Textbook for Specified Skills Evaluation Exam (ii) for Construction Industry

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Textbook for Specified Skills Evaluation Exam (ii) for Construction Industry Table of Contents

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Chapter 1 Duties of the Foreman

1.1 Role of the Foreman

1.1.1 Position of the foreman at the worksite

A foreman, according to the Industrial Safety and Health Act, is a supervisor who guides and supervises workers at a construction site. The foreman's role is to directly supervise the workers and carry out the daily work. At medium- and large-scale sites, the foreman must work closely with the construction site manager and therefore must ensure the smooth communication of the various on-site information. At small-scale sites, the foreman also acts as the site manager. In the case of small-scale sites, such as houses (traditional Japanese timber framing), shrines, and temples, the foreman is sometimes called “oyakata” or “toryo.”

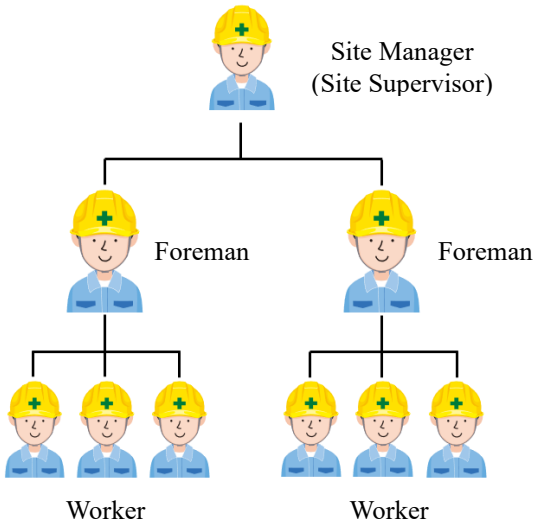

Figure 1-1 Structure illustration of a medium- or large-scale sites

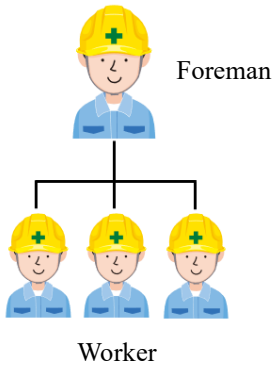

Figure 1-2 Structure illustration of a small-scale site

1.1.2 Role of the foreman

The role of the foreman is to issue appropriate instructions to the workers in order to carry out the work necessary to achieve the goal. The foreman is also required to prioritize worker safety above all else, and to ensure that quality work is performed without causing delays to the scheduled process.

This requires the ability to identify and assess the changes in various on-site situations, the ability to decide what action to take when problems arise, and the leadership skills to issue appropriate instructions. Specifically, the foreman is expected to conduct the following (1) through (11).

(1) Ensuring site safety

During construction work, the utmost priority is ensuring the safety of the workers. If there is a potential threat to the health of workers, improvements must be made to ensure a safe working environment. When a working environment is improved, it is also important to maintain it. If improving equipment or the environment, or liaison and coordination with other job categories is necessary to ensure safety, the foreman is responsible for making suggestions for improvements to the site supervisor or company superiors. Specifically, the following items must be conducted:

□ Prepare and inspect safety work manuals

□ Conduct safety meetings

□ Check for hazardous areas

□ Properly manage materials and machinery

□ Check for sort/set in order/shine status of the site

(2) Confirming the work plan and coordinating work procedures

The foreman checks the construction process for the entire construction site, makes a work plan, and prepares a work procedure manual based on this plan. Because site conditions are constantly changing, it is necessary to communicate and coordinate with other contractors to adjust work procedures as needed. Specifically, foreman must monitor the progress of the work and the procurement of materials and equipment at all times, and reconsider work priorities according to urgency and importance. This allows for timely adjustments to work procedures, preventing construction schedule delays and poor quality.

(3) Checking materials and machinery, instructing inspection and maintenance

For the work to proceed smoothly, the foreman must make sure that the necessary materials and

machinery are available before the work begins. If anything needed for the work is missing, the foreman must immediately make necessary arrangements. Conducting preventive inspections and maintenance before starting work is important, since breakdowns of machinery or equipment/tools during work may affect productivity and safety. If there is a problem, the foreman must immediately have the problem investigated and improved.

(4) Ensuring design quality and construction quality

There are two types of quality: design quality and construction quality.

Design quality is defined in the design documents and specifications during the design phase. It is also called “intended quality,” referring to the fulfillment of requirements such as shape, dimensions, and performance.

Construction quality is achieved during the construction phase. Construction quality is also referred to as “as-built quality.” The construction quality means to realize the intended quality in the as-built quality. If it is not realized, the construction must be redone. This is called rework or redo. Having to rework or redo adversely affects work performance and cost. The foreman keep in mind the as-built quality in observing the site and checking the workmanship of the workers. It is important to pay attention to the work in progress in order to reduce rework and redo. To do so, it is necessary to have an understanding of the design documents and specifications.

(5) Compliance

Compliance refers to acting in accordance with the law or with what a company has decided to do. Compliance also includes following social rules and adhering to employment regulations. Examples of noncompliance that are often discussed include lying on reports and hiding inconvenient matters. Non-compliance is a very serious issue, not only because it can damage a company's image, but also because it can lead to serious incidents later on in the construction process. As a foreman, it is important not only to be aware of the behavior of your workers, but also to be careful not to violate compliance yourself.

(6) Human resource management (proper allocation of workers)

The foreman is required to make appropriate assignment of workers according to the nature of the work. To do this, the foreman needs to know in advance the capabilities and skills of the workers. The foreman must also focus on maintaining worker motivation and promoting communication. One of the roles of a foreman is to give work assignments in a manner similar to OJT (on-the-job training) and advice to inexperienced workers so as to give them the opportunities to improve their skills. OJT (on-the-job training) refers to education in which superiors and senior employees in the workplace provide guidance to subordinates and junior employees through actual work to help them acquire knowledge and skills.

(7) Liaison and coordination with other job categories

Figure 1-3 is the “Example of a work assignment” from the Theoretical Textbook 1 for the Specified Skills Evaluation Exam (i). At large-scale sites, several specialty contractors may be working on the same site at the same time. In this case, the progress of other construction processes may affect your tasks, and vice versa. The foreman needs to keep track of the progress of the entire construction project, so he or she must meet with the foremen and site supervisors of other specialty contractors, and communicate and coordinate the work process as necessary.

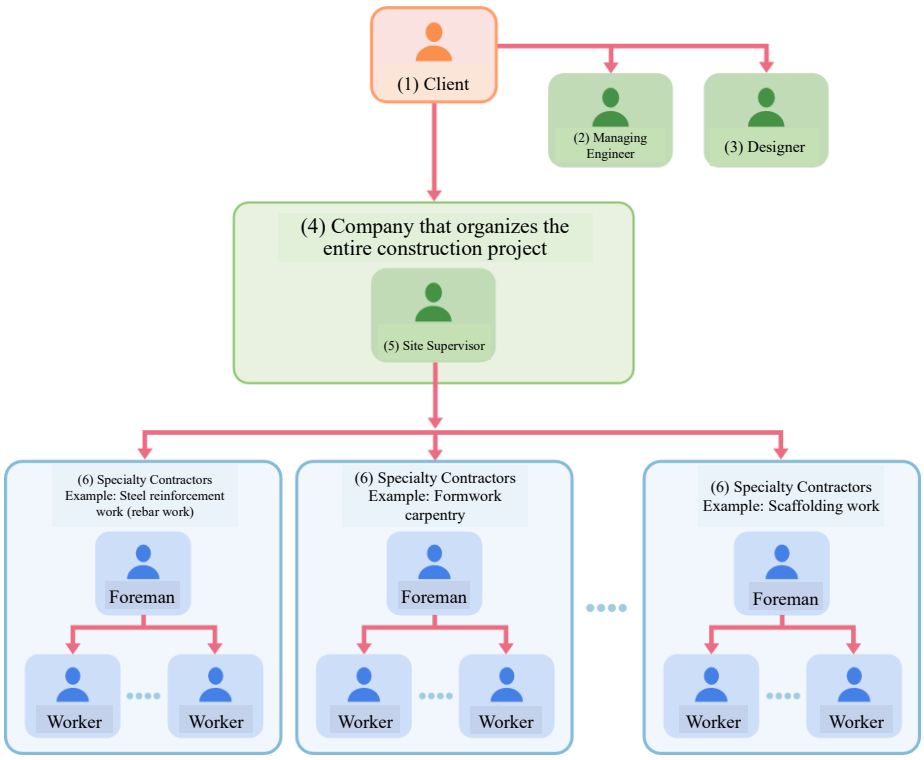

Figure 1-3 Example of a work assignment

(8) Participation in the Foremen's Association

In large-scale construction projects, many specialty contractors can enter the site at the same time with thousands of workers working together all at once. When the scale of the project is large, more than ten specialty contractors of the same type may be involved for certain work, which makes communication among these companies all the more important.

The larger the scale of the construction project, the more difficult it is for the site supervisor shown in Figure 1-3 to handle the worksite alone, so a Foremen's Association participated and voluntarily operated by foremen of specialty contractors will be formed. The activities of the Foremen's Association will also facilitate liaison and coordination with other job categories, as explained in (7).

The Foremen's Association chooses officers such as the president, the vice-president, the secretary, and the treasurer for the management of the Association. Led by the officers, a code of conduct (rules)

for safety and health at the worksite is established, and various safety and health activities are carried out to ensure that all workers can work safely and comfortably.

For example, safety patrols are not limited to your work areas; the Foremen's Association voluntarily patrols the entire worksite. This activity helps to discover hazardous factors that would normally go unnoticed and improve the overall safety level of the worksite.

Because it is important that all members of a Foremen's Association are heading toward the same goal, a name may be given to the Association, such as "XX-kai," and a flag of the association may be created. The Association also plans and organizes recreational activities to promote active communication among each other. Such an event is called a "shinbokukai" (social gathering). Since many specialty contractors come and go, social gatherings play an important part in helping specialty contractors newly joining an ongoing construction project can quickly feel at home with the worksite. Another important task is to educate people to understand the activities of the Foremen's Association.

Participating in a Foremen's Association, where foremen can have an impact on each other, will help each foreman to improve his or her overall competence in the respective workplaces. The job of foreman itself already requires leadership skills to organize workers, but to fulfill the assigned role in a Foremen's Association where many foremen gather requires even higher leadership and communication skills.

(9) Reporting, communicating, and consulting with the site manager and the company

The foreman prepares reports summarizing the status of work, progress, and problems at the worksite and submits them to the site manager and the company.

(10) Implementation of improvements

The foreman is expected to come up with plans for improving on-site work when there are problems with the work situation or progress at the site, and to implement them together with the workers. When considering improvements, note the following:

□ When implementing the proposed improvements, make safety the top priority and minimize the risk

of incidents.

□ Share problems and issues with the workers.

Don't just think for yourself; lend an ear to the ideas and knowledge of the workers. Taking advantage of the technical prowess and experience of the workers can realize improvements that are more effective.

□ Consider budget and time constraints.

Improvements that ignore budget and time constraints may be difficult to implement or cause reduced productivity at the worksite.

□ Rotate the cycle of improvement and evaluation

After implementation, repeatedly evaluate and adjust to improve on-site productivity.

(11) Facilitation of communication

By communicating with the workers, discussing problems and complaints, and working together to resolve them, the foreman can facilitate the on-site work.

1.1.3 Report, Inform, Consult

Report, Inform, Consult are referred to as HORENSO using the first syllable of each of the Japanese words. HORENSO and checking are very important to ensure that the work proceeds as planned.

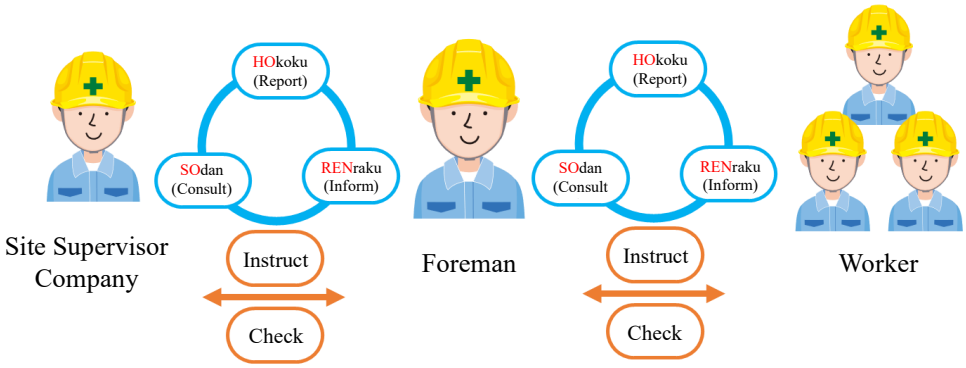

Figure 1-4 Relationship diagram of Report, Inform, Consult (HORENSO), Instruct and Check

(1) Report

The foreman must pay attention to changes that occur in the daily work and report any problems to the site manager and the company. When reporting, be sure to include suggestions for improvements, etc. Being mindful of the following points will make it easier to find problems to report:

□ Were there any problems with the safety and health of the workers?

□ Were there any problems in arranging the necessary personnel, materials, and equipment?

□ Were there any shortages or defects in materials or equipment?

□ Were there any shortcoming in the design documents or construction drawings, or were there any portions that could not be constructed according to the drawings?

□ Were there any problem with the work progress status or any delays in the schedule?

□ Were there any incidents or troubles?

□ Were there any problems with quality control?

□ Were there any violations of laws, regulations, or rules?

□ Were there any environmental pollution, noise, vibration, or other problems at the worksite?

(2) Inform

The foreman is responsible for informing the workers what they have been instructed to do by the site manager or the company. When informing, keep the following points in mind.

☐ Determine the degree of urgency and importance and inform the workers at the appropriate timing.

For matters that are both urgent and important, try to inform the workers as soon as possible.

☐ When informing, do so in an easy-to-understand manner and make sure that the other party understands.

Informing means nothing if the other party does not understand. Try to use plain language and be as concise as possible, and choose the right location to inform the workers.

Because of the high noise level at the worksite, it is necessary to choose a location where the other person can hear you. In addition, information that must be conveyed to workers urgently and

promptly may require the use of a loudspeaker.

(3) Consult

The fact that you have something to consult about means that you are fulfilling the role of the foreman with an awareness. In the Report, discuss with the site manager and the company what cannot be resolved by the foreman alone, how to implement improvement plans, etc. In particular, consult with the site manager and the company for instructions regarding the implementation of the improvement plan. From someone with a view of the entire work, what may seem to you like a good improvement idea could be something that would reduce the work performance or have a negative impact on the work of other job categories. The following perspectives will help you find matters about which you should consult.

□ Are there any obstacles to the smooth progress of the overall work?

□ Are there likely to be any delays in the schedule?

□ Are there any technical problems or challenges in proceeding with the work?

□ Are there any unclear points in the design documents or construction drawings?

□ Are all necessary materials, equipment, and tools available or arranged?

□ Are there any problems or concerns regarding quality control, safety management, or environmental protection?

□ Are there any problems with staffing or workload on site?

□ Are there any problems or concerns about complying with laws and regulations?

(4) Instruct/Check

HORENSO alone is not sufficient. When giving instructions to the other party regarding changes in the work schedule or work content, it is also important to check that the other party understood. To avoid mistakes, make sure to check with the person you are communicating with to ensure that the information is correctly conveyed.

1.2 Competencies required of a foreman

The foreman is responsible for multiple tasks while organizing the workers and ensuring timely progress, quality, and safety at the worksite. Accurate judgment and quick response are required to

deal with problems and troubles that occur on-site. Furthermore, it is important to keep track of on-site processes and budgets to keep workers motivated and enhance productivity. This requires several competencies, as shown in Figure 1-5. Competence can be improved through experience and learning. To this end, a foreman must be willing to continue learning.

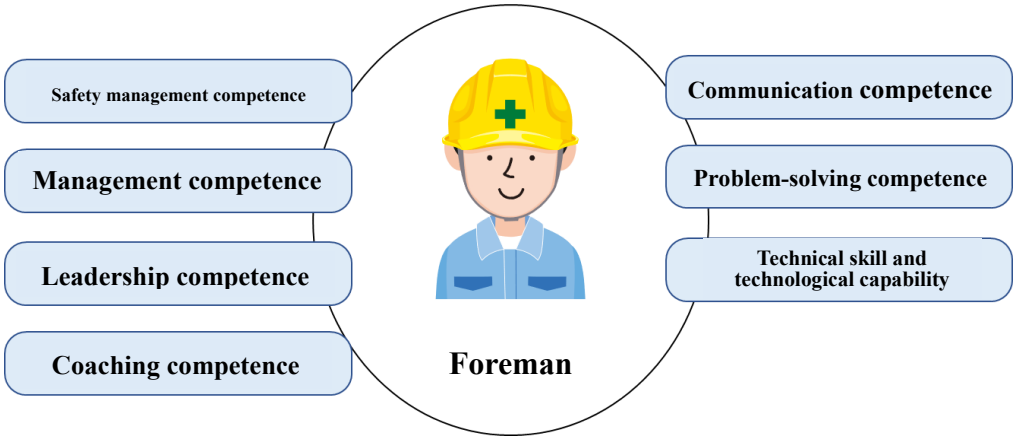

Figure 1-5 Competencies required of a foreman

1.2.1 Safety management competence

Safety management competence in construction sites refers to the ability to maintain a safe environment and manage risks so that workers can work safely without occupational accidents and incidents. Specifically, a foreman is expected to have the following abilities.

☐ Ability to recognize hazards and toxicity

The ability to recognize hazards and toxicity is the ability to recognize in advance potential hazards in the place where workers conduct work or in the manner in which they conduct work, and to consider remedial safety measures. To improve the ability to recognize danger, you must always be alert to what is going on around you. While it is important to make use of your previous experience, try to accumulate experience and learn from the examples of others in order to further develop the ability to make judgments based on experience in the ever-changing construction field. It is also important to keep up with safety information and new technologies to augment your expertise.

☐ Ability to conduct safety education

The ability to provide appropriate safety education is the ability to ensure that workers understand the risks and are able to implement safety measures. Safety meetings, safety seminars, and safety training are all means of conducting safety education, and the foreman is expected to take the leadership position in hazard prediction (KY) activities conducted during daily morning meetings.

☐ Ability to supervise the worksite

The ability to supervise the worksite is the ability to prevent unsafe work practices and provide appropriate guidance to ensure that workers can perform their tasks safely. To this end, it is important to always pay attention to the work performed by workers and their surroundings, and to take responsibility to ensure on-site safety.

☐ Ability to respond to incidents

In the event of an incident, the first step is to ensure the safety of the workers. Also, preserve the site where the accident or incident occurred for investigation of the cause of the accident or incident. This is the ability to, after investigating the cause of an incident, take prompt and appropriate action to devise and implement measures to prevent recurrence.

1.2.2 Management competence

Management refers to the organization of people and resources to effectively and efficiently run a worksite. When considering management as a foreman, it is necessary to have a good balance of the following skills. Specifics are explained in Chapter 2 and on.

□ Leadership skills

□ Communication skills

□ Problem-solving skills

□ Team management skills

□ Analytical skills of the situation and information

□ Project planning and execution skills to achieve goals

To improve your management competence, it is important to set clear goals for the content and projects you are to manage. When goals are set, tasks can be carried out more efficiently. In addition,

to demonstrate management competence, the foreman must possess leadership competence, coaching competence, communication competence, problem-solving competence, and technological capability and technical skill. Furthermore, for self-improvement, it is also important to maintain the willingness to continuing learning, which is explained in 1.2.8.

1.2.3 Leadership competence

Leadership and management are both necessary competences for a foreman in organizing a team.

Leadership motivates workers and encourages initiative. As with management, it maximizes workers' abilities to achieve goals and to reflect them in their work. Leadership influences the thinking and behavior of workers so as to bring everyone together. The statements and actions of the foreman as a leader play an important role. Be aware of the following and act accordingly.

□ Have a clear vision and goals, and communicate them in an easy-to-understand manner so that they can become common goals for all.

□ Voluntarily take action and set a good example as a foreman.

□ Maintain communication and build good relationships with workers.

□ Create an environment where members can cooperate with each other as a team.

To improve leadership competence, it is essential to improve communication competence as explained in 1.2.5. Other things that can improve leadership skills include the following.

☐ Find a role model.

Find someone you view as having good leadership skills and observe and learn from their actions, words, and work ethics.

☐ Actively seek input from others.

Accurate self-assessment of whether or not you are improving your skills requires actively seeking feedback from others. This is an effective method not only in leadership, but in all competence building.

☐ Create trust and cooperation among workers.

Leadership competency refers to the ability to unite multiple workers toward a single goal. Goal

setting is fundamental, but trying something new also provides a good opportunity to bring the team together.

1.2.4 Coaching competence

Coaching is a method of helping individuals achieve their goals and solve problems by drawing out their abilities through communication, based on the assumption that the individual already has the answers.

Coaching also plays an important role in leadership and management. In a superior-subordinate relationship, there may be a tendency of the superior to rely on the authority and experience of the superior position, but it is necessary to keep two-way communication in mind and to find an approach that is in line with the other party's thoughts and feelings.

