

まんがでわかる

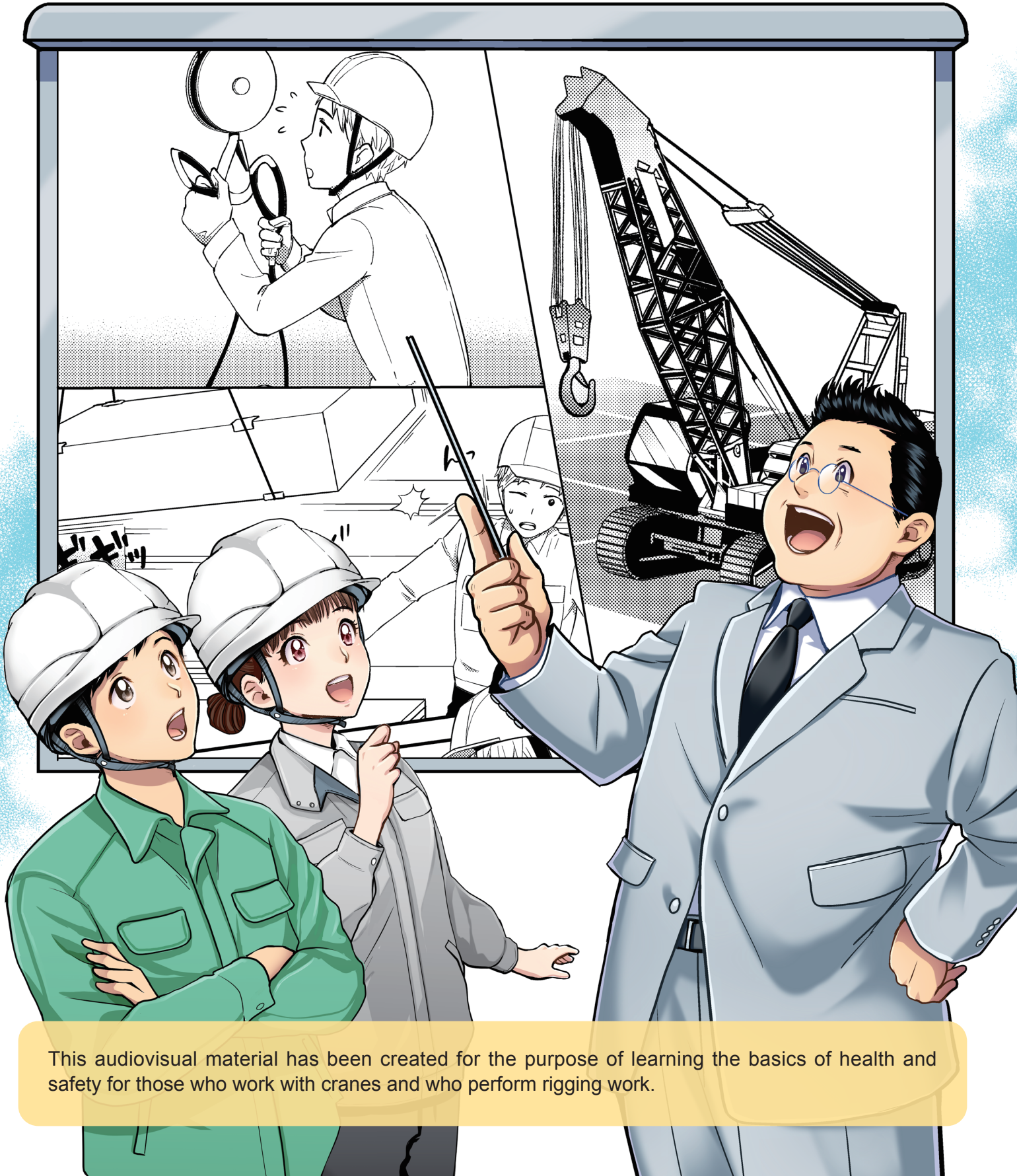


English
英語

クレーン・玉掛け作業の安全衛生

Learn through Manga

Health and Safety for Crane Operation and Rigging Work



This audiovisual material has been created for the purpose of learning the basics of health and safety for those who work with cranes and who perform rigging work.

