining a comfortable working environment with the goal of zero occupational accidents • Use of construction methods that eliminate and reduce risk factors • Development of a comfortable and safe work environment that takes into consideration the health status of the workers • Development of a work environment where safety education in the workplace and awareness-raising activities for the safety of each person are actively implemented.
10	What occupational accident prevention measures do you wish to see the construction industry retain in the future? These do not need to be examples of measures actually taken. Please note your opinion as a client ordering construction.	<p>It is our opinion that it is necessary for both the client and the contractor to actively work on prevention of occupational accidents by further embodying the efforts so far:</p> <ul style="list-style-type: none"> • Maintaining a comfortable working environment with the goal of zero occupational accidents • Use of construction methods that eliminate and reduce risk factors • Development of a comfortable and safe work environment that takes into consideration the health status of the workers • Development of a work environment where safety education in the workplace and awareness-raising activities for the safety of each person are actively implemented.
11	Please note your impressions of the health status of the construction of facilities for the Olympic and Paralympic Games.	<p>In the development of the Japan National Stadium, which will be the main stadium of the Tokyo 2020 Olympic and Paralympic Games, the basic principles of the mission to carry out the Olympic and Paralympic Games in a safe manner are: (1) athletes first; (2) the world's best universal design; and (3) harmony with the surrounding environment while at the same time maintaining a unique Japanese spirit. Since the development period was limited, a public offering was conducted by the open recruitment type proposal method (design negotiation / construction type) among potential contractors that consistently perform Design and Build, and the stadium was completed brilliantly in a period of about four years from the start of design. We thank all the people who participated in this large-scale project. We are convinced that the Tokyo 2020 Olympic and Paralympic Games, which have been postponed to next summer, will be held safely, and people in Japan and around the world will be able to experience the wonder of this stadium. We are confident that it will be a place where all that come will be impressed. Even after the games are over, we will continue to properly maintain and manage the legacy of this stadium to ensure it will continue to be a dear and loved stadium in the future as well.</p>



6. Occupational accident prevention measures that should be handed down as legacy measures

We have summarized the occupational accident prevention measures that should be handed down as legacy measures based on the responses from all eight companies.

1) Health and safety measures by clients

At the basic design, detailed design and construction stages, the clients hold regular meetings with designers and contractors to set appropriate construction periods, to verify health and safety, and they review those as appropriate to ensure communication among the three parties involved. In addition, the clients interview the contractors to confirm that the necessary expenses for health and safety measures during construction are properly accounted for so as not to compromise health and safety.

2) Promotion of risk assessment and so on

Clients adopt the appropriate construction methods that take into account health and safety during construction from the design stage. BIM/CIM (Building Information Modeling or Construction Information Modeling) is used in the design phase to speed up communication, improve drafting efficiency, check inconsistencies, and visualize design content using VR etc. In addition, virtual construction simulations using BIM/CIM are carried out to eliminate or reduce risks in advance by identifying the presence or absence of risks and difficult tasks during construction. It also leads to the clarification and rationalisation of the construction process at the construction stage.

3) Thorough prevention of fall accidents

The roof is assembled as a unit on the ground to reduce the work at height as much as possible and to reduce the risk of accidents due to falls. The clients apply the precasting of foundations, floor slabs, columns, etc., in order to improve the efficiency of on-site work. These initiatives not only shorten the construction period, but also drastically improve health and safety.

4) Creating more attractive construction sites

Creating more attractive construction sites: In order to develop skills of young people, the company will award young leaders, provide health and safety training mainly for inexperienced workers who handle machines and tools, support women and young people by acquiring qualifications, improve the working environment from a woman's point of view (for example, by providing rest rooms, napping rooms and powder rooms), and display photographs of women and young people working in a rewarding environment on site.

Thus, we can see that not only efforts are being made to improve health and safety from the construction stage, but they are also expanding to include efforts to improve health and safety by the clients and designers. These initiatives will not only improve health and safety, but will also contribute to more sophisticated design, more efficient and rational construction, shorter construction periods and more opportunities for women and young people to actively participate in the construction industry.

These initiatives are not be limited to the special construction projects related to the Tokyo 2020 Olympic and Paralympic Games but also should be rolled out horizontally to the entire Japanese construction industry.