Since people have differing perceptions, the key is not insist on a certain way of doing things, but to listen carefully to what the other person has to say and to explore the issues through asking questions. For example, you must discard the mindset that your way is the right way based on experience. It is also important to think about the positive contributions you can make to the other party. Based on this concept, take the following steps in the coaching process.

Step 1 Set the goals you want to achieve.

Step 2 Check the current situation.

Step 3 Create a plan to achieve your goals.

Step 4 Implement the plan and follow up regularly.

Step 5 Provide both positive feedback and feedback on matters requiring improvement.

Step 6 After the plan is completed, evaluate the entire process and apply improvements and lessons learned to the next step.

The above six steps summarize the key steps of how to proceed with coaching, but if you want to improve your coaching competence, you may want to read some specialized books. Always remember that the role of coaching is to encourage the personal growth of the other person. To this end, it is important that you strive to grow and set an example for the workers. This is especially important in relationships among people who work at the same site.

1.2.5 Communication competence

Communication competence refers to the ability to correctly convey your thoughts and to correctly receive and understand what others say. Communication competence is essential for leadership, management, and coaching. High communication competence is essential for a foreman, because such people can make a significant contribution to solving problems, improving teamwork, and providing effective feedback at the site and in interpersonal relationships.

Mutual trust is the key to promoting high quality work in a team consisting of multiple workers. Various forms of communication can foster a sense of mutual trust when different people meet for the first time. Figure 1-6 illustrates the flow for this purpose.

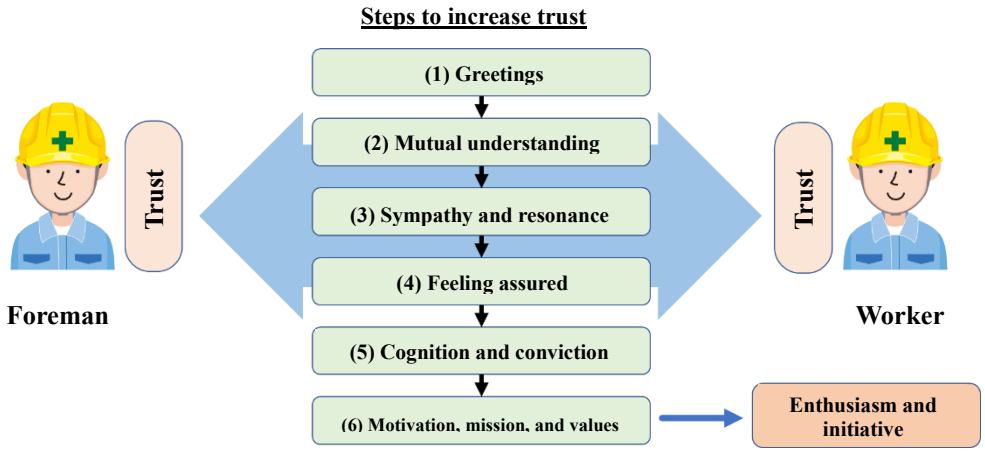

Figure 1-6 Steps to increase trust

(1) Greetings

Greetings are absolutely fundamental to building trust. Greet each other clearly and loudly, not only in the morning and on the way home, but also when you pass each other, saying "otsukaresamadesu (thank you for your hard work)." Be sure to greet not only your own team of workers, but also the workers of other contractors.

(2) Mutual understanding

Mutual understanding means understanding each other. Listen carefully to the workers and try to maintain two-way communication so that you can exchange ideas with each other. Working together to solve problems that arise on-site can facilitate mutual understanding.

(3) Sympathy and resonance

Sympathy refers to understanding, emotionally connecting with, and sharing the feelings and thoughts of each other. Resonance refers to the state of being able to empathize with one another. As mutual understanding is promoted, you will be able to sympathize and resonate with what the other person has said, even with just a few words, and take action based on them.

(4) Feeling assured

Feeling assured means understanding and accepting what the other party has said. Even when your action intended to solve problems do not yield the best results, maintaining good communication will help the other party feel assured of the outcome. If the other party does not feel assured, trust may diminish with each repeated failure.

(5) Cognition and conviction

Cognition refers to the workings of the mind in which a person receives information, acts on it, and makes sense of it. Conviction refers to the strong belief that something is completely right for oneself. As the results continue to be through communication, the workers begin to recognize the foreman as a trustworthy person, which enables them to work with confidence.

(6) Motivation, mission, and values

The above process will not only motivate workers to improve the quality of their work and help them to work on their own mission, but also to share common values as a team.

(7) Enthusiasm and initiative

When workers realize that what they say can make a difference to the entire team, it gives them enthusiasm towards work, and they begin to take initiatives.

Methods for improving communication competence include the following.

□ Listen carefully to what they have to say and speak actively.

One-way communication is a “transmission” of information to the other party and does not build trust. Try to listen carefully to what they are saying, understand what they are saying, and then speak actively.

□ See things through the other person's eyes.

It is important to speak not only from the position of the foreman, but also to be aware of how the

other person views the conversation. Maintaining an attitude of sympathy and understanding for the other person's words.

□ Use body language with awareness.

Body language refers to communication through means other than spoken language, such as gestures, hand gestures, facial expressions, and posture. Facial expressions and posture are especially important and can reveal whether the person is listening to you properly.

□ Be careful how you choose your words.

Choose your words in a way that is respectful of the other person's opinions and ideas, and be particularly careful in not using words that may cause discomfort to the other person. Be especially aware of the fact that because of the relationship between the foreman and the worker, impromptu words that come out could be perceived as power harassment.

□ Seek feedback from the other party.

Seeking feedback from others is important in order to accurately assess your communication competence. Making improvements based on such feedback can improve your communication competence.

1.2.6 Problem-solving competence

On construction sites, a variety of factors can cause discrepancies between goals and results. The ability to identify the cause of such problems and find a solution is problem-solving competence. The following are key points for demonstrating problem-solving competence.

□ Let go of preconceptions or prejudices based on experience in order to accurately understand the problem in question.

□ Collect and analyze information on the cause of the problem.

□ Devise several creative solutions to solve the problem.

□ Decide on a solution and make an action plan.

□ Execute the action plan.

□ Evaluate the results.

1.2.7 Technical skill and technological capability

The terms “technical skill” and “technological capability” are similar, but technical skill refers to proficiency in a certain task, while technological capability refers to the ability to have knowledge in a certain specialized field and to apply that knowledge. As a foreman, you are required to have a certain level of technical skills and technological prowess to demonstrate for your workers and communicate solutions to work problems. Having this competence can, in addition to guiding workers, contribute in the following manner.

□ Able to identify in advance and deal with potential hazards and defects in construction.

□ Able to conduct accurate and efficient construction and improve the quality of structures.

□ Able to conduct efficient construction without extra cost.

□ Able to accurately plan construction work and stay on schedule during construction.

A person who has a high technological capability or mastered a technical skill, called “takumi (master),” is able to instantly recognize the key points of a task, can utilize tricks learned through experiences, and work in a precise and concise manner. Such person also has the mentality to continue working in an efficient manner. Although you may have already acquired certain knowledge and skills from your previous experiences, it is important to continue learning from the example of masters and senior staff in order to further improve.

1.2.8 Learning for career advancement

To be promoted to a foreman and continue to advance the career, it is essential to not only acquire the aforementioned competencies, but also continue learning. Specific examples are as follows.

□ Stay interested and curious, and continue to learn

Maintaining an interest in the work you are involved in and in the work of other job categories and incorporating the latest trends and new skills in the construction industry will promote personal growth and career advancement.

□ Have a sense of purpose

Clarifying the purpose of learning and working toward specific goals will enhance the

effectiveness of learning. For example, it is important to study for certifications/qualifications. Furthermore, it is important to make use of such certifications/qualifications. Certifications/qualifications may provide self-contentment, but only becomes meaningful when you actually put them to use. When the purpose of utilizing the certifications/qualifications is “to provide higher quality products to our customers,” this would surely lead to career advancements. Please refer to Chapter 3 of the Textbook for the Specified Skills Evaluation Exam (i) for the Construction Industry for information on the types of qualifications.

☐ Conduct self-assessments

By objectively assessing your own skills and knowledge and identifying areas of deficiency, you can make your learning more effective.

☐ Put acquired knowledge and skills to practical use

Apply the knowledge and skills you have learned to your actual work. Feedback of these results to superiors and workers can promote personal growth and career advancement.

Chapter 2 The Role of the Foreman in On-Site Management

2.1 Conditions for good work

2.1.1 Components of work

No one knows the worksite situation better than the foreman, who is in a position to supervise the workers on-site. The foreman is in an important position to detect at an early stage situations in the work flow that affect quality, performance/efficiency, cost, and safety and health.

Figure 2-1 is an organized illustration of the elements that comprise work at a construction site. Workers use equipment, materials, etc. to carry out construction work in accordance with predetermined work methods and procedures. In this process, a variety of information is exchanged, including information about other job categories. The goal of management is to combine these four elements to achieve the best possible result, and this is the role of the foreman.

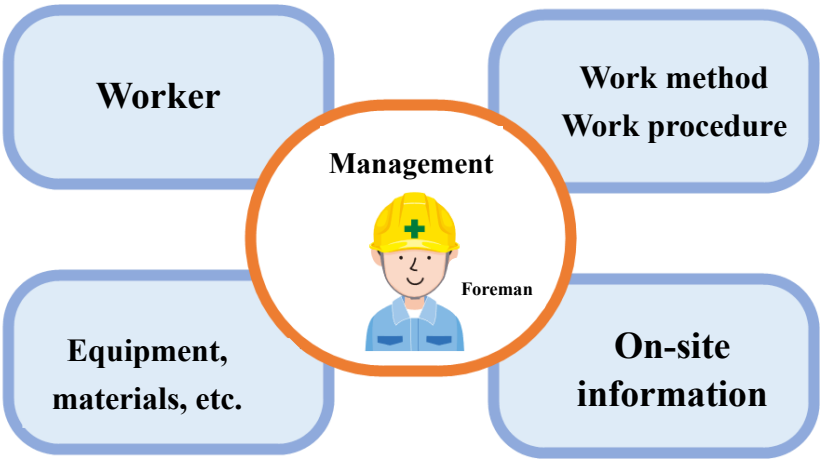

Figure 2-1 Components of construction work

2.1.2 Conditions for good work

If any one of the four elements in Figure 2-1 goes wrong, a variety of problems can occur. For example, if information is not accurately conveyed or there are missing materials, a problem called “waiting time” occurs, in which workers are kept waiting. It can also lead to other problems such as

“redo,” which is redoing the work, as well as “mistakes” and “rework.” All of these affect quality and cost. In the worst case scenario, an accident or incident may occur, ultimately resulting in unsatisfied clients. The foreman is a skilled worker with years of experience and knowledge of the people, objects, and workability of the workplace. It is necessary to always be aware of whether the four elements of work are functioning in a balanced manner, and to manage the worksite so that work flows without overburdening, inefficiency, inconsistency, waiting time, redo, mistake, rework, etc.

(1) Muri/muda/mura

Muri (overburdening) refers to a state of being burdened beyond one's ability. For example, it refers to the state of having to do something that is not in accordance with one's capabilities or performing work with a construction timeline that is extremely tight in relation to the work to be performed.

Muda (inefficiency) refers to doing things that are useless or ineffective.

Mura (inconsistency) refers to the simultaneous presence of both muri and muda, resulting in unstable work and inconsistent quality.

One of the causes of muri/muda/mura is an imbalance between the workload and the capacity. If the workload is greater than the capacity, the work cannot proceed as expected, and if there is too much capacity relative to the workload, the workers end up with waiting time.

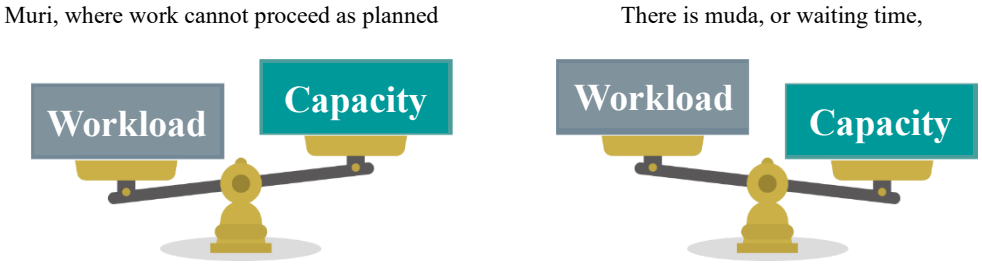

Figure 2-2 Balance between workload and capacity

As a foreman, it is important to allocate workers according to their abilities and to make the best personnel plan according to the nature of the work in order to eliminate muri, muda, and mura.

(2) Waiting time

The term “waiting time” refers to a situation in which a worker has stopped working because he or

she is unable to begin the next step of the work. Possible causes include the following.

- Lack of materials and equipment

Take measures such as contacting suppliers and confirming delivery dates at an early stage in order to ensure early procurement.

- Mistakes in process control

If the process is such that several different tasks are performed in the same location, the performance of the work may be compromised and waiting time may occur. Consideration should be given when planning the process, and meetings should be held between the foremen of different job categories.

- Delays in the previous process

A delay in the previous process causes waiting time. As a foreman, you must be aware of adhering to the process schedule so that it does not affect subsequent processes.

- Waiting to use shared machines

When machines such as cranes are shared by different job categories, it may result in waiting time. The foremen are to discuss the process of using the machines with each other and make adjustments to prevent waiting times from occurring.

- Differences in work capacity

Waiting time is minimized by creating a process plan that is in accordance with the work capabilities of each job category, and holding meetings among foremen to make adjustments.

(3) Redo/rework

Redo refers to the process of going back to a task and starting over from that point because it was originally skipped. Rework refers to modifying a part of the work or rebuilding everything from scratch due to defective work or other reasons. Possible causes include the following.

- Inadequate or incorrect work procedure manual

When the work procedure manual is difficult to understand or contain errors, it results in a redo. The foreman is to check the work procedure manual and take necessary measures such as holding a meeting to review the contents together with the workers.

- Failure to follow work procedures

As a foreman, you will train workers to follow work procedures.

- Work procedures differ from the actual procedures

The foreman keeps track of any changes and shares this information with the workers at morning meetings, etc.

(4) Mistake

A mistake is a mistake in procedure or arrangement. For the procedure, the causes can be the same as those for redo and rework. Regarding arrangements, mistakes can be wrong rental period of machines and errors in ordering the type and number of materials. To eliminate mistakes, early checking is important, as explained as risk management for process control.

2.2 The role of the foreman in setup and work management

In Japan, there is a saying, “80 % setup, 20% work.” It means that if your work preparation (setup) is perfect, it is as if 80% of the work is already done. There are a few things that you as a foreman should take care of in advance to ensure that quality work can proceed on schedule once the on-site work begins.

2.2.1 Dispatch education

Dispatch education is education provided in advance by contractors to their foremen and workers entering a worksite for the first time (called “newcomers”). The foreman will check the worker’s work experience, qualifications, and health condition in advance, consider the proper assignment (where the person is best suited to work), and train the workers according to their respective job sites.

The dispatch education includes the following.

□ Explanation of the safety and health plan for the workplace

Explanation of the correct working outfit, appropriate protective equipment, etc.

□ Site layout

Scope of construction, break areas, restrooms, on-site offices, commuting routes, smoking areas, etc.

☐ Explanation of site conditions

Locations where other contractors and workers are also present, locations of heavy equipment, etc.

☐ Brief description of the work

☐ Explanation of hazardous areas

☐ Explanation of evacuation procedures

☐ Explanation of site rules

If there are unique rules regarding how to adhere to work procedures, cleaning, organizing, sorting of industrial waste, cleaning up after smoking, etc. (e.g., no use of stepladders), this should also be explained. For foreign workers, it is effective to prepare materials for newcomers in their native language to make it easier for workers to understand.

Some worksites require newcomers to wear stickers for about a week for easy identification. Not only the contractor (the master employer), but also the foremen and other workers should pay some attention to newcomers.

2.2.2 Confirmation of work procedures

Review the work procedure manual to instruct the workers on the work procedure of the day. Work procedure manuals are generally compiled under the guidance of the foreman. The work procedure manual outlines the best sequence of work to eliminate muri, mura, and muda (overburdening, inconsistency, and inefficiency), as well as key points and tricks when carrying out the work. By following this procedure, the work can be conducted safely, accurately, and quickly. Make sure to communicate to workers why they must adhere to the work procedures manual, and ensure that they understand.

2.2.3 Confirmation of work status

The foreman goes around the worksite and checks the status of the work up to the previous day. The foreman ensures that there are no problems with safety or the placement of materials and equipment. If work is running behind, the foreman considers what steps can be taken to make up for the delay and plan the day's work.

2.2.4 Checking and managing materials, equipment, and tools

Check that the materials, equipment, and tools necessary for work are all accounted for. Since the positioning of materials also affects work performance, make sure that they are positioned according to the work flow. If they are not properly positioned, instruct the workers to reposition them before work begins.

2.2.5 Appropriate allocation of workers

To ensure that the work proceeds most efficiently, determine the appropriate worker allocation. This requires a thorough understanding of not only the knowledge, experience, skills, and qualifications of each of the workers, but also their health and fitness.

Remember that proper allocation affects not only work efficiency but also worker motivation. Provide opportunities for personal interviews with workers to understand their work-related and inter-personal relationship concerns, as well as to learn what they hope to achieve through their work. It is also necessary to base the allocation of workers on such information so that each worker can improve his or her abilities.

As for elderly workers, they often possess a wealth of knowledge and superior skills. On the other hand, their fitness and attention span are declining due to age, and overexertion can lead to accidents and incidents. It is important to talk with them often and in depth to determine the proper assignment.

2.3 Basic knowledge required for on-site management

2.3.1 Relationship between delivery, cost, and quality

QCD is an acronym for Quality, Cost, and Delivery. Quality, cost, and delivery are in an inverse correlation (when one improves, the other worsens) which each other (Figure 2-3).

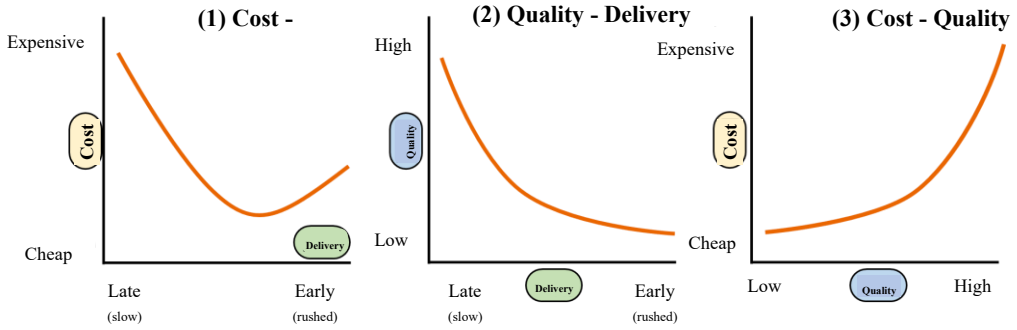

Figure 2-3 Relationship between Delivery, Cost, and Quality

(1) Cost - Delivery

Slow work can be wasteful, resulting in waiting time, etc., which increases the cost. Early delivery requires more personnel or introduction of machinery for improved efficiency, which increases the cost.

(2) Quality - Delivery

Slow work results in higher quality, but rushed work (*tokkan koji*: work completed in a short period of time) can result in poorer quality. Rushed work may occur when trying to adhere to a set construction timeline in a situation where rain, design changes, additional work, redoing, reworking, or waiting time has caused delays.

(3) Cost - Quality

If the cost is low, the quality may be poor; if the cost is high, the quality may be high.

2.3.2 QCDSE

On construction sites, in addition to Quality, Cost, and Delivery, Safety and Environment must also be considered. QCD and these two together are referred to as QCDSE.

Creating a safe work environment and being mindful of the environmental impacts on the areas around the construction site allow the workers to concentrate on their work. The idea that this also affects quality and cost in a positive way has taken hold.

As a foreman, in addition to QCD, you must acquire the skill for safety and health and environmental management. These will be explained in detail in 2.4 and thereafter.

2.3.3 General methods for ensuring quality, improving business and problem-solving

The PDCA Cycle is often used as a general method for improving quality, operations, and problem-solving. In addition to this, the OODA Loop is starting to be put to use in the recent years. By properly understanding these two, you as a foreman will be able to respond appropriately when improving quality, improving operation, and problem-solving.

(1) What is the PDCA Cycle?

The PDCA Cycle is the concept of repeating Plan, Do, Check, and Action as shown in Figure 2-4 in order to improve operations and increase performance.

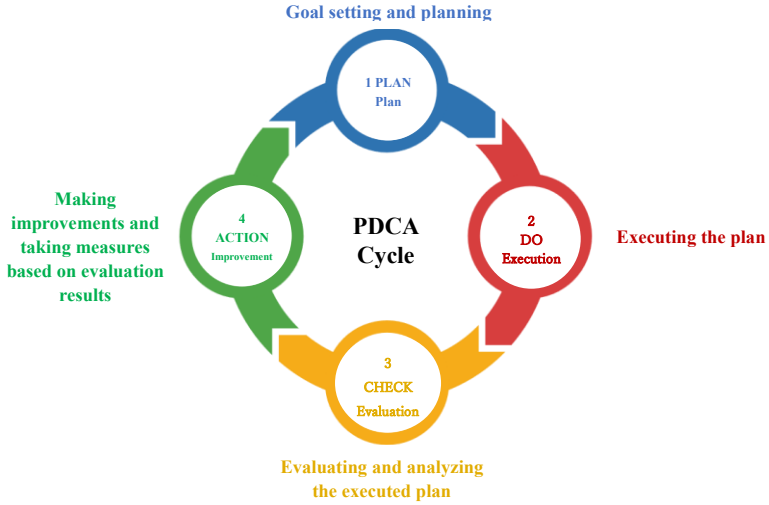

Figure 2-4 The PDCA Cycle

Below is an example of each step as it applies to a construction site.