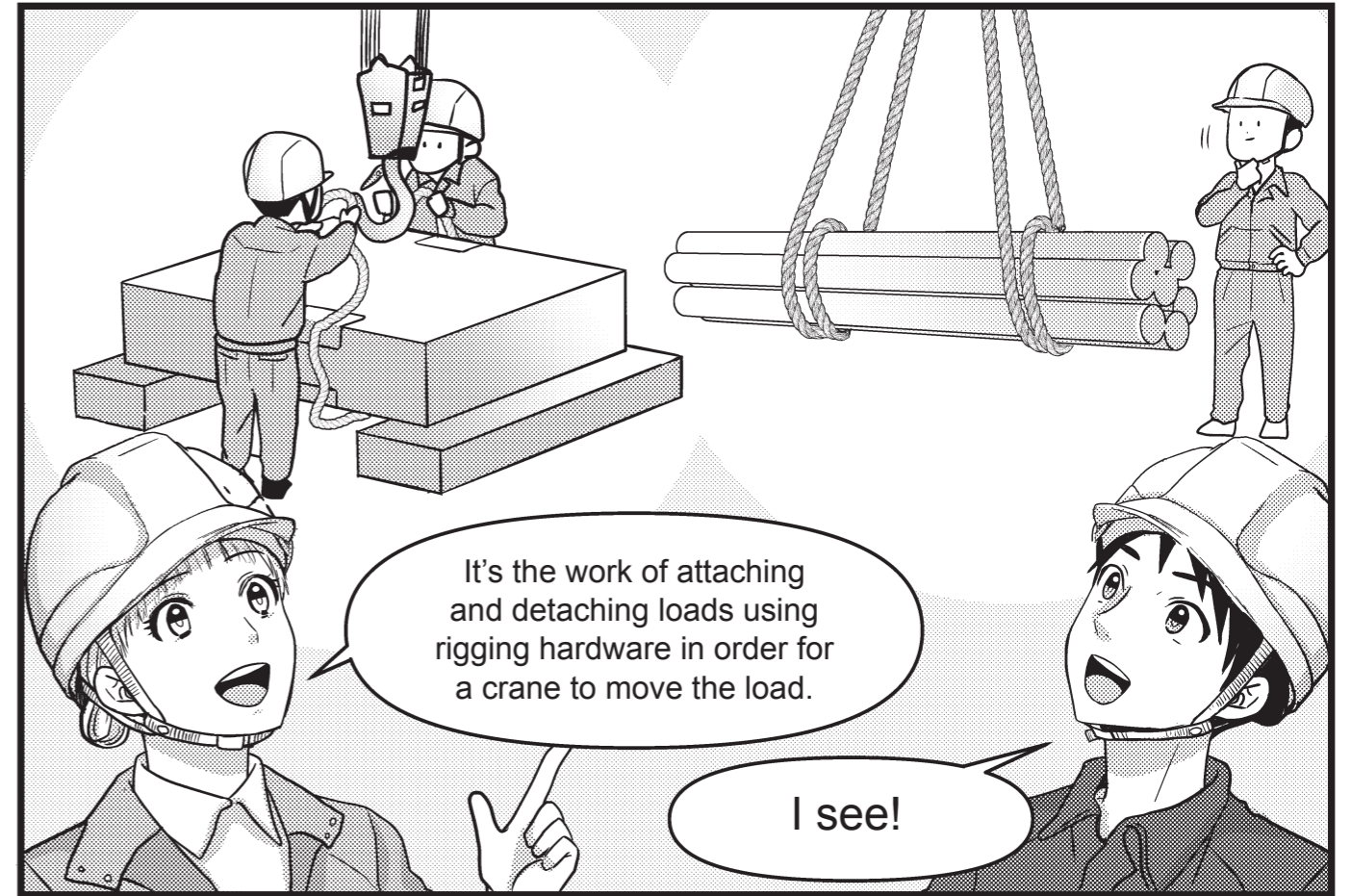
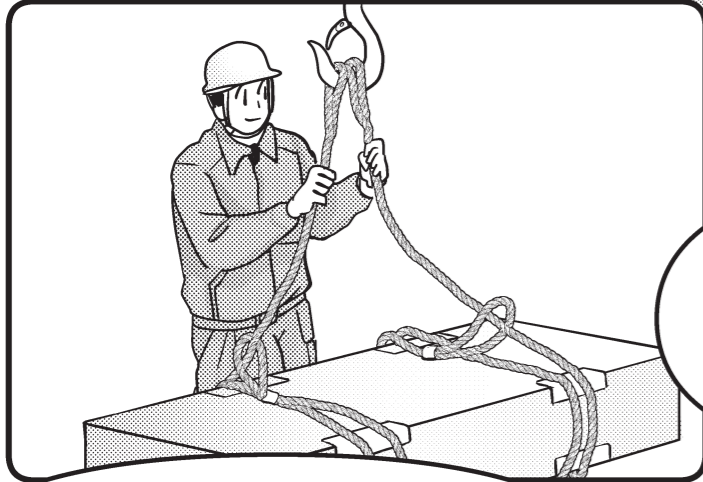
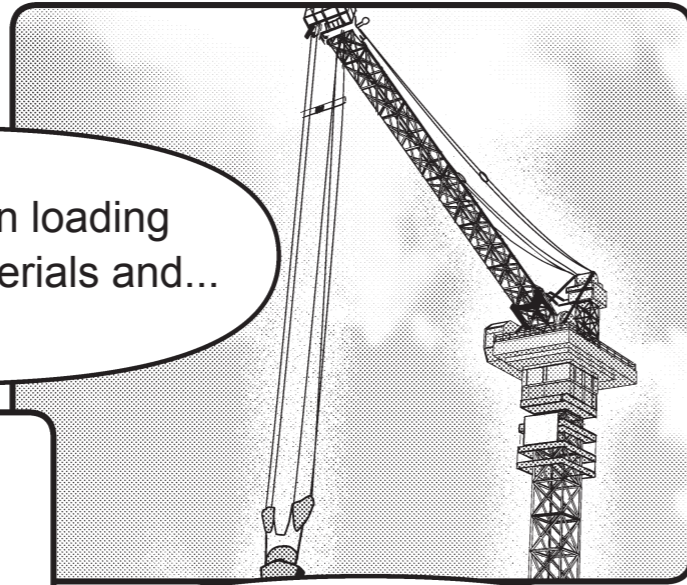
Crane operation and rigging work

is essential when loading and unloading materials and...

...equipment at various places such as construction sites and factories.

Let's take a look at some examples of injuries and accidents which can occur during crane operation and rigging work to learn how to maintain safety.

By the way, I know what crane operation is, but what is rigging work?



It's the work of attaching and detaching loads using rigging hardware in order for a crane to move the load.

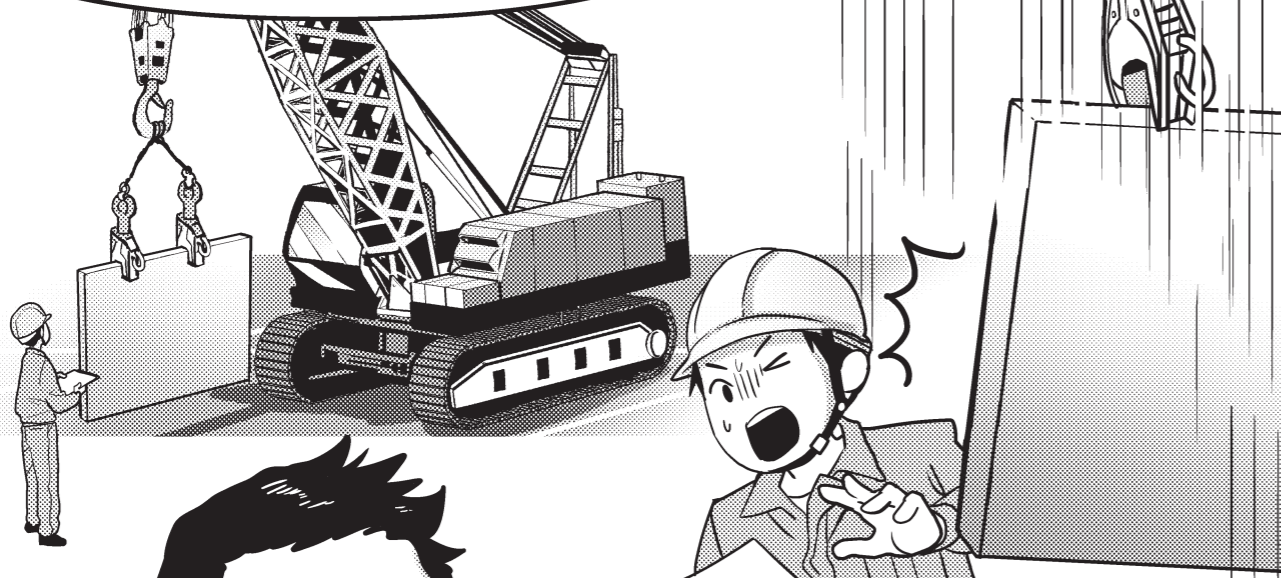
I see!

Crane operation and rigging work deals with heavy and bulky loads, so when accidents occur, they tend to be serious.