Step 1 Plan: Goal setting and planning

Set goals or improvement targets for quality or operations and create a plan for achievement of

such goals and targets. At a construction site, this step is to create a construction plan and based on this plan, devise a work procedure manual.

Step 2 Do: Executing the plan

The work will be performed according to the schedule in the construction plan and in accordance with the work procedure manual.

Step 3 Check: Evaluating and analyzing the executed plan

Evaluate the results of the work performed according to the work procedure manual. If the work is not completed within the targeted time or the targeted quality is not achieved, the reasons and causes are to be analyzed.

Step 4 Action: Making improvements and taking measures based on evaluation results

Update the work procedure manual based on the results of the Step 3 analysis. Using the updated work procedure manual, go back to Step 1 and repeat the process so as to further improve quality and operations.

(2) What is the OODA Loop?

The OODA Loop is a decision-making methodology developed by John Boyd, a military strategist in the United States Air Force. It is used to achieve results in unpredictable situations. On a construction site, the situation you are viewing go through changes over time, giving way to the constant possibility of unexpected (unpredictable) occurrences.

What is required of the foreman is the ability to make decisions on how to respond to problems as they arise. By utilizing the OODA Loop, when a problem arises, you can consult with your superior and respond flexibly to the situation on-site. It also allows us to anticipate and respond to unexpected risks.

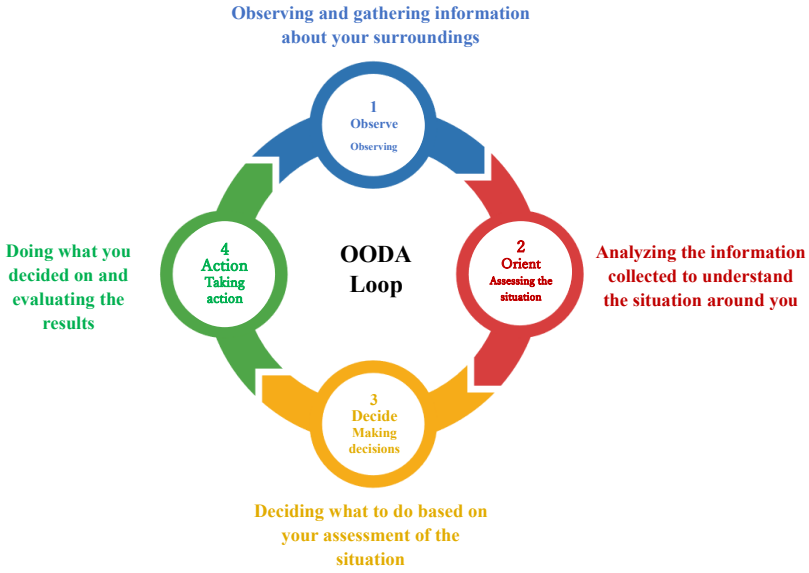

Figure 2-5 The OODA Loop

The OODA Loop consists of the four steps shown in Figure 2-5.

Step 1 Observe: Observing and gathering information about your surroundings

The OODA Loop is characterized by its first step, which is to Observe. The decision-maker, or the foreman, should carefully observe the current situation to obtain accurate information. Data obtained from observations are referred to as "raw data" to distinguish them from past data. When making observations, try your best to look only at the facts, without preconceptions. The idea that "this must have happened because of that" can interfere with free thinking.

Step 2 Orient: Analyzing the information collected to understand the situation around you

Analyze the raw data from your observations and combine it with your own experience and knowledge to determine the situation. Based on the results of the decision, formulate hypothetical plans on what should be done. At this stage, there is no need for a single hypothetical plan. Take as broad a view as possible and formulate several hypothetical plans.

Step 3 Decide: Deciding what to do based on your assessment of the situation

Once hypothetical plans are formulated, consider which will yield the best results. If there are multiple hypothetical plans, prioritize them. In general, if observation and situational assessment are carried out correctly, decision-making should take little time. If you cannot decide, you have not

observed or assessed the situation well enough and need to return to the previous step.

Step 4 Action: Taking action and evaluating results

If the executed plan does not work out, consider the reasons why, and implement the next plan based on the priorities determined in the decision-making step. If a plan works, document it so that it can become a know-how. The OODA Loop should not end with just one loop, but rather, it is important to observe the results and continue on to keep the loop in motion.

(3) Difference between the PDCA Cycle and the OODA Loop

The major difference is that the PDCA Cycle starts with goal setting, while the OODA Loop starts with observing.

The PDCA Cycle is suited for gradually getting better and better results by repeating the cycle. As shown in the example in (1), it can be used at construction sites for construction management based on construction plans. The PDCA Cycle is suited for executing the construction plan, checking progress and quality, and making improvements if problems are found.

The OODA Loop is better suited if the changes are constantly unfolding and quickly responding to problems as they arise is necessary. The OODA Loop concept can be used for on-the-job training by sharing scenarios with workers.

2.4 Safety management

The Industrial Safety and Health Act requires that a safety manager and a health manager be appointed when workplace has 50 or more workers. In the construction industry, foremen are often chosen for this role. Even when not appointed as a safety manager, the foreman is still required to behave in a way to keep the site safe.

2.4.1 Enforcement of safety regulations

Safety is ensured when all workers participate in safety activities. All it takes is one person who does not follow the rules to cause an accident or an incident to occur. To enforce safety rules, it is necessary to educate and train workers and raise their awareness regarding safety. When everyone is

aware of and follows safety rules, accidents and incidents can be prevented.

Because several outside contractors and related parties work at the same time on a construction site, it is important that everyone follow the safety rules and conduct themselves accordingly. Training newcomers is one way to do this. Posting posters and signs about safety regulations throughout the construction site can also be effective.

The foreman must strictly supervise compliance with safety rules and promptly provide guidance in the event of any violations. It is also important to promptly report and respond to any incidents that have occurred. Appropriate implementation of these activities will encourage workers to behave in a manner compliant to the safety rules.

2.4.2 Raising safety awareness

Improving safety awareness among all workers cannot be achieved overnight. To improve safety awareness, it is necessary not only to provide one-time education to the workers, but also to devise and implement ways to encourage safety behavior at all times. Here are some successful examples.

- Establishing a safety duty system and having all workers take turns to engage in safety activities, including keeping a safety log regarding safe work.
- Providing education on specific themes, such as “handling of portable elevated work platforms.”
- Setting up a board depicting an illustration of a worker wearing a working outfit, fall protection gear, hard hat, safety shoes, etc. and attaching a mirror to it so that workers can compare their own equipment with the illustration and check it.
- Posting a group photo of each cooperating contractor and their respective safety declarations to raise safety awareness and camaraderie.
- Posting examples of industrial accidents.
- Visualizing (using self-explanatory visuals) safety points by taking pictures of them.

2.4.3 Conducting safety meetings

A meeting or conference attended by all workers at a construction site is called a safety meeting.

After the safety morning meeting for the entire construction site, workers in the same or related job categories gather for a safety meeting. In many cases, the foreman will take the leadership role and conduct detailed meetings, which may touch on the following.

□ Communicate the content of the safety instructions (work content, work hours, work location, countermeasures for dangers and hazards, instructions and communication from the prime contractor, etc.) to all workers.

□ Check the worker's working outfit and health condition.

□ Conduct hazard prediction (KY) activities for the day's work.

2.4.4 Ensure safe use of machines and tools

Regular inspection and maintenance of machines and tools facilitates safety management on site. It is also important to instill in the workers the habit of conducting inspection before work begins and after work is completed. It is a good idea to determine which machines and tools require inspections.

Even if machines and tools are inspected and maintained, accidents and incidents can still occur if they are not used correctly. Workers must be required to use them correctly at all times. Training sessions on safe use and other topics regarding on-site work, tools, equipment, etc. that require special attention are to be conducted.

Training sessions are also an effective way to learn about construction equipment. For example, workers could be made to sit in the driver's seat of construction equipment to gain an understanding of the operator's blind spots. If a construction equipment has not been inspected prior to starting work, it is also effective to display a sign such as “Do not use” to prevent the equipment from being used as it is.

2.4.5 Visualization of hazardous areas

It is also effective safety management to make sure that hazardous areas are conspicuously marked. Visualization is often done by color-coding work areas with colored pylons.

Also, marking the sections where the fall protection gear must be attached with two hooks while

working at heights with red tape allows even inexperienced workers to know to do so. As a foreman, you must determine areas with potential dangers, think of ways to visually mark these areas, and actually mark them so as to reduce the number of accidents and incidents.

2.4.6 Response to accidents and incidents

Arrangements should be made with the company to which you belong or the company organizing the entire construction project as to how to respond in the event of an accident or incident. This section describes the actions a foreman is to take when an accident or incident occurs at the worksite.

(1) Emergency measures

Education and training on a regular basis are important in order to take appropriate actions in the event of an accident or incident. It is also important to place the highest priority on respect for human life. Response must consider not only the victims, but also the workers and others involved who happen to be there. As an emergency measure, it is also important to determine in advance an assistant to the foreman (a helper) in case several actions need to be executed simultaneously. The following actions are necessary in an emergency situation.

- In the event of an accident caused by a machine, activate the emergency stop on the machine and rescue the victims

Routine education and training are essential in order to be able to activate the emergency stop. It is necessary to know the location of emergency stop buttons for machines; how to shut off the power for electrical systems; and the location of valves and cocks for plumbing systems. As a foreman, it is also important to keep track of equipment that can make emergency stops in the work area and to indicate them with diagrams or other means so that the necessary maneuvers are obvious during an emergency.

When an accident occurs with construction equipment, the situation must be handled with care so as to avoid secondary accidents from operating the equipment in a panic to activate the emergency stop.

- Initiate emergency contact with your superior, relevant personnel, and agencies

To ensure smooth communication, predetermine where to contact and the contact methods.

- Provide first aid and emergency treatment to victims

If the victim is in cardiopulmonary arrest, perform life-saving measures such as CPR (cardiopulmonary resuscitation), defibrillation with an AED (automated external defibrillator), and clearing airway obstruction. The more time passes before such measures are performed, the less likely they are to save lives. These measures and how to use such equipment should also be part of the education and training.

- If there could be a secondary accident, evacuate the workers

It is also necessary to thoroughly educate and train the workers on how to evacuate in the event of an accident (e.g., evacuation routes, entrances and exits, etc.) on a regular basis. Predetermine a meeting place after evacuating, and conduct a roll call to ensure that no workers are left behind.

- In case of a fire, perform initial fire extinguishing and prevent secondary accidents caused by explosives

- Preserve as much of the site as possible so that the cause of the accident can be determined

(2) Accident investigation, analysis, and countermeasures

Accident investigation

After an accident or incident occurs, clarifying the cause can help prevent the recurrence of similar accidents. The accident investigation phase is similar to the first step in the OODA Loop; simply review the facts without preconceived notions. The key is to focus on “people,” “objects,” “work,” and “management.” For example, when focusing on “work,” the type of work that was being performed when the accident occurred is addressed.

- Analysis

For each of the facts identified, check to see if there were any problems. For example, when looking at the work, one possible analysis is on whether or not things were being done in an unusual manner.

- Countermeasures

Once the cause of the accident is identified, determine countermeasures to prevent recurrence. For example, if the rules were set in the work procedure manual but the work procedure deviated from those rules, this can be considered a work management problem. In this case, provide education to

ensure that the work procedure manual is respected. If the work indicated in the work procedures contains risks, the work procedures are to be reviewed.

2.5 Process control

Figure 2-6 summarizes the role of the foreman in process control. There are four roles of the foreman: creating process plans, sharing process plans, monitoring process plans, and updating process plans.

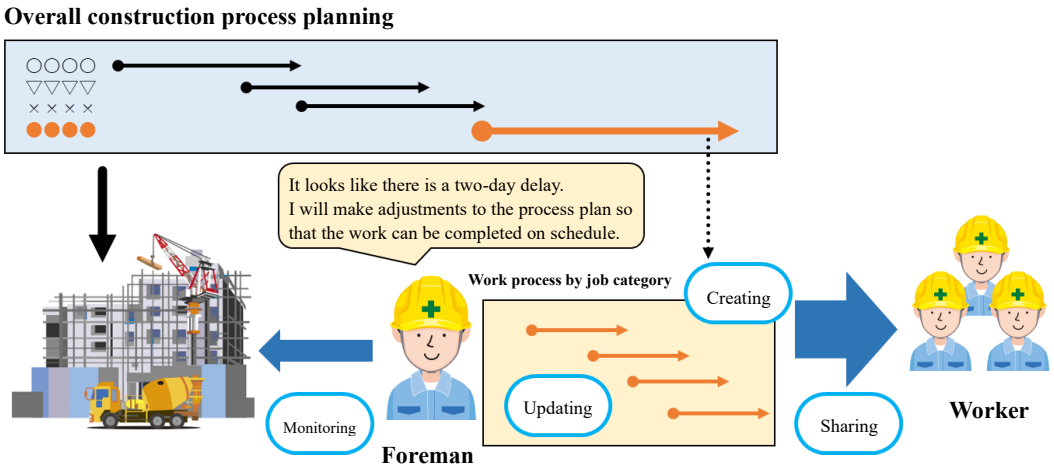

Figure 2-6 Role of the foreman in process control

2.5.1 Creating the process plan

The foreman creates a process plan for the work process for his or her job category based on the overall construction process plan. There are two methods for determining the number of days needed for a process: the “forward calculation” and the “reverse calculation.” The forward calculation

method adds up the number of days required for each task. The reverse calculation method starts from the completion date of construction and follows the processes in reverse order so as to determine the number of days necessary.

Process charts for managing work include Gantt charts, bar charts, graphical process charts, and networked process charts, each with its own advantages and disadvantages. It is desirable for a process chart to indicate the work procedure, number of days required for the work, degree of work progress, and work affecting the construction timeline. The following is an example of a networked process chart that can indicate these four items.

Figure 2-7 shows four work processes from A to D as a networked process chart.
The "◯" mark is called an "event" and the number of days for the task is indicated by an arrow.

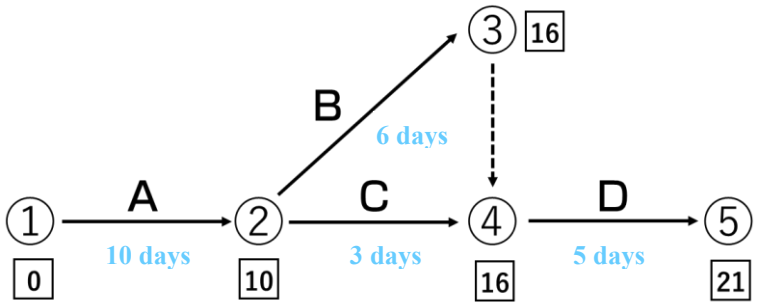

Figure 2-7 Example of a networked process chart

The number of days under the arrows indicates the number of days required for each task. For example, Work A, if started at ①, takes 10 days to complete, and then the next event at ② begins. From event ②, both Work B and Work C proceed simultaneously.

The number in the square below the event indicates the number of days required from the start of the work at ① until the event can begin. The event for completing the work is ⑤, which means that 21 days are needed to reach this event.

From the networked process chart, it is possible to decipher which work cannot have any delays and which work can be delayed up to a certain number of days without affecting the construction

timeline of the overall project. The dotted arrow from ③ to ④ means that event ④ cannot begin until event ③ is completed. The number of days for Work B is six days and for C is three days. Thus, it can be interpreted that Work C can take three extra days. On the other hand, delays in Work A, Work B, and Work D all affect the construction timeline.

2.5.2 Sharing the process plan

The foreman shares with all workers the overall construction process plan and progress, as well as the process plan for his or her job category. At this time, a networked process chart such as Figure 2-7 can be used to show the work for which delays will be difficult to recover.

2.5.3 Updating the process plan

The initial process plan should be reviewed and updated depending on the overall progress of the construction project and delays in certain work. When reviewing the plan, consider measures to ensure that the overall work completion schedule is not affected. For example, in Figure 2-8, if Work B is likely to be delayed, duration of Work C, which has three days to spare, could be changed from three to four days, and some personnel assigned to Work C could be reassigned to fortify the personnel for Work B.

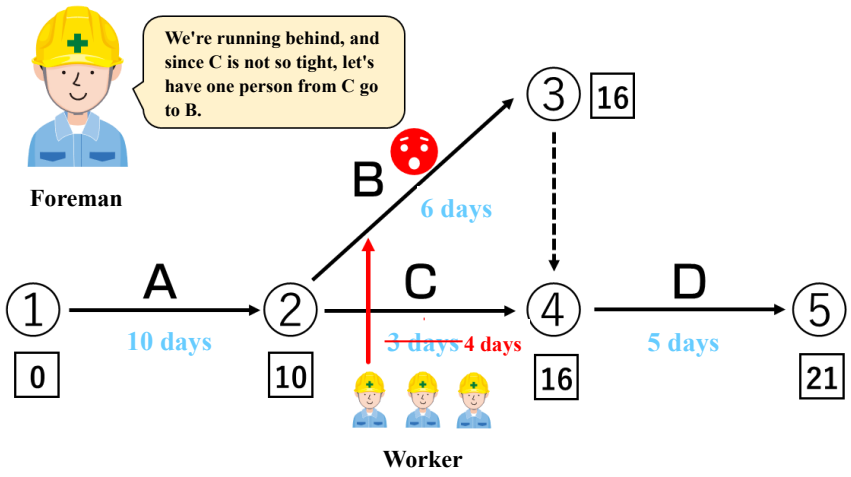

Figure 2-8 Example of updating the process chart

2.5.4 Monitoring the process plan and risk management

The foreman should always know the latest status of the process plan for the entire construction project, not just the process plan for his or her own job category. Since delays in other categories may affect the start of your own work, meetings are held among the foremen, and process plans are updated if necessary. In addition, delays in the delivery of necessary machinery and materials to the site affect the construction timeline, so this should also be written into the process chart.

Even a well-thought-out process plan may not go as planned due to weather and other factors. When implementing a process, it is desirable to try to completed it slightly earlier than the planned number of days, and it is important to intensively monitor the progress of Work A, Work B, and Work D in Figure 2-7, where delays are not acceptable.

When planning the processes, make sure to consider work that could be carried out simultaneously by proper allocation of personnel.

2.6 Cost control

2.6.1 Matters that impact costs

Construction costs in the construction industry refer to the direct costs incurred from the start of construction to its completion, and can be divided into four categories, as shown in Figure 2-9.

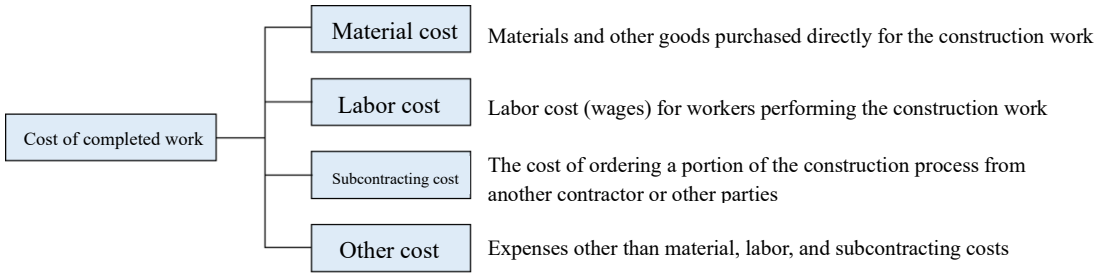

Figure 2-9 Construction costs in the construction industry

The foreman is not only expected to manage the site so as not to exceed the planned cost, but also to constantly deliberate and suggest ways to reduce costs.

Possible causes of exceeding planned costs are inefficiency issues including waiting times, redo,

mistakes, and rework. Overburdening and inconsistencies can also lead to inefficiencies.

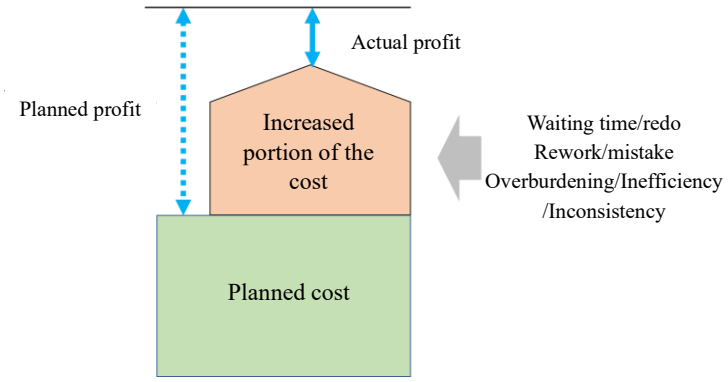

Figure 2-10 Causes of exceeding the planned cost

2.6.2 Preparation of a daily work report

A daily work report is a document that records the work performed, progress made, labor hours, materials and equipment used, and problems or troubles encountered at the site on that day. Daily work reports are prepared daily by the foreman or the workers and are used to track work and progress at the worksite.