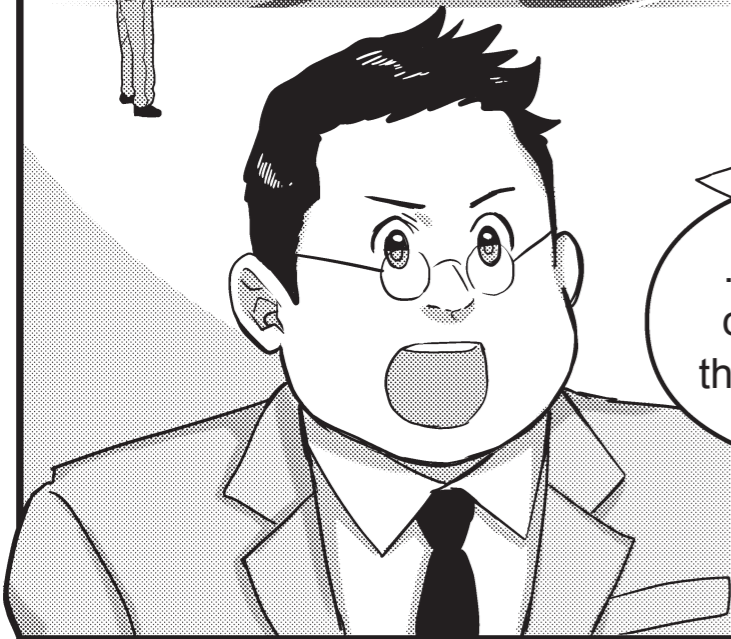
Huh.



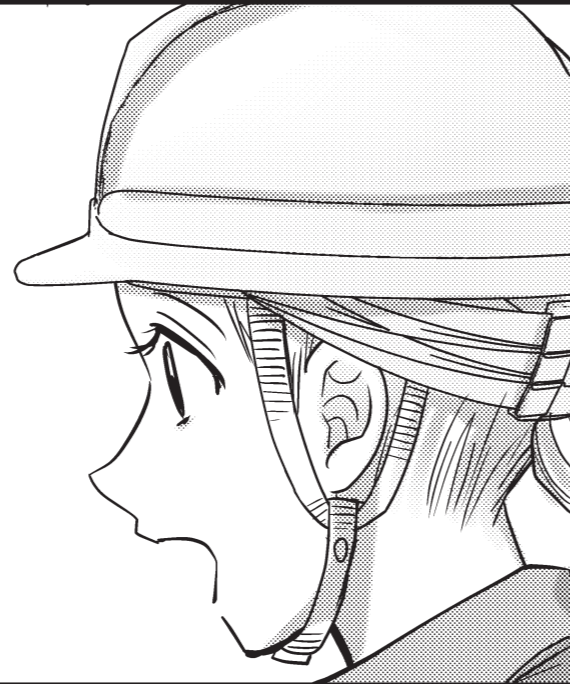
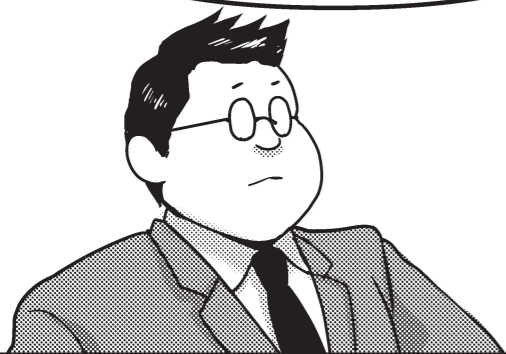
For example, there was an instance where an iron plate was suspended with a crane...



...when one of the suspension clamps became detached and the plate struck a nearby worker.

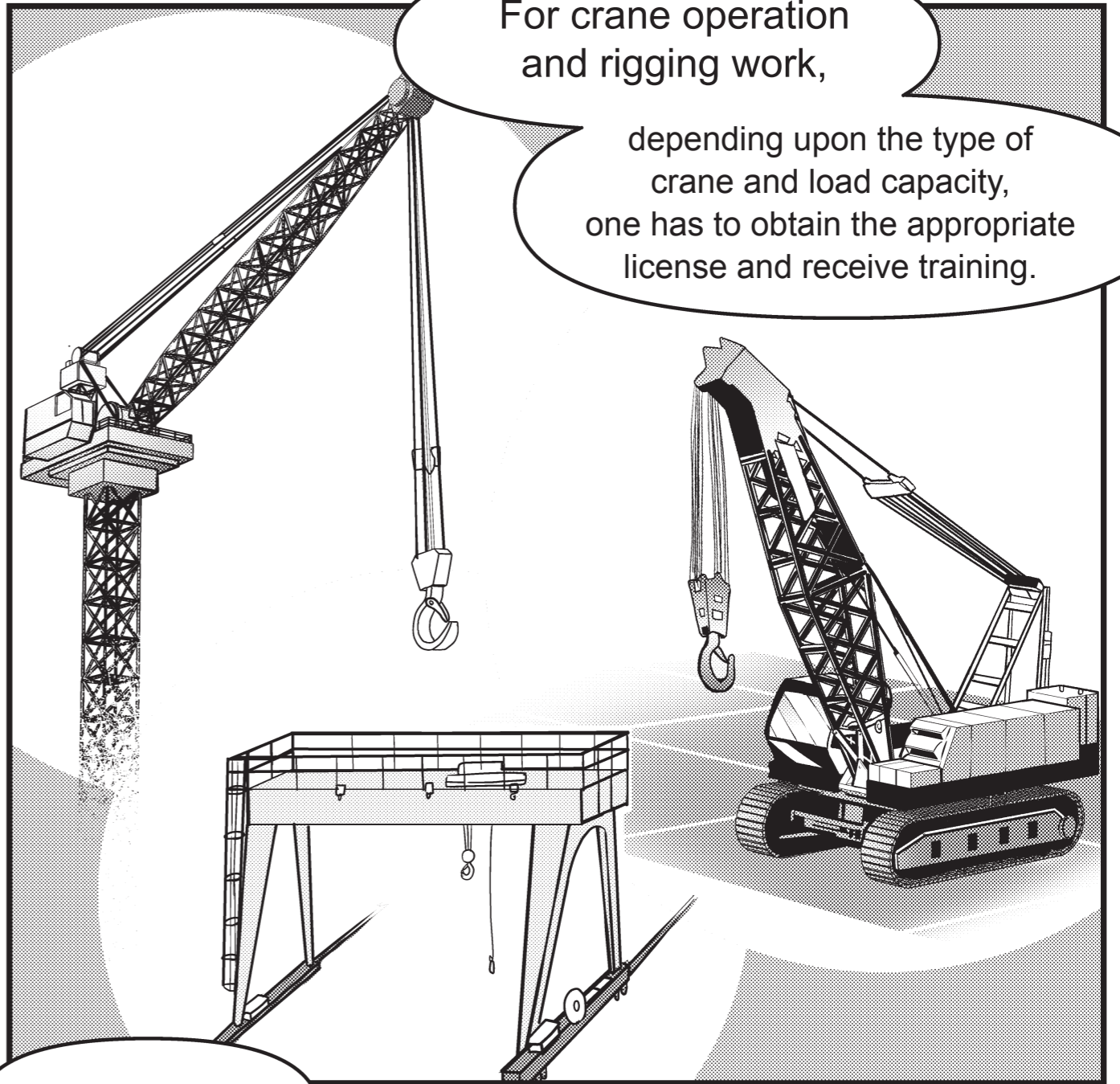


Why did such an accident happen?