In addition to monitoring work and progress, daily work reports are also used for quality control, safety control, material management, and labor management.

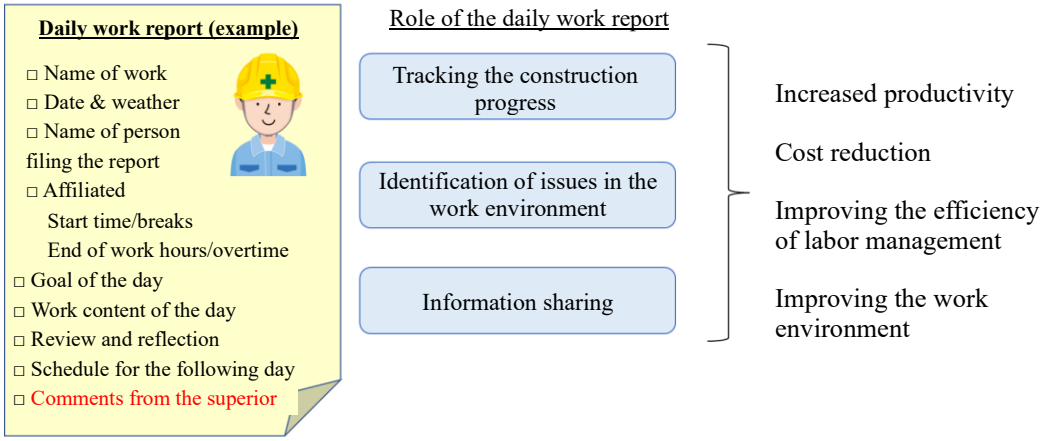

Figure 2-11 Example of the role and entries in the daily work report

Analyzing daily work reports can improve productivity, which can reduce costs. A large portion of

the cost is labor cost (man-days). By understanding how each worker works based on the daily work report, it is possible to optimize staffing and reduce labor costs. In addition, writing down the review and reflection of the day's work can also reduce costs because it makes the worker realize waste and errors in the work, leading to improvements the next time around.

The role of the foreman is important in order to gain a variety of benefits through the daily work report. You can make the daily reports more useful by entering your comments as a foreman in the daily report.

2.7 Quality control

The JIS standards define “quality” as the “totality of own characteristics or performances which are assessed to determine whether or not a product or service satisfies the purposes of its use.” It is the customer who uses the product or service. So, “good quality” refers not only to the “quality” or “workmanship” or “performance” of a product, but also to the state of having the functions and performance that the customer expects.

In construction, “quality control” refers to the management of quality to meet the design documents. Each process is checked to ensure that quality is met, and a construction record is kept using photographs and other evidence. Only after the quality of one process is confirmed does the work proceed to the next process.

2.7.1 Understanding design and specifications

In the construction field, “design documents” is a generic term for drawings (architectural drawings, structural drawings, equipment drawings, external structure drawings, etc.), specifications, bill of quantities, and technical data necessary for designing a structure. The design documents clearly show the shape, function, and performance of the finished product as envisioned by the designer. By adhering to the design documents during construction, it is possible to achieve the quality of finished products required by our customers.

Before on-site construction begins, a construction plan and construction drawings are prepared

based on the design documents, and process organization, fit of detailed points, etc. of the construction work are studied. It is important to ensure that the design and specifications are clearly understood, because if construction begins with unaddressed uncertainties in the design documents, redo, rework, and other inefficiencies may occur. Communication is important, such as receiving explanations from the client and the designer, in order to properly understand the purpose of the finished product and the designer's ideas.

Construction drawings are drawings created from design documents for on-site construction. The foreman manages the construction process of each worker based on a proper understanding of the construction drawings and the construction plan.

2.7.2 Instructions for appropriate construction methods

Particular specifications in the design documents provide specific details of the construction work and construction methods, including which materials are to be used and how to construct the product.

Construction methods are specified not just for the purpose of achieving the desired quality. Specific construction methods may be specified for reasons related to construction timelines and efficiency in mind, or to ensure safe work practices. The foreman must understand the intentions behind the specifications and instruct the workers on the proper construction method.

2.7.3 Confirmation of work quality

Inspections at the end of each construction process are generally performed by a construction supervisor who acts as an agent of the client. In addition, interim and completion inspections related to payments are performed by the client. Daily quality checks are important at the construction site because failure of quality inspections by the construction supervisor or client can lead to redo and rework. It is important for the foreman to constantly check the construction drawings and specifications while observing the workers when they work and confirming the workmanship.

At the end of a process, construction photos are taken as part of the construction records. Construction photos not only serve as evidence that appropriate materials are used and that the work

is proceeding properly according to the construction plan, but also provide documentation that helps to pinpoint the cause should any problems occur. Photographing is essential, especially to check areas that will not be visible after completion.

Since construction photos cannot be taken randomly, a photography plan should be included in the process control. The key points of photographing are as follows.

□ Choose a composition that explains 5W1H.

- Who: Contractors and witnesses
- When: Construction period
- Where: Construction location
- What: Construction name or construction type
- Why: Purpose of construction
- How: Construction method

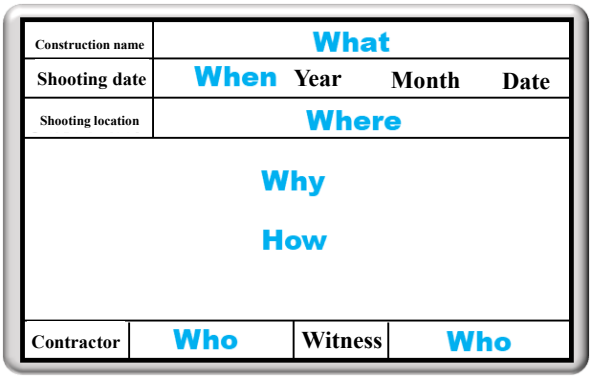

Figure 2-12 Example of a construction photography board

□ Photograph in a way that contents of the blackboard is legible

□ Try not to include anything other than what is intended in the photo

Photographing means nothing if the construction photos are lost or not easily locatable when they are later needed. It is important to manage them using Excel, apps, business performance software, etc.

Photo 2-1 Example of a construction photo

2.7.4 Training of workers

Quality at a construction site depends largely on the management competence of the foreman and the technical prowess of the individual workers. It is the workers on-site who actualize the intended quality laid out in the design documents. As a foreman, you need to give each worker a job or

provide guidance in a sequence that allow them to become skilled technicians as quickly as possible.

When teaching the individual skills necessary for construction, simply teaching the workers how to do it is not enough; it is important to have them think about why it is better to work that way. In the world of craftsmanship, there is an educating method known as watch-and-learn, and it is sometimes said that “it takes 10 years to become a skilled craftsman.” One of the reasons behind the watch-and-learn method is that skilled craftspeople are often unable to communicate their skills in words that are easy to understand.

In today's construction sites, performance and quality are simultaneously required. Foremen and experienced workers are expected to be able to explain work tricks and give pointers to less experienced workers in an easy-to-understand manner.

2.7.5 Approach to quality problem solving

The problem of defective construction quality must be addressed to prevent recurrence. As a foreman, the following thought processes will help you solve quality problems.

(1) Fact-based thinking

When a quality defect occurs, the first step is to go to the real place to see the real goods and confirm the real facts. Real place, real goods, and real facts are collectively called the 3 Real Philosophy, and is one of the basic concepts in quality control. It is said that the more experienced the workers are, the more likely they are to neglect this 3 Real Philosophy. Avoid predicting the cause based on assumptions and experience. If the quality changed somewhere during the process, determining the point at which the change occurred can make it easier to pinpoint the cause.

(2) Principle/rules mindset

A “principle” is a law or theory that explains why things are the way they are. A “rule” is a word that describes how most things will be, with possible exceptions. Adding these two to the 3 Real Philosophy becomes the 5 Real Philosophy. The data obtained from the 3 Real Philosophy will be compared with principles and rules as follows.

- Did something ever deviate from the principle?
- Did anything occur that did not follow the rules?

2.8 Environmental management

Structures impact the natural environment and the lives of the local residents in a variety of ways, not only during construction but also after completion. Before starting construction, it is necessary to conduct a thorough investigation and take various measures to prevent problems from occurring. As foremen, it is important to understand how the work we are involved in affects the natural environment and the surrounding environment, and to be proactive about measures we ourselves can take.

2.8.1 Natural environment

(1) Impact of construction on the natural environment

Construction can affect water, air, soil, ground, etc. Here are three specific examples.

- Increased heat island effect

The heat island effect is a phenomenon caused by urbanization in which temperatures in a city rise above the surrounding temperatures. Possible causes include increased presence of concrete and asphalt, a lower sky view factor (the percentage of the sky visible from below) due to the construction of high-rise buildings, and increased artificial heat emissions from air conditioners, cars, and other sources. Concrete and asphalt store heat from the sun and release it at night, creating a phenomenon known as sweltering nights. Lower sky view factor increases heat buildup. Effective countermeasures include water-retaining pavement, use of heat-reflecting paints, and greening of building walls and rooftops.

- Destruction of ecosystems

The construction of buildings can destroy the natural environment in the area. For example, a road crossing a wooded area impedes the movement of small animals. A possible solution to this problem would be to build an underpass under the road for small animals to travel on. There have also been cases where materials used for slopes contained non-native species, causing the extinction of native species. For river and coastal construction, we investigate the ecosystem core areas and deliberate on structure design and construction methods that do not affect those areas.

- Land subsidence

Digging deep holes or pumping up a lot of groundwater for construction can cause subsidence in the surrounding area, which can cause homes and structures to tilt.

(2) Mitigating the impacts on the environment

Mitigation is the process of reducing the impact of construction on the surrounding environment. For example, dam construction has a wide-ranging impact on the ecosystem, so time must be taken to survey the ecosystem and consider mitigation. Consideration proceeds in the order of avoid, minimize, rectify, reduce, and compensate.

- Avoid

Avoid environmental impacts by avoiding all or part of the construction project.

- Minimize

Minimize environmental impact by reducing the scale and extent of implementation.

- Rectify

Rectify environmental impacts by repairing, restoring or recovering the affected environment.

- Reduce

Reduce environmental impact by continuing protection and maintenance activities.

- Compensate

Compensate for the environmental impact by creating the environment to be lost in another place.

2.8.2 Surrounding environment

Before construction begins, you must carefully avoid problems with the local residents. Residents have anxiety not only during the construction period, but also after the structure is completed. Before construction begins, it is important to conduct a thorough survey and listen to what the local residents have to say. In general, a construction briefing is held for the local residents.

(1) Impact of the constructed structure and construction work on the local residents

The surrounding environment can be impacted not only during construction, but also after the structure is completed. For example, there are issues such as sunlight blocking, poorer ventilation, and radio disturbance. Here are three typical examples, focusing on the impact of construction.

- Noise and vibration

Construction work may generate noise. Especially in the case of constructing large structures or factories, mechanical noise and truck traffic may continue to affect residents' lives after completion.

- Increased traffic

During a construction project, various types of construction vehicles pass through the area, increasing the possibility of traffic accidents. In addition, depending on the intended use of the constructed structure, it may increase traffic in the vicinity and affect the lives of residents.

- Disaster prevention measures

Construction may alter the surrounding land and the flow of waterways. Another important issue for residents is how the structure will withstand disasters such as earthquakes and floods.

(2) Visualization of construction work to the local residents

Generally, the construction site is not visible from the outside during construction. There are examples where “visualization” of some information has been successful in allaying the fears of the local residents.

- Visualization of vibration and noise

Display numerical indicators of noise and vibration. In addition to informing the public of the actual numerical level at which construction work is being done, disclosing the numerical values helps people understand that the construction work underway is taking noise and vibration into consideration.

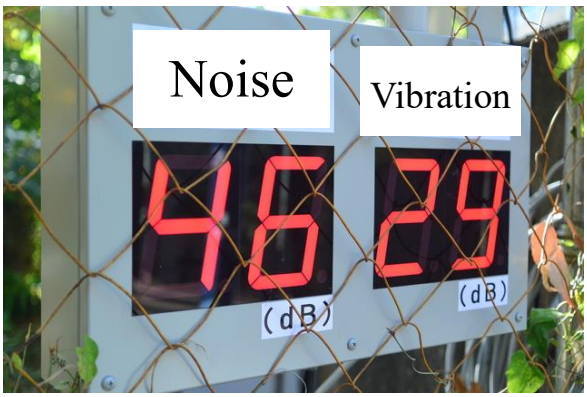

Photo 2-2 Example of a noise and vibration level indication

- Informing of the construction work using QR codes

Make information and photos of the construction status available via QR codes, and display the QR codes and instructions on the pedestrian walkway.

- Easy-to-understand displays, even for children

Display the status of noise, vibration, odor, dust, vehicle traffic, etc. in a way that is easy for even children to understand.

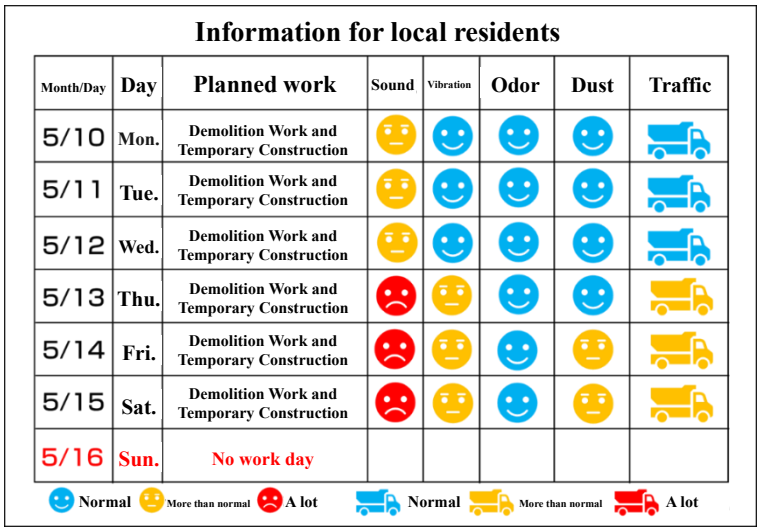

Figure 2-13 Example of a display for local residents

(3) Making greetings mandatory

Regardless of the size of the construction project, do not neglect to greet the local residents. In large-scale construction projects, greetings are given at construction briefing sessions, etc. However, in small-scale construction projects such as renovation work or repair work on condominiums, make sure that all workers always greet the residents. Greetings like “good morning” and “we regret the inconvenience we are causing” can curb potentially tense situations with residents. Also, be sure to wear clean working outfits. A pleasant greeting can improve a company's image.

2.8.3 Work environment

The environment in which workers work directly influences safety and quality. Efforts to create attractive workplaces are continually made to reform the way people work. Officially named the Bill on the Arrangement of Related Acts to Promote Work Style Reform, it went into effect as of April 1, 2019. This reform came about because long working hours have become the norm in the construction industry due to the shortage of human resources caused by the aging of the workforce and declining number of workers. The Ministry of Land, Infrastructure, Transport and Tourism has

established the following policies to solve this problem.

- Set appropriate construction timelines

- Ensure wage levels

- Promote five-day workweeks

- Train and secure technological experts and technicians

While it is difficult to implement these four policies in a short period of time, there are some things that a foreman can do. For example, improving the accuracy of the daily report can help to accumulate data to be used in determining the construction timeline of the subsequent projects that is more appropriate. This data can also improve the accuracy of cost accounting, thus improving company profits and helping to ensure wage levels.

Seeing an appropriate construction timeline is the basic requirement for achieving a five-day workweek, but this is not an easy issue to resolve since adjustments must be made according to the client's desired delivery date. So, it may be wise to also consider whether the introduction of methods that can speed up the construction timeline, such as construction ICT (Information and Communication Technology).

In the construction industry, if workers are granted at least 10 days of annual paid leave, their employer is required to make them take five days of paid leave per year. One reason that paid leaves are not taken is that workers feel like they should not ask for paid leaves. As a foreman, it is important not to create an atmosphere where workers feel like they should not mention it.

The training of technological experts and technicians is an area where the foreman can demonstrate his or her abilities, as discussed in various places in the other section. It is important not to think of the four policies as something the company should do, but to be willing to explore what you can do in your capacity as a foreman running the worksite.

2.9 Occupational safety and health management

Safety and health activities can be divided into two main categories: safety management and health management. Depending on the size of the project, the contractor appoints a General Safety and Health Supervisor. The General Safety and Health Supervisor manages occupational safety and

health at the worksite by supervising the safety manager and the health manager. Since the foreman is often also the safety manager and health manager, the Ministry of Health, Labour and Welfare (MHLW) has indicated in a notice that this training should be conducted as “Training for Foremen and Safety and Health Managers (14 hours).”

Safety management to protect workers from workplace accidents and incidents is dealt with in detail in Chapter 3, and in this section, occupational safety and health management is explained.

2.9.1 Purpose and effectiveness of occupational safety and health management

The purpose of occupational safety and health management is to protect workers' health and provide a comfortable work environment. When contractors actively engage in safety and health management, the following effects can be expected.

□ Provision of a sense of security in working at the workplace

□ Increased motivation

□ By enabling each individual to work with a sense of assurance, overburdening, inconsistency, and inefficiency in work are reduced, operations are improved, leading to increased productivity

□ Companies certified by the Ministry of Health, Labour and Welfare as “Enterprises Committed to Excellent Occupational Safety and Health Practices” can expect to improve their social image and increase the number of job seekers

2.9.2 The “3 Management” concept

The purpose of safety and health management is to protect the health of workers. It is easy to assume that health management is the highest priority among the three, but it is important to first address the causes of health problems. So, when considering the 3 Management, do so in the order of work environment management, work management, and health management.

2.9.3 Work environment management

Construction sites have a variety of factors that can affect worker health. Work environment management is the process of creating a comfortable work environment by removing or improving

harmful factors.

(1) Measures to address factors affecting health

Factors affecting worker health may include those shown in Figure 2-14.

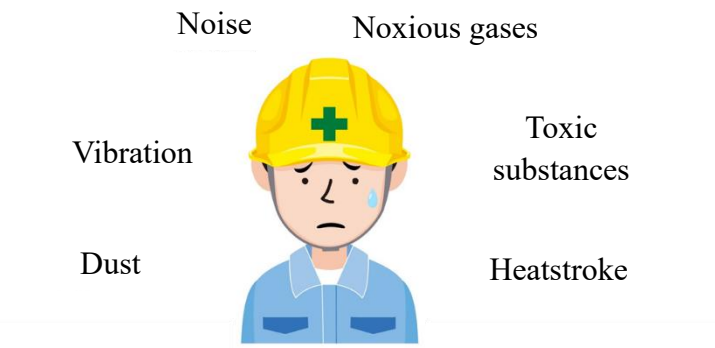

Figure 2-14 Harmful factors at construction sites

If there are harmful factors in the work environment, they must either be removed or reduced to under a certain limit. If this is difficult to achieve, workers are to be required to wear protective equipment and protective clothing. To determine the measures to be taken, it is necessary to know the extent to which hazardous materials or substances are present in the work environment. So, the work environment is measured using special measuring instruments. The Ministry of Health, Labour and Welfare (MHLW) specifies and publishes work places where the work environment measurements should be taken and the types of measurements to be taken. The types of measurements specified are as follows. Learn them so you are aware of the types of hazardous factors at the worksite.

□ Concentration of airborne dust and the quantity of free silica in the dust

□ Temperature, humidity, radiant heat

□ Equivalent noise level

□ Carbon monoxide and carbon dioxide concentration

□ Temperature

□ Airflow rate

□ Indoor and outdoor temperature, relative humidity

□ Dose equivalent rate from external radiation

□ Concentration of airborne radioactive materials

□ Concentration of airborne specified chemical substances (Class 1 or 2 substances)

□ Concentration of airborne special organic solvents and organic solvents

□ Concentration of airborne asbestos

□ Concentration of airborne lead

□ In the case of Class 1 oxygen deficient danger operations, the concentration of oxygen in the air

□ In the case of Class 2 oxygen deficient danger operations, the concentration of oxygen and hydrogen sulfide in the air

□ Concentration of the relevant organic solvent

(2) Improvement and maintenance of the work environment

Various efforts are made to make the workplace pleasant for the workers. The following are specific examples.

- Improving comfort in on-site offices, break rooms, and dormitories

Providing air conditioning, shower rooms, and clothes dryers in changing rooms; laying down tatami mats and carpeting and allowing no entry with shoes to ensure a clean environment; providing refrigerators, water servers, and electric kettles; providing air showers; creating break and smoking areas; offering gargling solutions, disinfectants, and masks; etc.

- Improving the restroom situation

Installing women's restrooms, installing pour-flush latrines, making portable toilets flushable, installing warm-water electric bidet seats, installing mobile, vehicle-mounted portable toilets, etc.

- Providing women-only rooms

Providing women-only rooms with women's restrooms, washrooms, and lockers, installing makeup tables, etc.