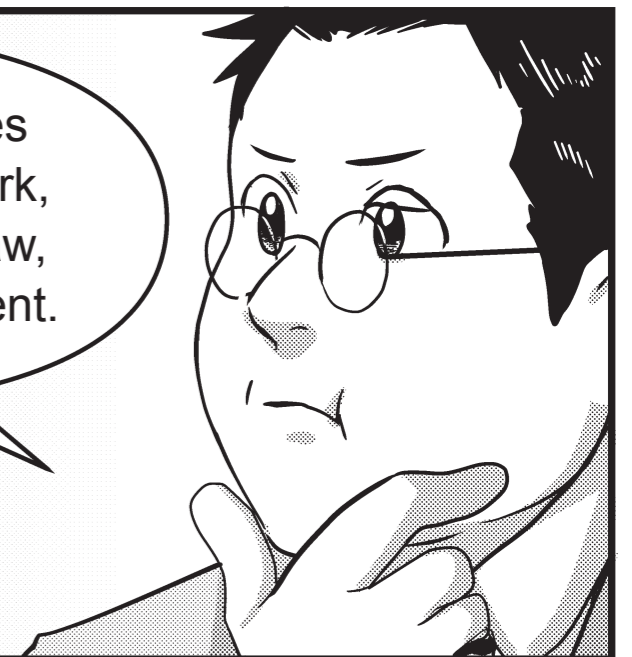
For crane operation and rigging work,

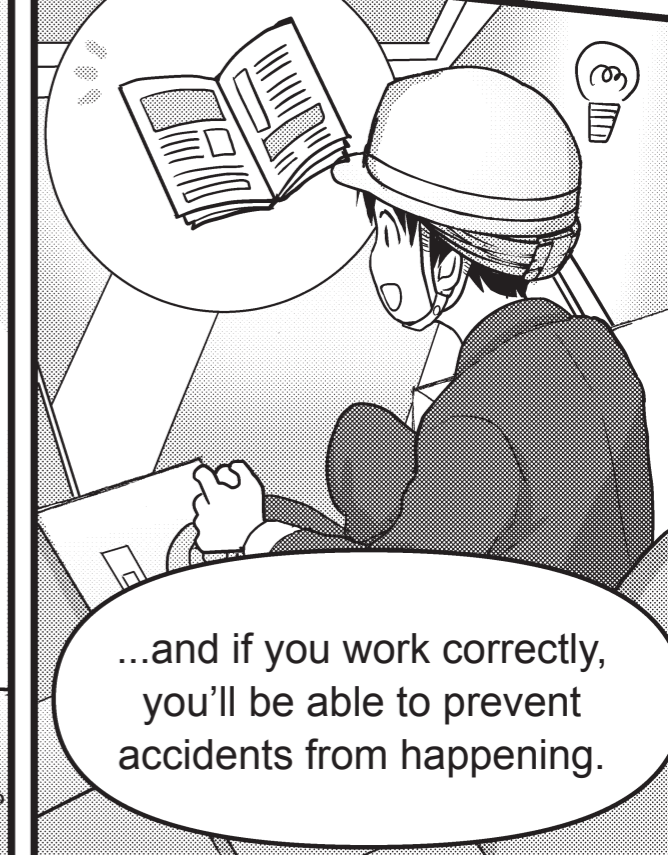
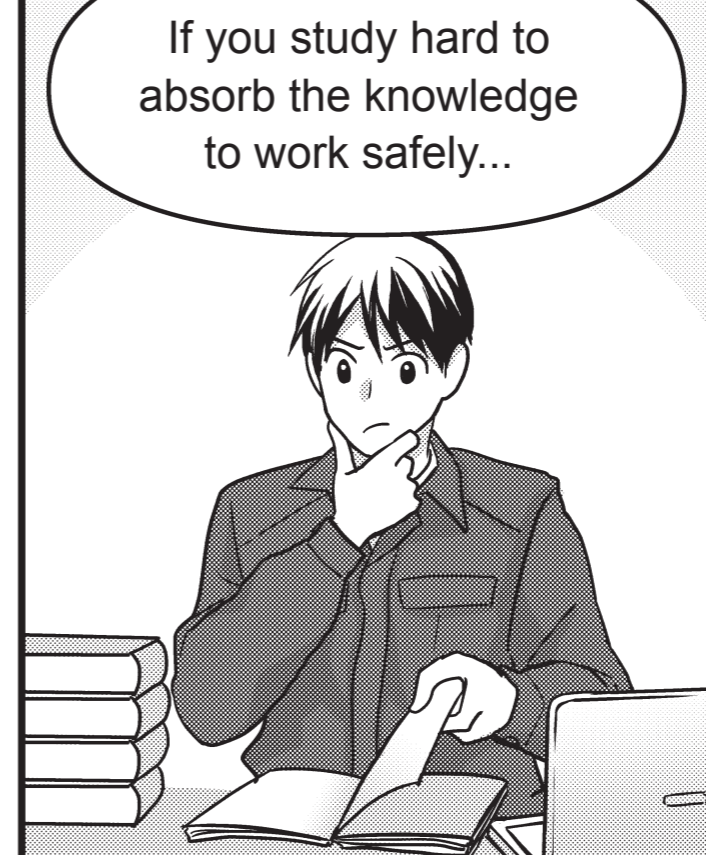