(3) Heat stroke prevention

Heat stroke prevention is especially important at construction sites because workers work in locations exposed to direct sunlight or in enclosed spaces. Heat stroke can cause dizziness and

fainting, which can lead to accidents. According to data compiled by the Ministry of Health, Labour, and Welfare, there were 916 cases of heat stroke from 2018 to 2022, the highest number among all industries, with 52 fatalities. The graph of the number of casualties by month also shows that heat stroke cases begin to increase from May onward, with a drastic increase in July and August, and then begin to decrease from October onward.

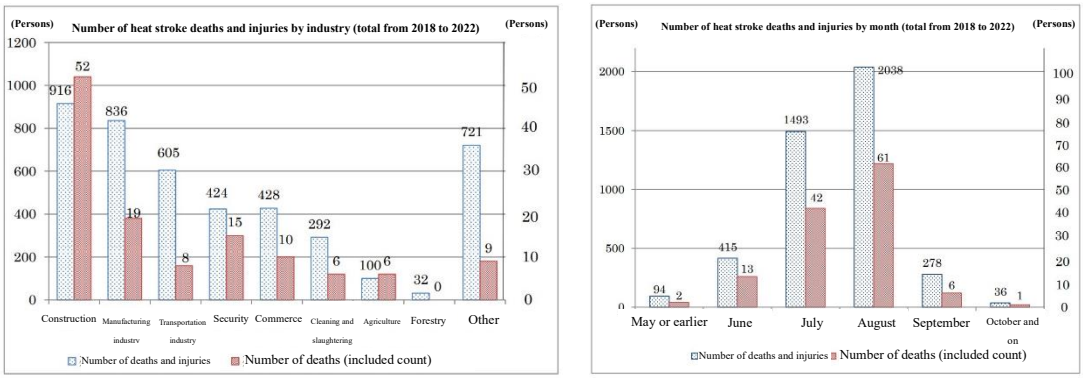

Figure 2-15 Data on heat stroke summarized by the Ministry of Health, Labour and Welfare

The following measures can be taken to prevent heat stroke.

- Use the weather information provided by the Japan Meteorological Agency

The Japan Meteorological Agency provides high temperature advisories, weather information related to high temperatures, and early warning information on abnormal weather conditions related to high temperatures, based on observed temperatures throughout Japan. The foreman should pay attention to this information and warn workers in morning meetings or other occasions when they are at risk of heat stroke.

- Measure and utilize the heat index (WBGT index) at the worksite

It is advisable to suspend work whenever possible when the heat index reaches 31 or higher. When the heat index falls between 28 and 31, the risk of heat stroke is increased, so instruct the workers to take breaks and increase their water and salt intake. The Ministry of Environment publishes daily heat index predictions for approximately 840 locations throughout Japan every three hours, so make sure to utilize this information as well.

- Install thermometers and hygrometers

In general, temperatures above 35 degrees Celsius is a level that poses health risks. Install thermometers and hygrometers at the worksite to make workers aware of hazardous conditions.

- Use of apps

Recently, heat stroke prevention apps have been developed that automatically send a warning e-mail to smartphones based on the heat index.

- Reduction of the heat index

Since the risk of heat stroke increases during hot, humid, and windless conditions, take measures to reduce the heat index such as installing shade nets, dry mist machines, large industrial fans, and air blowers, and using water sprinkler trucks to lower the temperature at the worksite.

- Provide break areas

Install air conditioning and shower rooms so that the workers can cool down appropriately during breaks. It is also important to always provide refrigerators, ice machines, and vending machines, and to make oral rehydration solutions and other liquids available. If the break area is far from the work site, consider placing a “break vehicle” with air conditioning and a refrigerator.

2.9.4 Work management

Work management is the process of removing harmful factors such as eliminating substances harmful to the environment and the human body and easing the physical load, and ensuring that work can be conducted properly. Specific methods and work procedures to protect workers from harmful factors in the work environment described in the previous section are determined, and workers are instructed to follow these methods and procedures. Specifically, these methods and procedures are to be included in the work procedure manual, and training should be provided to ensure understanding. The work procedure manual should be as specific as possible, as in the following example.

“To prevent back pain, alternate between sitting and standing work.”

“Wear gloves, supporters, etc., for tasks that could hurt the hands or fingers.”

The procedures contained in the work procedure manual should be reviewed periodically with consideration to opinions from workers.

2.9.5 Health management

Health management refers to activities to check the health conditions of workers through health check to detect abnormalities at an early stage and to prevent their progression or aggravation. In the event of health problems, treatment to restore the patient to his or her original state of health and improvement of the work environment will take place.

General health checkups, which companies are required to conduct on a regular basis, are conducted yearly with checkups being no more than a year apart, and special health checkups are conducted semiannually with checkups being no more than six months apart (tetra-alkyl lead checkups are conducted quarterly with checkups being no more than three months apart, and pneumoconiosis checkups are conducted once every one to three years).

While regular health checkups are important for health management, daily health management is also important because health conditions can change every day. The foreman, who spends the most time with the workers, is in the best position to notice changes in worker health. An effective way to identify health condition abnormalities of each worker is to have them self-check and declare their status during morning meetings.

Chapter 3 The Role of the Foreman in Safety and Health Activities

3.1 What are safety and health activities?

Safety and health activities are initiatives implemented to ensure the safety and health of construction workers. Construction sites are home to many dangerous tasks such as working at heights and operating heavy machinery. Workers also handle chemicals that are harmful to the human body from time to time, so appropriate safety and health measures must be taken. Safety and health activities typically include the following.

(1) Raising awareness among workers

For safety and health activities to be effective, everyone involved must have an awareness of the importance of safety and health. It is also necessary to show motivation through lectures given by the president and management at safety meetings. As a foreman, it is also effective to talk about close calls that you have experienced yourself.

-> Close calls are explained in detail in “3.5.3 Close call prevention activities.”

(2) Listening to the workers

To improve the work environment, it is important to have workers present what they have noticed and what they want to improve, and to be willing to listen to them attentively. For workers who have difficulty speaking in front of many people, other appropriate measures should be taken, such as interviewing them individually. It is also effective to conduct anonymous surveys.

(3) Providing safety and health education

It is important to educate and train workers on the potential hazards of their work and the proper safety measures to ensure that they have the knowledge and skills to perform work in a safe manner. To ensure that the results of the training can be implemented as safety and health activities, keep the following points in mind.

□ Teach from the learner's perspective, considering the learner's level and experience

□ Teach specifics

(e.g. Hold the box carefully -> Hold the box at the bottom with both hands, and squat to hold)

□ Communicate why they should (or should not) do something

□ Consider the order in which you speak so that it is easier for the learner to accept and understand

(e.g., from easy to difficult content, from overall to individual content, etc.)

□ Utilize external educational institutions

(4) Maintaining a clean work environment by continuing 5S activities

-> This will be explained in detail in "3.5.1 5S activities."

(5) Preparing a work procedure manual

Prepare a work procedure manual that outlines the work to be performed and the procedures to be followed. The work procedure manual can be used not only during work, but also during training. The manual should include the following information, including details for safe work practices.

□ Work name

□ Work procedure

□ Equipment and tools to be used

□ Components and materials to be used

□ Protective equipment to be used

□ Accidents and incidents that may occur in connection with the work

□ Measures to prevent accidents and incidents

Key points for an easy-to-understand manual

□ One procedure per item

□ Keep it short and concise

□ Include any tips or tricks

□ Provide precaution for any probably hazards

□ Explain why the work must be done

(6) Conducting safety patrols to check for unsafe behavior

(e.g., Scattered tools -> 5S is not thoroughly implemented

(7) Reporting what you notice

Any close call reports or suggestions for improvement raised by workers are reported to the superiors.

(8) Identifying and eliminating potential sources of danger at the worksite through hazard prediction (KY) activities

-> This will be explained in detail in “3.5.2 Hazard prediction (KY) activities.”

(9) Conducting a risk assessment

-> This will be explained in detail in “3.4 Risk assessment.”

(10) Maintaining the health of workers

-> This is explained in detail in “2.9 Occupational safety and health management ”

3.2 Industrial Safety and Health Act

3.2.1 What is the Industrial Safety and Health Act?

The Industrial Safety and Health Act is a Japanese law that aims to protect the safety and health of workers. The purpose of the Act is to minimize the various hazards workers face in the workplace and to achieve a healthy working environment by establishing rules to prevent work-related accidents, clarifying responsibilities and promoting voluntary actions.

Under this law, employers are responsible for the safety and health of their workers. For example, employers are required to have industrial physicians and public health doctors onboard for projects exceeding a certain size, as well as to report, investigate, and compensate for work-related accidents. Knowing what is required by the Industrial Safety and Health Act will give you, as a foreman, a perspective on what you should report to your company and your superior, as well as an eye for suggestions for improvement. The main stipulations in the Industrial Safety and Health Act are as follows.

□ Provide safety education for workers

□ Maintain workers' health

□ Create a comfortable work environment

□ List of hazardous or noxious substances for which the employer should take measures

□ Risk assessment

□ Organization and staff

□ Responsibilities of the prime contractor

□ Responsibilities of the client

□ Designation of work that cannot be performed without qualifications

On the other hand, workers are expected to follow instructions and use the necessary protective equipment to protect their own safety and health. In addition, if a worker discovers a hazardous situation, he or she is required to promptly report it to the employer.

Cooperation between workers and employers is essential to ensure workers' safety and health. To this end, the law mentions the establishment of Safety and Health Committees to ensure that workers and employers cooperate to protect workers' safety and health. In the construction industry, it is mandatory to establish a safety and health committee when the number of workers at a business site is 50 or more.

3.2.2 Key points regarding the amendments of the Industrial Safety and Health Act

The Industrial Safety and Health Act was enacted in 1972. As times change, workers' work styles have diversified, and new technologies have been introduced to construction methods at construction sites. With such changes, the scope of safety considerations has also expanded.

For example, before this law was enacted, Japan was in the midst of a rapid economic growth, which resulted in the manufacturing industry to implement unfamiliar new machines one after another to increase production capacity, and working methods underwent changes. As a result, by around 1965, the number of deaths due to work-related accidents exceeded 6,000 each year, and the

harsh working environment also became a social problem. The Industrial Safety and Health Act was enacted in order to remedy this situation, and in the 10 years since its enactment, it has reduced the number of work-related accidents to less than half.

Amendments to the Industrial Safety and Health Act are made to address new issues that have arisen or may arise. Examples include strengthening measures against deaths from overwork, preventing health hazards caused by dust, and strengthening measures against sexual harassment.

In some cases, the amendment may also create a new system, so foremen must pay attention to the amendments of the Industrial Safety and Health Act and consider whether any of the changes applies to their worksites.

As an example, here are some of the additions made by the 2023 amendment.

(1) Assessing the working hours

(Article 66-8-3 of the amended Industrial Safety and Health Act / Article 52-7-3 of the amended Ordinance on Industrial Safety and Health)

The assessing of the working hours has been changed from a guideline to law, requiring assessing the working hours of workers by objective methods. Records of working hours must be kept for three years. Objective methods include the following.

- Time card records
- Record of login and logout times of computers, etc.

The latter, in particular, can be seen as a measure in response to the changing work styles that have led to an increase in remote work.

(2) Changing requirements for face-to-face guidance by physicians for those who work long hours

Employers must provide face to face-to-face guidance by a physician to workers who have accumulated fatigue due to long hours of work. Previously, it was stipulated that employees should receive face-to-face guidance “when the number of hours of off-hours work and work on days off exceeds 100 hours in a month, the accumulation of fatigue is recognizable, and when a request is made by the worker,” but the amendment changed the number of hours of off-hours work and work on days off requirement from exceeding 100 hours to 80 hours. This change is based on medical

findings that the number of incidences of cerebrovascular and ischemic cardiac disease is highly associated with long working hours.

3.3 Accidents in the construction industry and prevention measures

3.3.1 Accidents in the construction industry

In the field of occupational safety, the terms “incident” and “accident” are used in different ways, as follows.

- Incident

An event in which factors (machinery, equipment, or human behavior) deviate from the standard and cause actual damage (loss) (in the narrower sense, this excludes “accidents”)

- Accident

An incident that causes bodily harm to humans

A variety of work-related accidents occur at construction sites.

□ Fall from heights □ Slipping/tripping/falling/tipping over □ Crashing □ Flying/falling □ Crumbling/collapsing

□ Struck-by □ Caught-In/Between/Entanglement □ Being cut/scraped □ Stepping through

□ Drowning □ Contact with hot or cold objects □ Exposure to hazardous substances □ Electric shock □ Explosion □ Rupture □ Fire □ Traffic accident (road) □ Traffic accident (other) □ Movement kickback/forced movement □ Other

For an explanation of each, please refer to Chapter 7 of the Textbook for the Specified Skills Evaluation Exam (i) in the Civil engineering, Building and Lifeline infrastructure and equipment categories.

3.3.2 Causes of work-related accidents

Figure 3-1 illustrates the basic model of how work-related accidents occur. “Unsafe and unhealthy situation” refers to material things (environment, equipment, etc.) and “unsafe behavior” refers to

human behavior. Unsafe behavior may be caused by the mentality of “it’ll be fine” or by some unconscious actions.

When analyzing the causes of work-related accidents involving four or more days of absence from work, it is known that about 90% of such work-related accidents have an overlap of “an unsafe situation that caused an accident” and “unsafe behavior that caused an accident.”

For example, a person walking absently in an office corridor will not cause a major accident, but walking absently in an office under construction with unfinished floors increases the likelihood of a “fall from heights”-type work-related accident.

It is true that an unsafe situation alone, or an unsafe behavior alone, can cause work-related accidents, but they account for only a few percent of the accidents. In other words, if we can eliminate one, either unsafe situation or unsafe behavior, we can reduce the occurrence of most work-related accidents.

Safety management is necessary to eliminate unsafe situations and unsafe behavior. The role of the foreman, who is in a position to manage safety at the worksite, is very important, because it can be said that flaws in safety management can lead to work-related accidents.

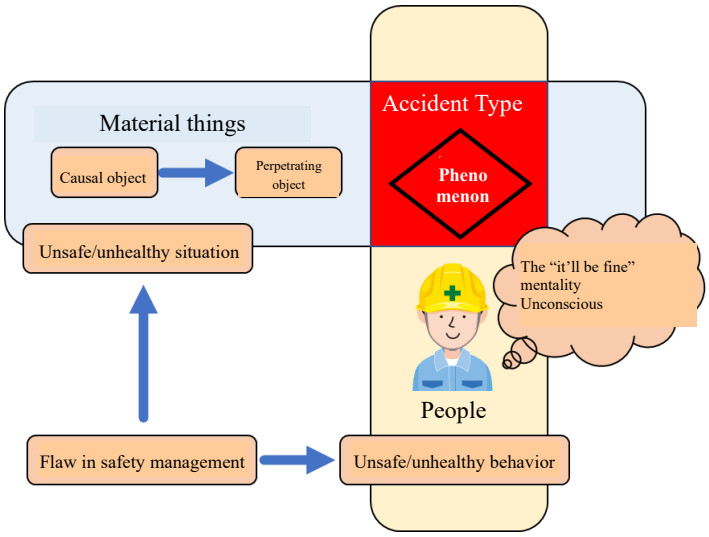

Figure 3-1 Basic model of how work-related accidents occur

3.3.3 Intrinsic safety and blocking off

The unsafe status of material things and people cannot be reduced to zero. Take civil engineering work, for example. The land at the start of a construction project has many unstable places. There are also limits to a person's attention span. The concepts of “intrinsic safety” and “blocking off” are used to address these risks.

“Intrinsic safety” means avoiding hazardous conditions. For example, if a car is dangerous, then not getting in the car is intrinsic safety. In reality, however, there are times when a car must be used. In such cases, we consider ways to reduce the degree of danger. This concept is called “functional safety.” Cars incorporate a variety of functional safety mechanisms, such as devices that control the inter-vehicular distance, brakes that mitigate damage from collisions, and acceleration control devices when the wrong pedal is depressed.

The same is true at the worksite; if a task is deemed to be potentially hazardous, the intrinsic safety option is to not perform that task. However, if such work must be performed, measures to reduce the hazards should be considered.

“Blocking off” is one functional safety method. Blocking off means making the object unapproachable. For example, when heavy machinery or cranes are in operation, accidents can occur by people coming into contact with them, etc. In this case, incidents due to contact will not occur if the operating area of machine at work is blocked off by installing do-not-enter fences or by assigning flaggers so that people cannot approach the area.

A machine with bare rotating belts can cause entanglement. In this case, if the area where the machine is located is blocked off so that people cannot approach it, no accident can be caused by the belt. Alternatively, installing a cover over the rotating belt will also block off the hazard.

If a high-voltage power line is nearby during construction work using cranes, the crane could receive an electric shock even when it is just close to the line without touching it. To prevent such electric shock accidents, measures should be taken such as providing protective facilities and installing warning signs to prevent entry within the clearance distance.

3.3.4 Thorough use of protective equipment

Working at heights can be a potential fall-from-heights hazard. Eliminating work at height is intrinsically safe, but in many cases, it is not possible to eliminate the work itself. So, we consider functional safety.

For example, one method is to use an aerial work platform that can provide a stable working platform. If an aerial work platform cannot be used, a horizontal safety net is stretched over the work area to prevent falls. The use of full-harness fall protection gear is another functional safety method.

Protective equipment includes safety glasses, protective masks, gloves, and welding helmets. When workers are to engage in work where these protective equipment are effective, make sure that they always use them, ensure that they are used, even if the work is only for a short time.

3.4 Risk assessment

As a foreman, knowing the risk assessment methodology will enable you to accurately prioritize the measures to be taken against risks. Content related to risk assessment should also be included in the work procedure manual.

3.4.1 What is risk assessment?

(1) What is risk assessment?

Risk assessment is a method for evaluating the likelihood that a particular risk will occur in a given situation and the potential impact of that risk. Since April 1, 2006, it has become an obligation to make the best efforts for implementation as provided by Article 28-2 of the Industrial Safety and Health Act .

Until then, risk countermeasures consisted of investigating the causes of incidents and accidents that occurred and developing preventive measures to ensure that they do not recur. Risk assessment, on the other hand, is a proactive approach that identifies potential dangers and hazards at a worksite before an incident or accident occurs, and eliminates the risk or implements risk reduction measures by developing preventive measures in advance.

Assessment means to evaluate and analyze people and factors objectively. To ensure objectivity, the process may proceed with the assistance of outside experts.

(2) Basic risk assessment procedure

Figure 3-2 shows the basic procedures for risk assessment. Details are explained in the next section.

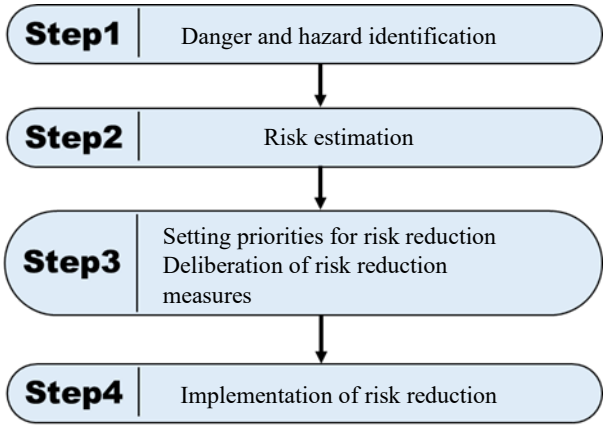

Figure 3-2 Basic risk assessment procedure

(3) Effectiveness of conducting risk assessment

In addition to clarifying risks in the workplace, conducting risk assessment can be expected to have the following effects.

□ Sharing of awareness of workplace risks throughout the workplace, including with managers.

As a general rule, risk assessment is led by the foreman and participated by everyone. By having workers on site participate and work together on the assessment, it is possible to create a common understanding of safety and health risks throughout the workplace.

□ Prioritization of safety measures in a reasonable manner.

All risks should be mitigated as quickly as possible, but there are cases in which addressing them

immediately is not possible. In such cases, risk can be prioritized based on the results of the risk estimate.

□ Clarification of the reasons for “rules to be followed” regarding the remaining risks.

Technological, time, and economic constraints may not allow appropriate risk reduction measures to be taken immediately. In such cases, workers must be given precautionary instructions. When all workers participate in the risk assessment, they are already aware of the reasons why they need to be careful, making it easier for them to follow the rules set forth.

□ Increasing of sensitivity to “safety” by full participation by the workplace.

3.4.2 Danger and hazard identification

Dangers and hazards are also collectively referred to as “hazards.” Danger and hazard identification refers to identifying objects or situations that may cause injury or illness to workers. Identifying dangers and hazards is the first step in the risk assessment and is the basis for subsequent risk evaluation and risk management. By developing countermeasures against identified dangers and hazards, risks can be minimized and a safer work environment can be achieved.

Specifically, the following points will be examined for dangers and hazards.

□ Work behavior

□ Work environment

□ Machinery, equipment, tools, devices, and other items operated or used by workers

□ Hazardous materials or chemicals that workers may touch or be in close proximity with

3.4.3 Risk estimation

To reduce various risks, it is necessary to consider priorities for implementation. “Risk estimation” is conducted to determine this priority. Risk estimation considers the elements of risk: severity of injury and likelihood of injury, together with frequency (how often it occurs). A common risk estimation method is to express risks numerically. Tables 3-1 through 3-3 are examples of numerically scoring frequency, likelihood, and severity.

- Frequency: Frequency is a term that describes how often and over what period of time a certain event occurs. “High frequency” means that it occurs frequently, while “low frequency” means that it rarely occurs. The risk estimation gives a score of how often the hazardous condition occurs.

Frequency	Score	Details
Occurs frequently	4 points	Approx. once a day
Occurs from time to time	2 points	Approx. once a week
Almost never	1 point	Approx. once every six months

Table 3-1: Example of score distribution for the frequency of hazard occurrence

- Likelihood: The likelihood of a hazardous condition that occurred turning into an accident is expressed as a score. (Table 3-2)

- Severity: The severity of the accident that occurred is expressed by a score. (Table 3-3)

Likelihood	Score
Definitely	6 points
Very likely	4 points
Possible	2 points
Rare	1 point

Severity	Score
Critical	6 points
Severe	4 points
Moderate	2 points
Mild	1 point

Table 3-2: Example of score distribution for likelihood of an accident occurring Table 3-3: Example of score distribution for severity of an accident

After scoring the frequency, likelihood, and severity of the risk, the “risk scores” are calculated by totaling each score. Finally, the “risk level” is evaluated based on risk scores. Table 3-4 shows examples of risk scores and risk levels.

Risk Level	Risk Score	Risk Details
IV	13-20	Seriously problematic
III	9-12	Problematic
II	6-8	Somewhat problematic
I	3-5	Not really problematic

Table 3-4 Examples of risk evaluation

3.4.4 Evaluation of risk estimation

The table below shows an example of an estimation for a given risk.

Risk estimation			Evaluation	
Frequency	Likelihood	Severity	Risk Score	Risk Level
2	6	6	14	IV

Table 3-5 Example of risk estimation

Viewing the table while referring to Tables 3-1 through 3-3 reveals that the estimation shows that this risk occurs approximately once a week, and when the risk does occur, it will definitely result in an accident, and that accident will be severe (serious). Since the risk score is 14, the risk level can be determined as “Seriously problematic.”

Based on this risk level, “how to proceed with risk reduction measures” will be discussed. The way to proceed with respect to risk levels should be determined, as in the following example.

Level IV: Immediately implement risk reduction measures. Suspend work until reduction measures are taken.

Level III: Promptly implement level reduction measures.

Level II: Systematically implement level reduction measures.

Level I: Take risk reduction measures as necessary.

3.4.5 Deliberation and implementation of risk reduction measures

Once the risk assessment determines the priority of the response, specific mitigation measures are considered and implemented according to that priority.

When considering risk reduction measures, it is also necessary to consider the possibility that the reduction measures can give rise to new risks. Even if the risk rarely occurs and, if it does, is unlikely turn into an accident, it is important to take interim measures rather than ignoring it if it could cause death or a serious illness.

After implementing risk reduction measures, the effectiveness of risk reduction should be maintained and improved through periodic evaluation and, if necessary, modification and improvement.

In considering and implementing the measures, we must make sure to implement what is legally required. Other risks will be considered in the priority order shown in Figure 3-3.

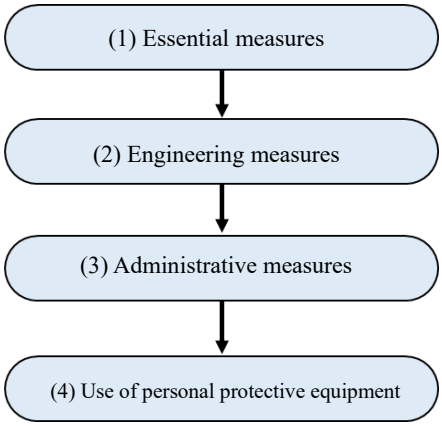

Figure 3-3 Priority of risk reduction measures to be considered

(1) Essential measures

Essential measures include eliminating the work itself so that hazardous work does not have to be performed, or changing the work procedure to a safer one. Dangerous or hazardous materials are replaced with safer ones.

(2) Engineering measures

Engineering measures refer to the implementation of physical measures such as the installation of protective fences around machinery and equipment and the use of work platforms.

(3) Administrative measures

Administrative measures include the development of work manuals, blocking off do-not-enter areas, and education and training.

(4) Use of personal protective equipment

Use of personal protective equipment is using protective equipment such as protective gloves.

3.5 Types of safety and health activities and the role of the foreman

3.5.1 5S activities

(1) What are 5S activities?

5S activities are one of the quality control methods that originated in Japan, and are designed to improve and increase performance in the workplace. 5S stands for five words starting with S: Seiri

(sort), Seiton (set in order), Seisou (shine), Seiketsu (standardize), and Shitsuke (sustain).

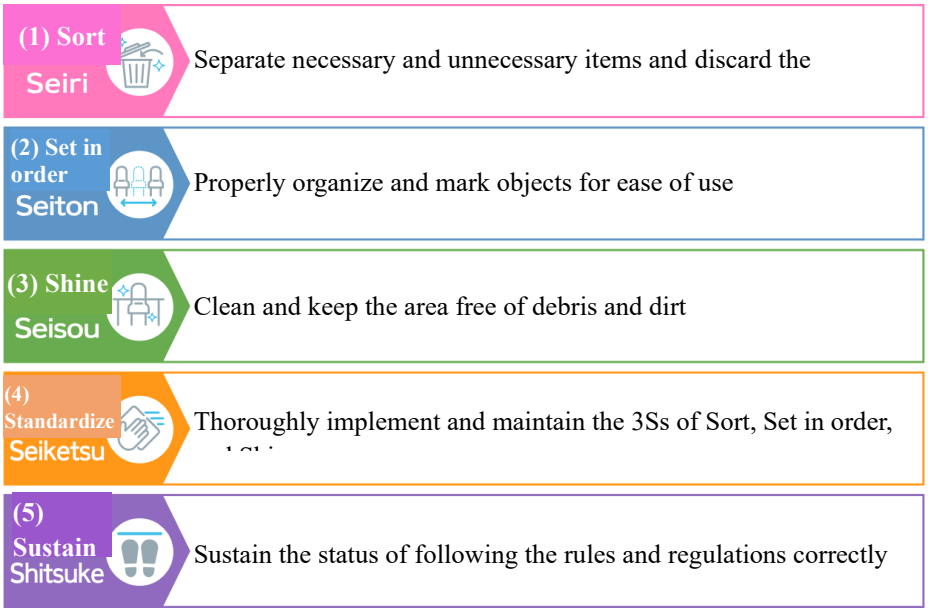

Figure 3-4 What are 5S activities?

(2) The aim of 5S activities

Our aim in conducting 5S activities as a company is to become a trusted company. As a company, we have three expectations from the worksite.

□ Improvement of autonomy of all employees (workers)

The “Sustain” of the 5S activities can be replaced with “Systemize.” As workers become able to engage in 5S activities on their own initiative, we expect it will help increase workers' autonomy.

□ Building good teamwork

We expect having all workers cooperate in 5S activities to build good teamwork.

□ Leadership development

We expect that by leading the promotion of 5S activities, the leadership skills of the foreman will improve.

(3) Purpose of 5S activities

The 5S activities are an effort to keep the worksite clean, but in Japan, this is also considered one of the methods of “quality management,” “safety management,” and “organization building.” The

objectives of 5S activities are shown in Figure 3-5.

Figure 3-5 Purpose of 5S activities

(4) 5S activities at construction sites

5S activities at construction sites include the following as efforts to improve safety and work efficiency.

- Sort (Seiri)

Items are sorted by keeping only the required number of necessary items and disposing of unnecessary items. On construction sites, this includes removal of unneeded materials, tools, construction debris, and trash.

- Set in order (Seiton)

The sorted items are set in order by arranging them in a way that makes them easy to find. On a construction site, materials and tools are arranged in appropriate locations, considering the work flow.

- Shine (Seisou)

The worksite is thoroughly cleaned until it shines to ensure cleanliness and safety. At construction sites, this includes cleaning up dirt and dust, and clearing away building material chips generated during construction.

- Standardize (Seiketsu)

To maintain an efficient work environment, sort, set in order and clean in order to always keep the workplace clean. On construction sites, this includes managing workers' safety equipment, such as safety shoes and helmets, and maintaining construction equipment and vehicles.

- Sustain (Shitsuke)

Rules and manners are determined for the continuous implementation of 5S, and employees are educated and monitored to ensure that they can behave in accordance with these rules and manners. On construction sites, this includes enforcing safety rules and construction site rules, as well as maintaining order and good manners on site.

(5) Role of the foreman in 5S activities

The role of the foreman is very important in 5S activities conducted on construction sites. The foreman is expected to promote worker awareness and productivity by taking the initiative in improving the work environment of his/her team, keeping it clean, organized and tidy, and raising safety awareness. Specifically, the foreman informs the workers on the necessity, methods, and rules of 5S activities, and enhances workers' commitment to 5S activities by conducting periodic checks and evaluations.

The foreman is also expected to contribute to improving site safety by pointing out hazardous areas and areas needing improvement at the site and cooperating with the workers to implement remedial measures.

As explained in (2), companies expect foremen to play a central role in promoting 5S activities, thereby improving their leadership skills. The foreman are sometimes responsible for planning the work for the workers, managing their progress, and controlling safety and quality on the worksite. As a foreman, improving your leadership skills will allow you to contribute to worker awareness and site improvements, and at the same time, will lead to you being expected to become deeply involved in the management and operation of the organization.

3.5.2 Hazard prediction (KY) activities

(1) Role of the foreman in hazard prediction (KY) activities

The role of the foreman is important in hazard prediction activities on construction sites. The

foreman conducts hazard prediction activities together with the workers to predict potential hazards that may occur at the site in advance and to propose improvements to reduce these hazards.

The foreman informs the workers on the need for, method of, and rules of hazard prediction activities to promote worker awareness and safety.

Since the foreman is also responsible for site safety and quality control, he or she is expected to observe the site and point out dangerous areas and areas needing improvement.

In addition, the foreman summarizes the information obtained through hazard prediction activities and reports it to his/her superior, the safety and health committee, etc.

(2) Hazard prediction (KY) activities and hazard prediction training (KYT)

Hazard prediction activities, also known as KY (Kiken Yochi) activities, are conducted by imagining situations where accidents might occur on-site so as to prevent incidents and accidents from occurring. Due to the nature of construction sites, there are many safety hazards associated with moving and transporting workers, facilities, equipment, and materials. There is also work at high altitudes, in locations with oxygen deficient danger, and in handling hazardous materials. So, it is important to foresee hazards in advance and take preventive measures.

Hazard prediction training, also known as KYT (Kiken Yochi Training), is a method for improving the ability to detect dangerous and hazardous factors that may be present in a task or worksite.

(3) Hazard prediction activities (KY activities)

The hazard prediction (KY) activities at a construction site are conducted in the following specific steps.

Step 1: Identification of hazards in the work area and work content

A risk assessment is conducted by identifying the hazards of the work conducted at the construction site in general or at each work location.

Step 2: Predicting hazards

Based on the identified hazards, potential accidents that may occur are predicted, and everyone participates in coming up with measures to prevent them from occurring.

Step 3: Eliminating or reducing hazards

Measures are taken to eliminate or reduce predicted hazards. Examples include securing scaffolding, wearing fall protection gear, and installing fall prevention fences.

Hazard prediction activities are an indispensable approach to ensuring onsite safety and can prevent incidents and accidents from occurring if conducted on a daily basis. So, it is effective when conducted before the start of the work scheduled for that day.

(4) How to proceed with hazard prediction training (KYT)

If KY activities are to be taken to a higher level, daily training is important. So, it is not possible to draw a clear line between training (KYT) and KY activities.

The “KYT Basic 4 Round Method” is known as the standard basic method for KYT. The KYT Basic 4 Round Method recommends that hazard prediction training be divided into four rounds as shown in Table 3-6.

Figure 3-6 Example of an illustration sheet

Round	4 rounds of hazard prediction training	How to proceed with hazard prediction training
1R	What hazards could be waiting to happen?	Show the workers the prepared illustration sheets and ask them what hazards they see. The opinions expressed will be written on a piece of construction paper. When workers speak up, instruct them to include the following elements. - Where are the hazards? - What are the risk factors? - What kind of incident will they cause?
2R	Marking potential dangers	Of the hazards found, circle those that seem important. In addition, mark with a ◎ those that are unanimously deemed particularly important. Underline the hazard key points and “point and recite” them for confirmation. “Point and recite” means that everyone points at the slogan, etc. and reads it out loud. The goal is to unify everyone's mindset and increase the team's sense of unity and solidarity.
3R	What would you do?	Participants think about how to solve the hazards marked with ◎ and come up with specific countermeasures.

4R	Decided on what to do	The measures are narrowed down by unanimous agreement and marked with an asterisk (*) and underlined as “priority action items.” To put this into practice, “team action goals” are set and confirmed via “point and recite.”

Table 3-6 How to proceed with hazard prediction training

(5) Necessity of “pointing and calling”

“Pointing and calling” refers to a confirmation method conducted before performing a certain action, done by pointing a finger directly at the object you need to confirm and saying in a clear voice, “XX Yoshi!”It is also called “*shisa kosho*.” Pointing and calling is a fundamental action in hazard prediction (KY) activities.

There are five phases of the consciousness state, from 0 to IV, and most daily tasks are said to be performed at Phase II (normal, relaxed). Phase IV is a state of hypernormal, which may cause over-focusing on only one point or a panicked state. Pointing and calling is said to have the effect of raising Phase II and lowering Phase IV to Phase III (normal, clear).

Phase	Mode of consciousness	Focus	Physiological state	Reliability
0	Unconscious	Zero	Sleeping	Zero
I	Subnormal	Careless	Fatigue, doze	0.9 or less
II	Normal, relaxed	Introverted	During routine work	0.99 to 0.99999
III	Normal, clear	Extroverted	During active engagement	0.999999 or more
IV	Hypernormal, excited	Over-focused on a single point	Panic	0.9 or less

Table 3-7 Stage of consciousness state (the late Professor Kunie Hashimoto, College of Industrial Technology, Nihon University)

3.5.3 Close call prevention activities

(1) What are close call prevention activities?

When working in the field, workers experience instances of “I almost injured myself.” The purpose of close call prevention activities is to report “close call” situations that occurred while working, and to share and analyze this experience with the entire workforce to prevent the same problems or incidents from happening again.

Figure 3-7 represents “Heinrich's Law” by Herbert William Heinrich, a pioneer of occupational safety in the United States in the 1930s. An analysis of many occupational injuries revealed that for

every severe accident, there are 29 minor accidents and 300 non-injury accidents of the same nature. The 300 cases in this figure are what we call “close calls.” Continued close call prevention activities can help prevent fatal accidents and serious or minor injuries before they occur.

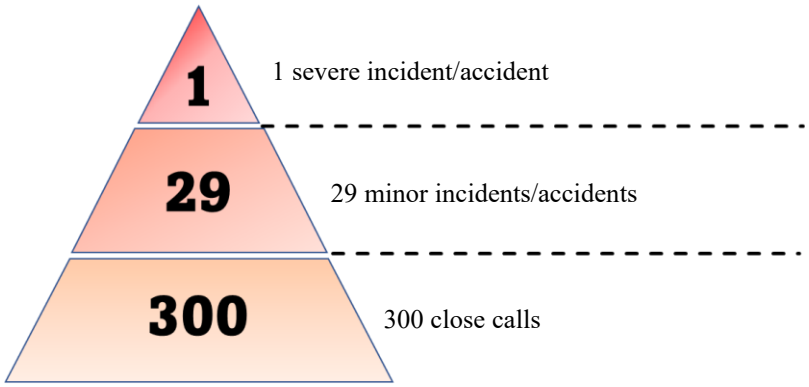

Figure 3-7 Heinrich's Law (accident triangle)

(2) Key points for implementation of close call prevention activities

The key points for implementing close call prevention activities are as follows.

□ Reporting close call experiences

The following situations experienced by workers at construction sites are reported as close calls.

- When working in hazardous working conditions
- When facilities and equipment required for the work are inadequate
- When there is a problem with the work procedure
- When danger arises due to lack of coordination with other workers
- When there is a problem with the work environment or materials and equipment

Close call reports enable identification of hazards and problems at the site so that solutions may be considered. In addition, the reported information can be analyzed to derive points of improvement so as to prevent similar incidents and problems from occurring.

□ Utilize close call for improvement

Always review the contents of the report and share the results. If nothing is done with the report, the motivation to report may be lost.

□ Do not hold the reporting worker responsible

The purpose of the close call report is to enhance the safety of the worksite by having all workers

share the close call they experienced. For this reason, it is important not to accuse or blame the reporting worker in order to maintain an atmosphere encouraging of reporting.

(3) The role of the foreman in close call prevention activities

As the leader of the workers, the foreman plays an important role in site safety management. So, the foreman should take the lead in close call prevention activities to raise the awareness of the entire workforce. In close call prevention activities, the foreman is responsible for the following.

□ Collection and reporting of close calls

Receive close calls reported by workers and organize them accurately and appropriately. If there is a situation in which workers are hesitant to report a close call, instruct them to be proactive in reporting.

□ Analyze close calls and propose improvement measures

Analyze reported close calls, identify causes, and propose improvement measures. In addition, among the reported close calls, prioritize those of high importance or those with the potential to cause similar close calls in taking action and making improvements.

□ Confirmation/report of the improvement status

Implement improvement measures and confirm the effectiveness of the improvements. In addition, raise the safety awareness in the entire worksite by reporting the status of improvement to the workers.

□ Guidance and education for workers

Provide guidance and education on the importance of close call reporting as well as on safety to raise workers' safety awareness and promote close call reporting efforts.

3.6 The role of the foreman in human error prevention

“Human error” refers to errors or mistakes made by humans. It is said that there are 12 different causes of human error. The foreman is required to train and instruct workers on human errors that occur on the worksite. This section describes the actions that the foreman should take to prevent each of these human errors.

(1) Cognitive errors

Cognitive errors are human errors caused by assumptions, misjudgments (misperceptions), and mishearing. These include misreading drawings, overlooking warning signs on equipment, etc., and falling from heights due to assuming there is scaffolding. To avoid cognitive errors, it is important to always conduct “point and call” confirmation and checks by multiple people.

(2) Lack of attention

It is a human error that occurs with decline in concentration. For example, when a worker is focused on one point, he/she may not pay attention to the surroundings. It is important for workers to be aware of their surroundings at all times, but it is also effective to call their attention to their surroundings from time to time. As a foreman, be aware of the workers' surroundings and call out to them if there is a potential danger.

(3) Attention lapse and diminished awareness

Continued monotonous work can lead to decreased attention to one's surroundings. As with (2), calling out to workers is effective. Make it a habit for workers to call out to each other.

(4) Inadequate experience/knowledge

This is a common human error among newcomers. It is important to have updated task manuals and provide thorough training. As a foreman, assess the ability of each worker and do not allow unreasonable assignments.

(5) Complacency

Cutting corners due to complacency can also be seen as disregarding danger. This can cause incidents not only for seasoned workers, but also for newcomers as they become accustomed to the work. As a foreman, make sure that your workers are following the established rules while working

(6) Group errors

This is a human error caused by the general worksite atmosphere. For example, when the construction schedule is tight, speed may be prioritized over safety. Under any and all circumstances, make sure to have your workers work according to the rules that have been established.

(7) Shortcuts and omissions

When in a hurry, workers may try to skip steps, change the work method, etc. Skipping steps is the same as cutting corners as explained in (5). It is important to make workers understand what happens

when they omit steps of a given procedure. If a complicated procedure is required, do not modify the procedure while working; instead, allocate time to work on it as an improvement measure.

(8) Communication errors

This is a human error caused by incomplete communication or miscommunication due to misunderstanding the content. Make sure to always “communicate and confirm” to make sure the content is understood.

(9) Behavior based on situational instinct

This is a human error caused by instinctively taking certain actions. For example, when a worker working on a stepladder almost drops a tool, he or she instinctively reaches out to catch it. It is important to understand that we as humans behave in such instinctive ways at times. With this understanding, it is effective to discuss possible behaviors specific to certain scenarios during tasks and consider countermeasures by all employees through hazard prediction (KY) activities.

(10) Panic

This is a human error caused by panicking and being out of the ordinary. As with (9), it is important to confirm such situations through hazard prediction (KY) activities.

(11) Decline in physical and mental functions

This is a human error caused by decline in physical abilities and attention span due to age. The aim should be to conduct health management measures at the workplace, and to create a healthy work environment with break areas.

(12) Fatigue

As fatigue sets in, the body may not be able to respond as it should and attention span may decrease. Check on the health of workers during each morning meeting and ensure that they take breaks at appropriate intervals. Heat stroke also causes a strong sense of fatigue. Measure the heat index (WBGT value) in the workplace and implement measures such as putting up shading nets in hot and humid environments, installing dry mist and large fans, etc.

3.7 Power harassment

3.7.1 What is power harassment?

Power harassment refers to the act of a superior, colleague, teacher, or senior employee who abuses his or her power or authority through words or behavior to inflict mental or physical pain on someone in a weaker position, such as at work or at school. Typical types of power harassment and specific examples are listed below.