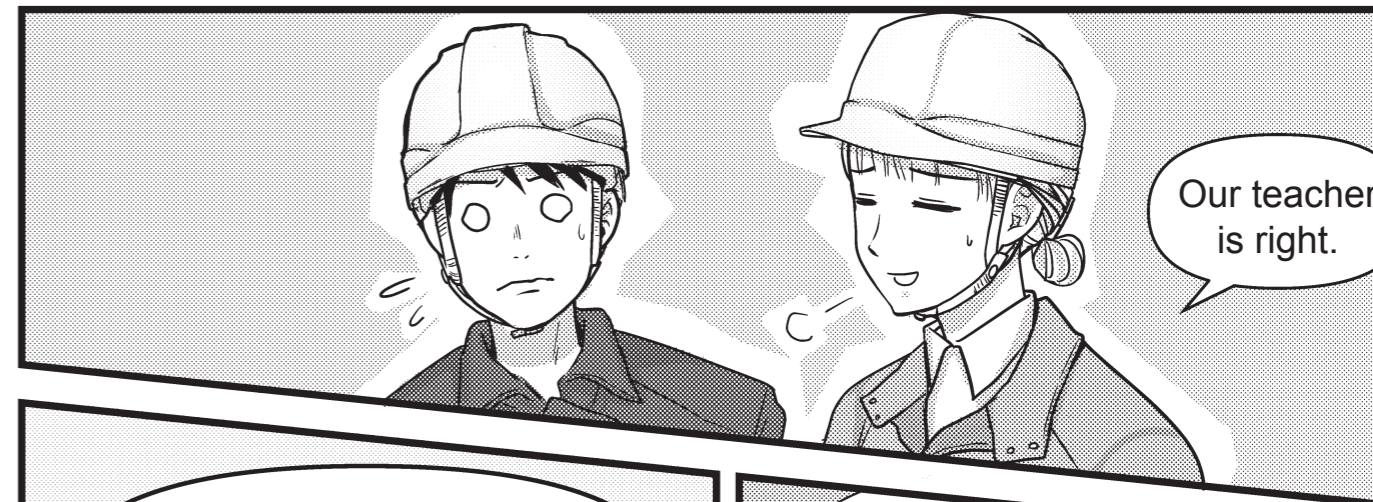
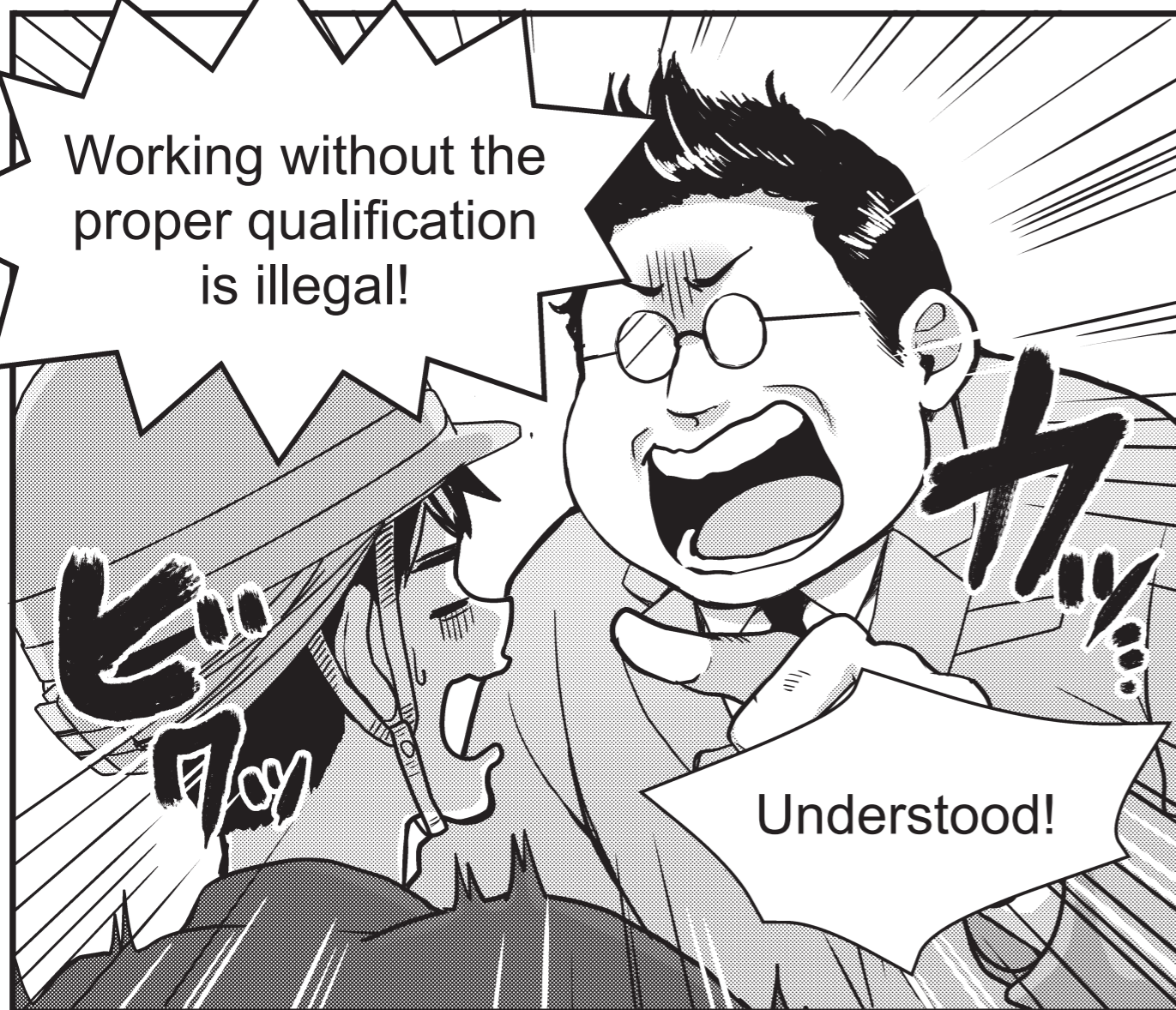
depending upon the type of crane and load capacity, one has to obtain the appropriate license and receive training.