(1) Physical abuse (assault/inflicting bodily harm)

- Hitting, kicking
- Throwing things at someone and injuring them

(2) Psychological abuse (threats, defamation, insults, verbal abuse)

- Saying or doing things that undermine the character of another person
- Repeatedly giving loud and intimidating reprimands (scolding) in front of other workers.

(3) Detachment from interpersonal relationships (ignoring, ostracizing, isolation)

- Removing workers who don't agree with you from the job, isolating them in a separate room, or having them do home training
- Ignoring one worker as a group and isolating him/her in the workplace

(4) Excessive demand

- Giving workers work for which they have not received the necessary training and cannot perform, and reprimanding them when they fail to accomplish it
- Making workers perform personal chores unrelated to his/her work

(5) Excessively low expectations

- Assigning work well below the worker’s abilities for a long period of time in order to make them decide to quit
- Deliberately not giving work to workers you don't like

(6) Invasion of privacy (excessive involvement in private matters)

- Monitoring workers outside of the workplace
- Disclosing personal information (sexual orientation, medical history, fertility treatments, etc.) to other workers without their consent

Power harassment threatens the mental and physical health of its victims, but it does not stop there. It can negatively affect the workplace atmosphere, which can result in poor worker performance, accidents, and worker resignations. So, the Act on Comprehensively Advancing Labor Measures, and Stabilizing the Employment of Workers, and Enriching Workers' Vocational Lives (known as the "Power Harassment Prevention Act") mandates large companies to prevent power harassment in the workplace starting June 1, 2020. In addition, as of April 1, 2022, the act also applies to small and medium-sized companies. Employers must clarify their policies against power harassment and establish prevention systems such as consultation services.

It is important to understand power harassment because without this understanding, a foreman, who is the leader of several workers, may also unknowingly engage in acts of power harassment.

3.7.2 Why power harassment occurs

Power harassment can occur not only because of the harasser, but also by problems on the receiving end, changes in the work environment, and other factors.

(1) When the power harasser is the problem

A foreman or senior staff member may develop a sense of superiority stemming from his or her power and position, and try to control those who are in a weaker position. In such a case, they may expect submissive attitudes, speech, and actions from subordinates.

Excessive stress and anxiety can cause a person to lose his or her composure and to say or do inappropriate things. In Japan, there is a word "*shigoku*" that describes treating others strictly or giving them quotas in order to help them grow. It is also possible that harsh treatments are stemming from the harasser's misconceived idea of "being harsh helps people grow."

(2) When there are issues on the victim's side

Failure to follow social rules, lack of manners, or irresponsible behavior may result in such worker to be on the receiving end of power harassment. In such a case, as the foreman, you must strive to "guide" such workers.

(3) Changes in the work environment

Power harassment can occur due to changes in the environment, such as a sudden increase in

workload or increased competition. For example, in an organization that is highly competitive and requires highly qualified personnel, it is more likely for the superiors and senior staff to engage in power harassment.

In addition, in workplaces where there is a sense of unfairness in employment conditions or low mutual respect, self-centered people may engage in power harassment in order to impose their views and arguments onto others.

3.7.3 Key points to avoid power harassment

The key to avoiding power harassment is to first understand the difference between “power harassment” and “guidance.” With this understanding, choose the method of communication carefully.

(1) Difference between “power harassment” and “guidance”

Power harassment can result in hurting or bringing to submission the other person. Guidance is a constructive act to help the other person grow. The main differences between power harassment and guidance are as follows.

- Difference in purpose

Guidance is intended to teach the skills and knowledge necessary to perform the duties and tasks of the job. Power harassment, on the other hand, refers to inappropriate speech or behavior toward another person for personal purposes such as self-gratification, intimidation (instilling fear), or the desire to control.

- Difference in methods

Guidance generally involves providing constructive advice and feedback in order to encourage the growth and development of the other person. Power harassment, on the other hand, may use threats, insults, or other methods to hurt or bring to submission the other person.

- Difference in targets

Guidance is intended for new and inexperienced employees and others who have not yet mastered skills in the workplace. Power harassment, on the other hand, is typically behavior exhibited by superiors and colleagues targeting subordinates and junior staff; in other words, it occurs towards

those over whom they hold positional power or authority.

- Difference in method tailoring

Guidance is based on understanding the skills and knowledge of the other person, and then providing advice tailored to his or her level in an appropriate manner to maximize that person's growth. Power harassment, on the other hand, disregards the skills or knowledge of the other person, because the attacks on the other person are for the purpose of self-gratification.

(2) Communication that does not constitute power harassment

- Study your emotions

When you are about to be harsh with someone, consider whether the reason comes from anger, fear, impatience, envy, sadness, or other emotions.

- Calm yourself, and listen carefully to what they have to say

First, calm yourself, and listen carefully to what they have to say. In doing so, observe the other person, and be careful how you choose your words and how you treat the other person. In particular, choose words so as to avoid being misleading, and pay attention to how you speak. It is fundamental to treat others with respect.

- Communicate your requests in a non-aggressive manner

Even if you have a problem with their behavior, do not be aggressive; instead, speak in a way that communicates your needs. Be careful not to think, "It's their job, so they have to do it."

- Be on the lookout for concealed power harassment

Be aware of changes in other workers and lookout for concealed power harassment that may be occurring.

Chapter 4 How to View Drawings as a Foreman

As a foreman, having the ability to correctly understand documents such as construction drawings and specifications is a very important factor that directly affects the quality of the finished product. Design documents related to construction can be divided into two main categories. One is documents that tell the construction company what the client wants to build and where, and the other is documents that tell the onsite workers how and on what schedule they should work.

4.1 The role of the design documents

4.1.1 Types of design documents

The design documents are part of the contract because they are documents containing contractual matters. They can be broadly divided into three categories: design drawings, specifications, and on-site orientation documents (Q&A sheets).

(1) What is a design drawing?

Take the case of architecture as an example. A design drawing is a drawing by the designer of the building requirements that the purchase order intends to realize. The design drawings, pursuant to the purchase order, specifies the performance, the shape and dimensions of the building, and how the interfacing parts will fit together. There are two types of design drawings: draft drawings and working drawings (construction drawings).

- Draft drawing

A draft drawing is a drawing that outlines the entire building, including the floor plan, structure, materials, and equipment required by the purchase order. Purchase orders are prepared in a manner that is easy to understand, and legal regulations are be taken into account. The following are some of the studies and considerations at this stage of the project.

□ Purpose and scale of the building □ Building specifications □ Service life of the building □ Ground condition of the site

□ Location of the site □ Constraints such as by the Building Standards Act □ Surrounding conditions □ Financial plan

Since it is difficult to change the contents of the draft drawings after construction has begun, the designer will fully discuss the matter with the client at this stage.

- Working drawing

Working drawings are drawings based on draft drawings, necessary to place an order for construction. There are four major types of working drawings: architectural drawings, structural drawings, equipment drawings, and external structure drawings.

Architectural drawings are drawn to show the overall composition, design, and layout of the building. They include the following.

□ Plan view □ Elevation view □ Sectional view □ Sectional detail □ Reflected ceiling plan □ Exploded view □ Detailed floor plan

□ Layout plan

Structural drawings are drawings that show the structural parts of a building, such as columns and beams that affect the safety of the building, and include the following.

□ Inner floor beam plan □ Timber frame plan □ List of member sections

Equipment drawings show the wiring of electrical systems such as outlets and lighting, as well as piping for gas, water, and air conditioning. The following are included in the equipment drawings.

□ Electrical equipment drawing □ Sewage, drainage and sanitation equipment drawing □ Air conditioning equipment drawing

External structure drawings are drawings that describe the design and specifications of the exterior portions of the building, excluding the main structure.

(2) What are specifications?

Specifications are documents that describe the specifics and technical requirements for construction work, and consist of two parts: standard specifications (common specifications) and particular

specifications. It includes details that are not included in the design drawing, such as materials to be used and construction methods. Even if the contractor changes mid-project, the specifications ensure that the results are above a certain quality.

- Standard specifications (Common specifications)

Standard specifications (common specifications) are intended to ensure the quality of the building and to streamline construction. In public works projects, there are standard specifications for each type of work, such as civil, architectural, and electrical work. They set detailed technical standards for materials, equipment, construction methods, and testing in each of the areas of construction planning, design, construction, and maintenance. In general, private construction projects are constructed in accordance with public construction specifications in order to obtain a high level of quality.

- Particular specifications

Particular specifications are documents that contain more specific details as special notes than the standard specifications. For example, for steel frames to be used for building construction, they describe the type of steel members, the standard strength values, and the grade of the fabrication plant. Because they contain detailed information on materials, they are also used to calculate construction costs (called “cost estimation”).

(3) On-site orientation document (Q&A sheet)

When the client is in the process of deciding on a construction contractor, an “on-site orientation” of the construction project is given to the contractors participating in the bidding process. The on-site orientation document is prepared for this purpose. The on-site orientation document includes the location of the site, surrounding conditions, construction and estimating requirements, statement of quantities and construction breakdowns, other general items, list of questions, and special notes.

During the quotation period following the on-site orientation, the client accepts questions from the contractor. The document prepared at that time is called a “Q&A sheet.” The Q&A sheet contains the questions and responses from the client.

4.1.2 Construction plans and construction drawings

The construction plan and construction drawings are the documents required for work to be performed on site.

(1) Construction plan

The construction plan is prepared by the prime contractor prior to the start of construction, and contains the following information, including the procedures and construction methods necessary to complete the construction project.

□ Construction outline □ Project schedule □ Site organization chart □ Specified machinery □ Major equipment

□ Main materials □ Construction method (including main machinery, temporary facilities plan, construction site, etc.)

□ Construction management plan □ Safety management □ Emergency system and response □ Traffic management □ Environmental measures

□ Maintenance of work environment □ Promotion of the use of recycled resources and proper disposal methods for construction by-products □ Other

(2) Construction drawing

Construction drawings are the drawings necessary for on-site construction. In actual construction work, many types of components are required, but the design drawings do not contain such detailed information. To produce a quality finished product, accuracy to the millimeter must be ensured. In the actual work, the workers need drawings that show in what order the individual materials should be used and how they should be used in combination, and the construction drawing provides such information.

In addition, buildings have many interfaces (junctions where different structures meet). When preparing construction drawings, it is important to have multiple meetings with specialized contractors

related to your construction project to ensure feasible interfacing so that problems will not occur after construction has begun. A feasible interfacing refers to interfacing that is structurally sound and easy to build.

(3) Difference between design drawings and construction drawings

Construction drawings and design drawings differ in terms of who prepares them, the purpose for which they are used, and who uses them (for whom they are prepared), as shown in Table 4-1.

Type	Created by	Intended use	User
Design drawing	Client Consultant Design firms, etc.	Used by designers to propose designs for the client and builder	Project owner, builder, recipient of applications (e.g., government office)
Construction drawing	Construction manager or cooperating specialty contractor	Used to communicate to on-site workers how exactly to proceed with the construction	Construction managers and technicians working on site

Table 4-1 Difference between design drawings and construction drawings

As shown in the table above, you as a foreman will be heavily involved with the construction drawings. However, since construction drawings are based on design drawings, it is important for the foreman to have knowledge about the design drawings as well.

(4) Examples of design drawings and construction drawings

To make it easier to understand the difference between design drawings and construction drawings, here is a simple example of rebar work and formwork to create columns, beams, and slabs.

Figure 4-1 shows an example of a plan view and elevation view, two of the design drawings for a building construction project. This drawing shows the shape of the finished product, the dimensions of the lower part, and the specifications of the rebar to be used, but it is not clear how the rebar should be placed, what formwork should be made and how they should be put together.

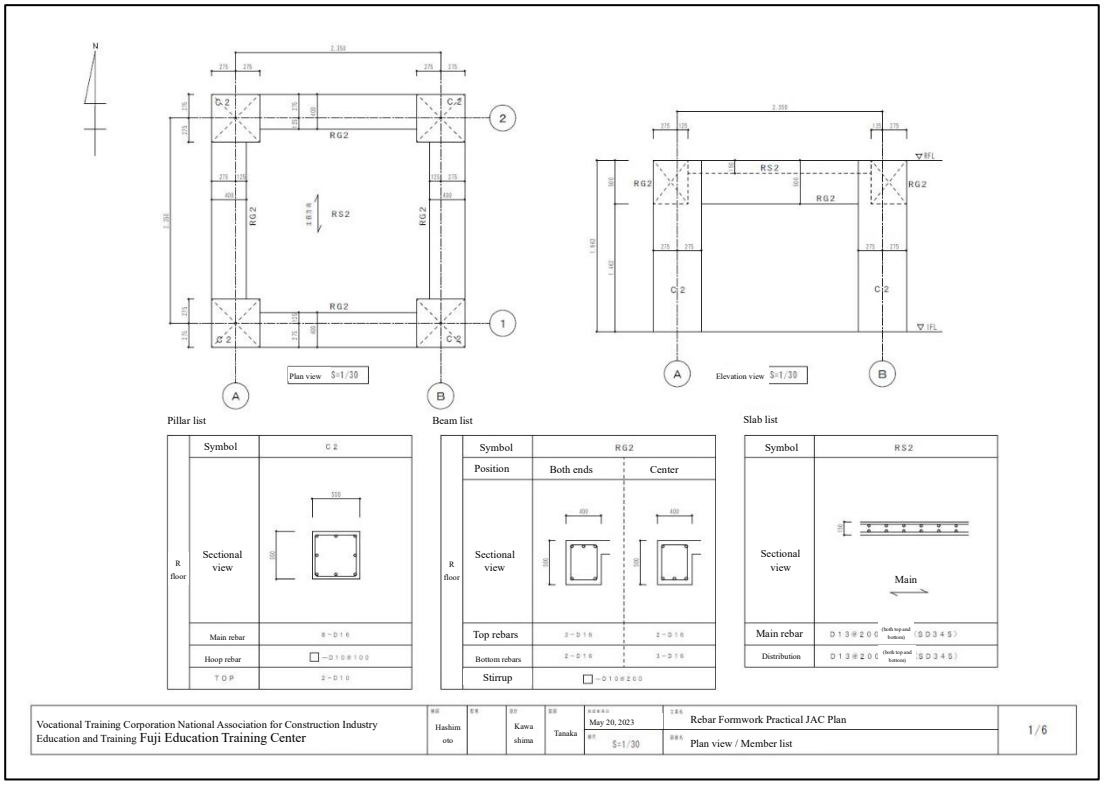

Figure 4-1 Design drawing example

Figure 4-2 shows how the rebars are placed for the pillars and beams, and Figure 4-3 is a construction drawing that shows the slab rebar placement. Figure 4-4 is a formwork plan showing how many pieces of formwork to prepare, and Figure 4-5 is a construction drawing showing how to assemble the formwork. Construction drawings allow workers to know how materials should be assembled to create the finished product.

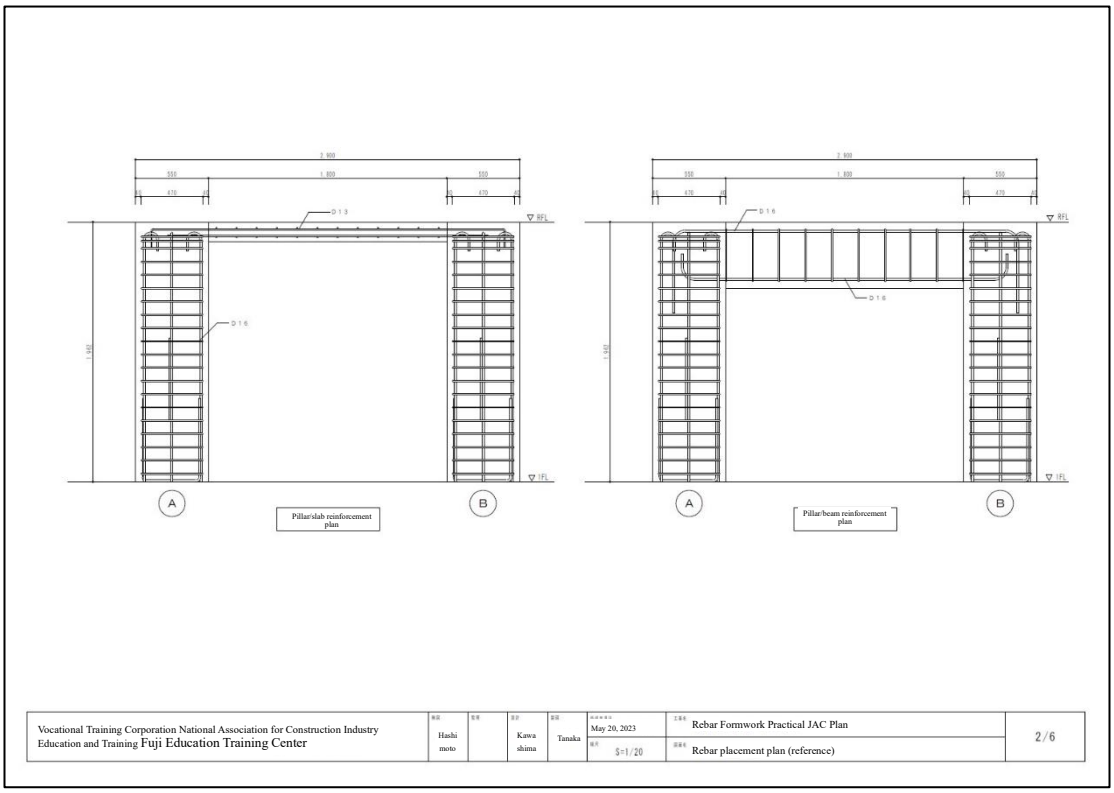

Figure 4-2 Construction drawing example: pillar/beam reinforcement plan

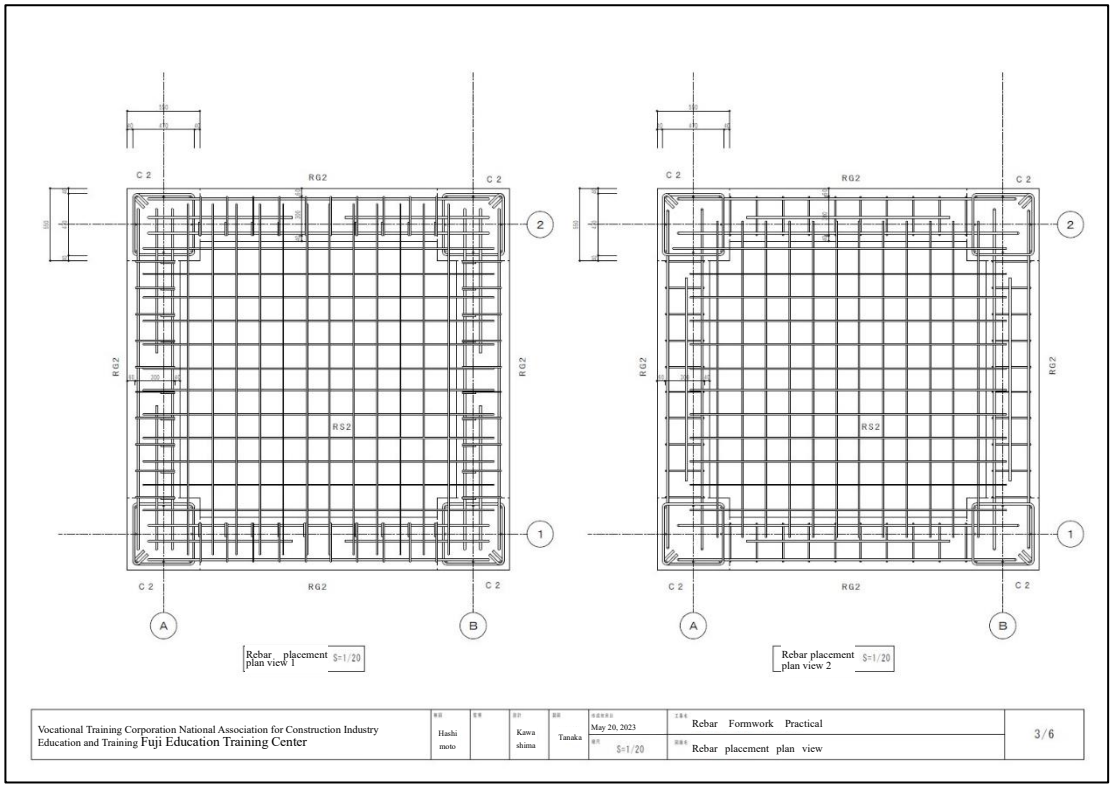

Figure 4-3 Construction drawing example: pillar/slab reinforcement plan

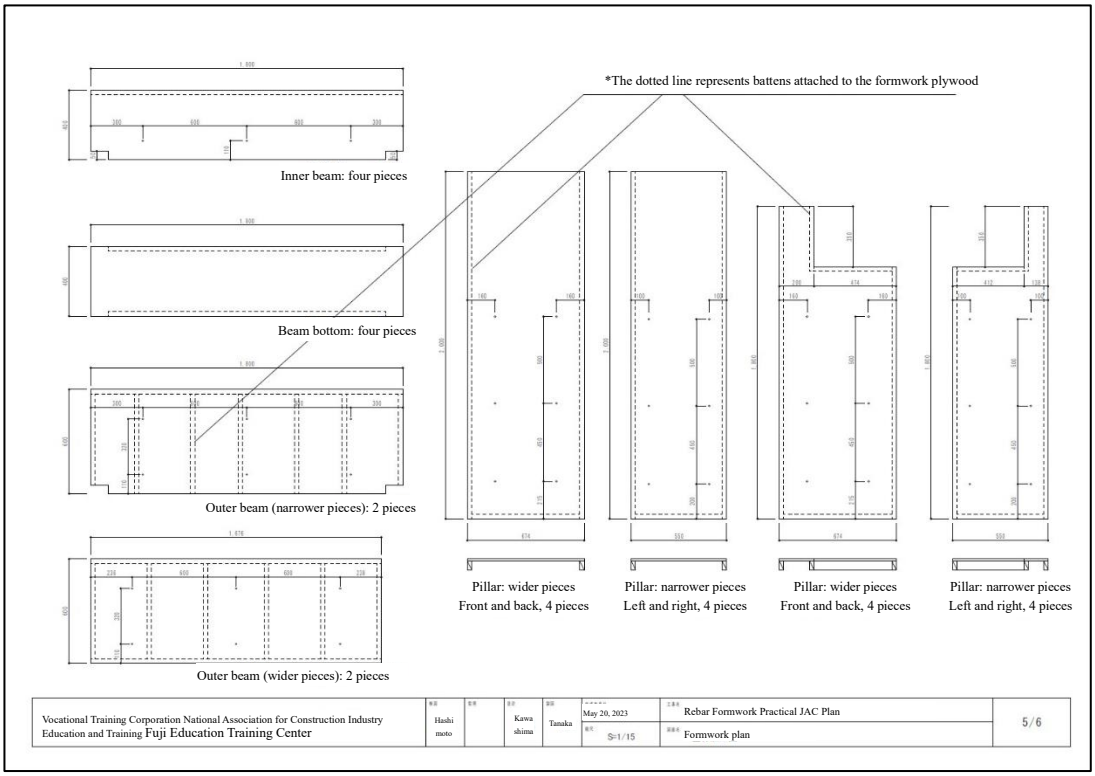

Figure 4-4 Construction drawing example: formwork plan

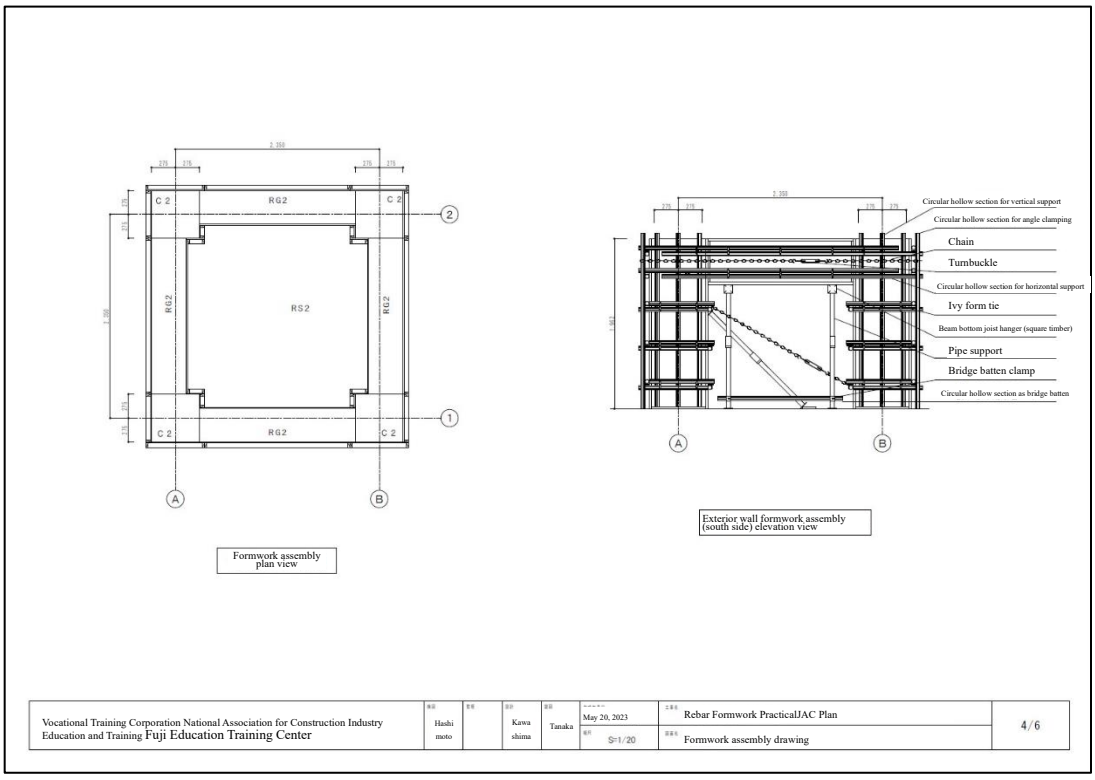

Figure 4-5 Construction drawing example: formwork assembly plan

4.2 How to study construction drawings as a foreman

The foreman has the major role of reviewing work procedures from the construction drawings and preparing a work procedure manual. Fully review the construction drawings and have meetings with the person who prepared the construction drawings to make sure that your understanding is correct and to ensure that nothing remains unclear.

4.2.1 Construction quality and construction drawings

Construction quality is determined by the quality of the construction drawings. Often, those working on site never see the design drawings. No matter how excellent the design drawings are, workers on the site rely on the construction drawings to build the project, and if the construction drawings are inadequate, the quality required by the design drawings will not be achieved.

Since construction drawings affect the quality of the finished product, it is desirable to have accurate drawings that are easier to understand, easier to read, and that do not omit any information. However, it is important to note that this may not always be the case. In many cases, construction can still be completed when sufficiently accurate construction drawings are not available, but this can lead to a lot of redo and rework before completion, resulting in wasted time and effort. In principle, workers on site are to build the finished product according to the construction drawings, but in actuality, there are cases where completion is not possible without various innovative workarounds. It is the important role of the foreman to come up with these workarounds.

4.2.2 Relationship between construction drawings and the work procedure manual

(1) Accurately decipher construction drawings

The foreman should thoroughly understand the construction drawings before preparing the work procedure manual. Since workers follow the manual, the work procedure manual has the greatest impact on the quality of the construction. If the foreman does not correctly understand the information on the construction drawings, redo and rework will occur later.

In addition, construction drawings may have a reduced number of lines or extremely short

explanations in order to make the drawings easier to view and read. The foreman must also be able to read information omitted from the drawings.

(2) Decipher work procedures from construction drawings

For example, in steel reinforcement work, work proceeds by assembling many types of rebar. The construction drawings do not contain information on where to start assembling the first rebar and what to do next. The foreman should determine the specifics and the details of work procedures so that the workers can proceed without hesitation.

For this purpose, it is especially important to study the fit of each section in the construction drawings and consider work procedures that realizes it. Mistakes at this stage can lead to redo, which means breaking and redoing what was built.

(3) Work procedure manuals are an asset

A work procedure manual is a document that outlines the specific procedures to be followed in order to obtain a high-quality finished product. Clearly written work procedure manuals not only reduce the likelihood of work errors, but also allow work to proceed more efficiently, resulting in shorter construction periods and more time to spare for each work.

It is important for the foreman to realize that work procedure manuals are an asset to the company, since they contribute to improving the skills of the workers and the quality of the work. It is important to review and update the manual on a regular basis.

Chapter 5 Understanding the Construction Industry as a Foreman

Establishing on-site safety measures and training skilled workers are important roles of the foreman. By understanding the social role of the construction industry, its problems and challenges, and the Construction Business Act, we can implement measures to cultivate skilled workers with an established sense of purpose in working in the construction industry.

5.1 Social role of the construction industry

The construction industry contributes to the development and improvement of society by constructing a wide variety of buildings and facilities, including housing, commercial facilities, roads, bridges, airports, tunnels, dams, and power plants. Below are some specific examples of the construction industry's role in society.

(1) Building social infrastructure

“Infrastructure” is a term used to refer both tangible elements such as facilities and equipment that are indispensable for social and economic development, and intangible elements such as laws, systems, and human resources that support the tangible elements. The construction industry facilitates the movement of people and logistics, improves the living environment, and promotes economic development by building roads, bridges, tunnels, airports, ports, waterworks systems, sewage systems, power grids, communications networks, and other social infrastructure.

(2) Housing construction

The construction industry contributes to the development and welfare of society by building homes and providing a safe and comfortable living environment.

(3) Urban development

In urban areas, high-rise buildings and large-scale shopping malls are being developed in accordance with the City Planning Act. The construction industry contributes to the development of cities by constructing and renovating buildings necessary for urban development.

(4) Disaster recovery

Japan's construction industry plays a very important role in disaster recovery. Japan is a country prone to natural disasters such as earthquakes and typhoons, and these disasters inflict great damage to the affected areas. Contractors are involved in repairing and rebuilding roads, bridges, rivers, infrastructure including power plants, buildings, facilities, homes, etc. in the affected areas.

Another major role of the construction industry is to help disaster victims rebuild their lives. Examples include the construction of temporary housing and facilities necessary for daily living.

(5) Environmental conservation

The construction industry has a significant impact on the natural and living environment. With increased awareness towards environmental conservation in recent years, the construction industry contributes to the preservation of the global environment by adopting environmentally friendly construction methods, constructing energy efficient buildings, implementing renewable energy, and overall working toward environmentally friendly construction of buildings and facilities.

(6) Job creation

Construction projects are participated by construction companies and contractors involved in large-scale civil engineering and building projects, suppliers of construction materials and machinery, and companies that provide design, supervision, and other technical support. Large construction projects, in particular, require a large labor force. It can be said that construction is one of the industries that create many jobs.

(7) Contribution to the local economy

The construction industry is also considered to have a significant impact on the local economy. The execution of construction projects increases the demand for lodging, restaurants, transportation, and other services in the vicinity of the site for the traveling and living of workers and engineers.

5.2 Problems and issues in the construction industry

The following problems and challenges exist in the construction industry.

(1) Shortage of manpower

Table 5-1 graphs the results of the Ministry of Internal Affairs and Communications' survey of the labor force by age group in Japan in 2022. The labor force aged 44 and under is showing a declining trend. In 10 years, there will be a serious shortage of labor throughout Japan, as more than 20 million people over the age of 55 will be leaving the labor force.

Because the construction industry relies on labor for a large percentage of its work (this is called “labor-intensive”), labor shortages are a particularly important issue. A shortage of skilled workers and engineers needed for the construction industry could cause delays and poor quality in construction projects.

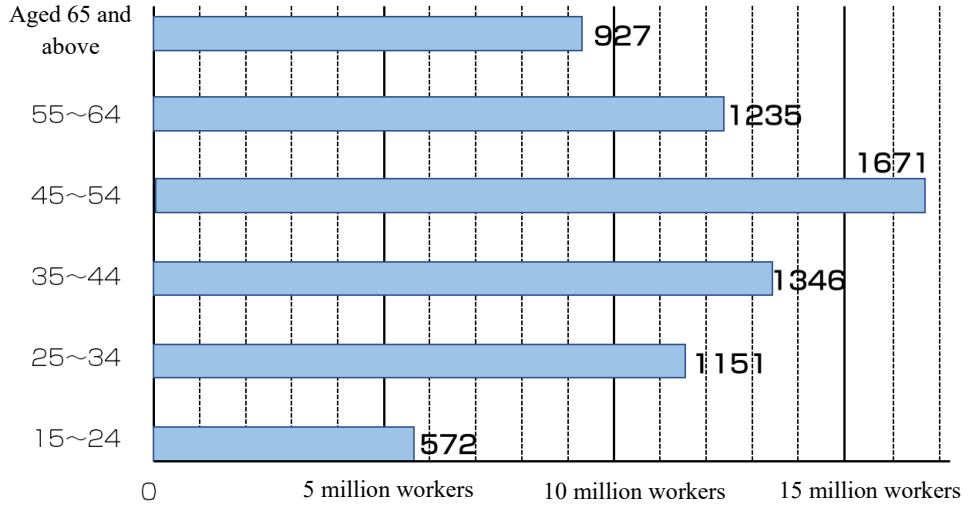

Table 5-1 Japan's labor force by age group in 2022 (Statistical data from the Ministry of Internal Affairs and Communications)

(2) Young people avoiding the construction industry

While the labor force aged 24 and under is declining, even more young people are avoiding the construction industry. Possible reasons for this are that the construction industry is perceived as having too few days off, low and unstable pay, and a triple whammy of hardships (grueling, dangerous, and dirty). In March 2018, the Ministry of Land, Infrastructure, Transport and Tourism

formulated the “Program for Accelerated Workstyle Reform in the Construction Industry” to address the issues of labor shortages and younger workers avoiding the construction industry. To increase the number of young people entering the workforce of the construction industry, the new triple advantages (good pay, more vacation days, promising) is now the new quadruple advantages with the addition of “cool,” and the government and private companies are working together to make this new quadruple advantages of the construction industry a reality.

The program includes the following.

- Promotion of the five-day workweek and reducing long working hours
- Pay commensurate with skills and experience
- Promotion of social insurance coverage
- Improvement in productivity through the use of ICT
- Deliberation on relaxing requirements for engineer presence to make better use of limited human resources

(3) Analog management

The use of IT is an effective way to create an efficient working environment in response to labor shortages and younger workers avoiding the construction industry. Digital Transformation (DX) refers to management innovation that utilizes digital technology, and in the construction industry, the introduction of ICT (i-construction) construction is being promoted. On the other hand, the majority of companies in the construction are small companies with a small number of employees, and there are many skilled technicians, known as “one-man” contractors. In some situations, DX-ing cannot progress due to the lack of IT knowledge and costs involved.

(4) Environmental impact

Construction is an industry that consumes large amounts of resources and energy, and therefore, has a significant environmental impact. In particular, the decreases in construction waste due to the extended service life of buildings and CO_2 emissions have become social issues, and various environmentally friendly initiatives are now being actively implemented. Below are some examples of such initiatives.

- Construction methods that do not visually harm the landscape

In slope and revetment construction, there are methods to simultaneously promote greening. A bag-like mat with a structure similar to soil is filled with plant-friendly materials and seeds to green the construction surface.

- Rooftop greening

Solar power generation is a possible use for rooftops, but high-rises and condominiums are not well suited for solar power generation because the rooftop area is small relative to the building volume. Instead, soil is being spread on rooftops in a greening effort. Rooftop greening not only restores lost greenery, but also has the added benefit of cooling the building and providing people with a place for recreation.

- Concrete recycling

Concrete is one of the waste materials generated in enormous volume at construction sites. Cement, the material of concrete, cannot be recycled and used again as cement after it has hardened. However, since most of the volume of concrete is gravel or sand, known as aggregate, it is possible to recycle these materials. This recycling technology has advanced to the point where it is now possible to achieve a recycling rate of close to 100%.

- Durable buildings

While concrete waste is being recycled, efforts are also being made to extend the life of buildings so as to reduce the amount of waste material itself. Highly durable concrete with a durability of more than 100 years is one such example. However, since concrete is not the only material that constitutes a building, research into higher durability of materials for piping and other parts must be conducted at the same time.

5.3 Construction Business Act

Failure to comply with the Construction Business Act can lead to a variety of problems. The Construction Business Act is an act that construction companies must comply with, but as a foreman, it is important to understand the key points to know if the construction site you are working on is compliant with the Construction Business Act. For example, the Construction Business Act requires

fair contractor agreements to protect subcontractors. For this purpose, the prime contractor must obtain the subcontractor's opinion on the process and work methods in advance. If construction has begun and the work is proceeding in an unreasonable manner, there may be a problem with the contract or a violation of the contract.

5.3.1 Purpose of the Construction Business Act

The purpose of the Construction Business Act is defined as follows.

The purpose of this Act is to ensure the proper execution of construction work and the protection of the owners as well as promote the sound development of the construction industry through improving the integrity of persons operating construction businesses and ensuring proper contracts for construction work, and thereby contribute to the furtherance of the public welfare.

The objectives can be organized into the following four items.

1. Ensure the proper execution of construction work
2. Ensure the protection of the owners
3. Promote the sound development of the construction industry
4. Contribute to the furtherance of the public welfare

5.3.2 Outline of the Construction Business Act

The Construction Business Act provides for a license system, an engineer system, and proper contracting.

(1) License system

The license system is designed to improve the qualifications of construction contractors and covers 29 types of work. As a requirement for the license, “business stability” such as management abilities and financial foundation, “technological capabilities” for each type of work, and “suitability” such as integrity are evaluated, and therefore, management is required to aim to improve these qualities. As a foreman, it is important to be aware of technological capabilities and

suitability in your work.

There are two types of licenses: one based on the amount of subcontracted amount and the other based on the location of the business office (Figure 5-1).

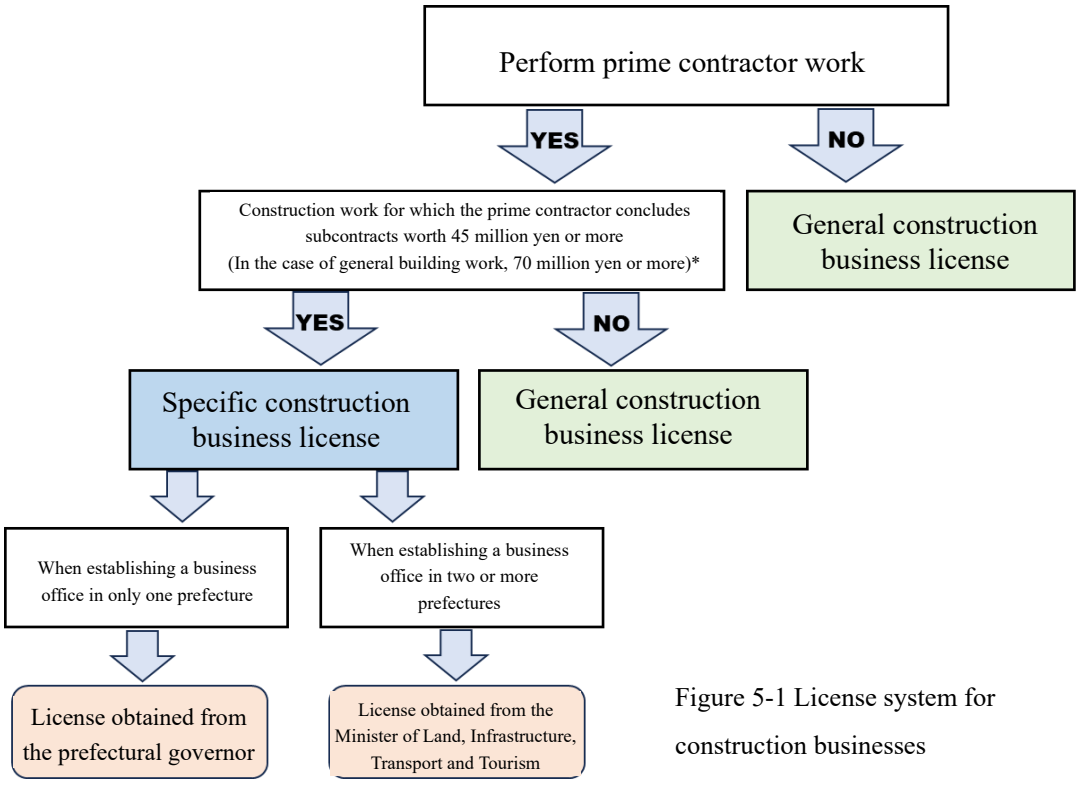

Figure 5-1 License system for construction businesses

(2) Engineer system

The engineer system is intended to ensure having suitable construction technology, and each type of work is required to assign a “Chief Engineer” or “Managing Engineer” at the construction site. Full-time assignment is required especially in public works projects.

- Chief Engineer

The role of the Chief Engineer is to prepare construction plans and perform supervisory duties such as process control, quality control, and safety management. The foreman assists the Chief Engineer in process control, quality control, and safety control.

On smaller sites, the On-Site Agent may concurrently serve as the Chief Engineer. An On-Site Agent is a person who is stationed at a construction site to act as an agent for a manager who has difficulty being stationed at a construction site. To become a Chief Engineer, one must have a first- or second-class national qualification appropriate for the type of work he or she is in charge of, or

must have at least a certain period of work experience.

- Managing Engineer

For works for which the prime contractor concludes subcontracts worth 45 million yen or more (or 70 million yen or more in the case of general building work), a Managing Engineer must be appointed in place of the Chief Engineer. The role of a Managing Engineer is almost the same as that of a Chief Engineer, but to become a Managing Engineer, one must have a first-class national qualification appropriate to the type of construction work for which he or she is responsible.

(3) Proper contracting

The purposes of proper contracting include protecting the client and subcontractors. The act stipulates the obligations of the prime contractor, the obligation to conclude a fair contract agreement, the obligation to conclude a written contract agreement, etc.

For example, as an obligation of the prime contractor, a work ledger and work plan must be prepared and kept at each site for any work for which subcontracts worth 45 million yen or more (or 70 million yen or more in the case of general building work) are concluded. The work plan is to be posted in an easily viewable location at the construction site.

These are the main contents of the Construction Business Act. Contractors are expected to fulfill their social responsibilities by complying with the Construction Business Act and to contribute to the sound development of the construction industry as a whole.