If...

an unqualified person operates a crane or performs rigging work, it's not only a violation of the law, it could lead to a serious accident.





We'll be learning how to maintain safety related to crane operation and rigging work today.

If and when you notice an unqualified person working, please report it to your supervisor.

This will lead to saving not just your life, but also your coworkers' lives.

Okay!

Good!

Before a day arrives where you will be tasked to operate a crane or perform rigging work...

Topic 1 : Types of cranes

Topic 2 : Hardware used for rigging work and how to rig loads

Topic 3 : Qualification and training courses

Topic 4 : Indicators and signals for safety

Topic 5 : Occupational health and safety protective gear

Topic 6 : Examples of incidents resulting in fatalities

Let's first take a look at the basic knowledge to prevent injuries and accidents from occurring!

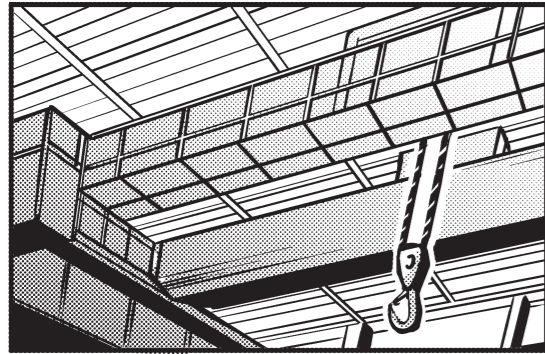
Types of cranes

Roughly, cranes can be categorized into two types.

Let's take a look at the categories and subcategories!



Cranes

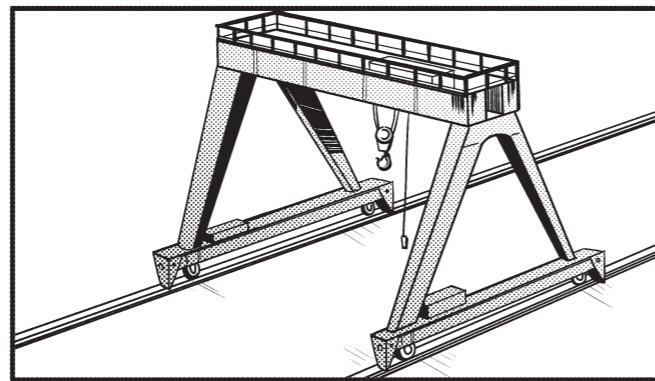


Overhead cranes

Overhead cranes are used for transporting materials and equipment in factories.

Gantry cranes

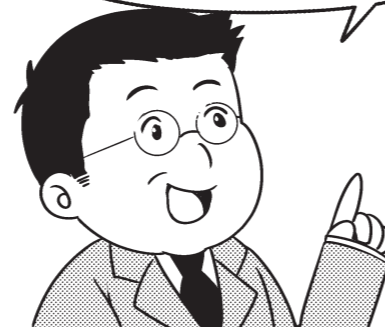
As with overhead cranes, gantry cranes are also used for transporting materials and equipment in factories. They're also used for loading and unloading cargo.



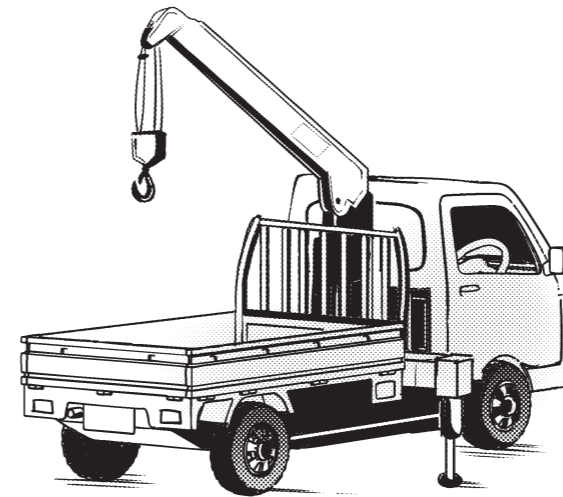
Jib cranes

Jib cranes have a jib, and the load is lifted via a winched wire rope on the pulley at the end of the jib.

Let's take a look at mobile cranes.

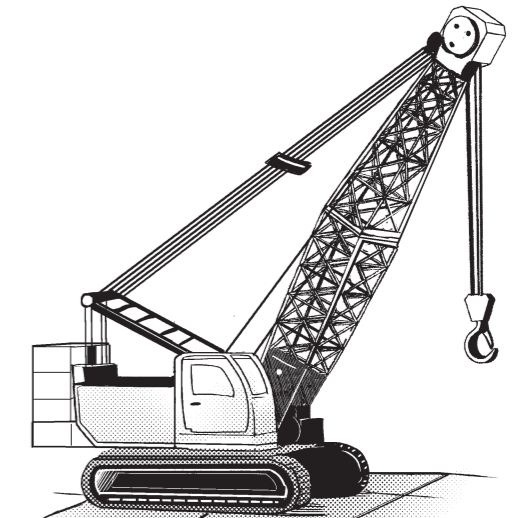


Mobile cranes



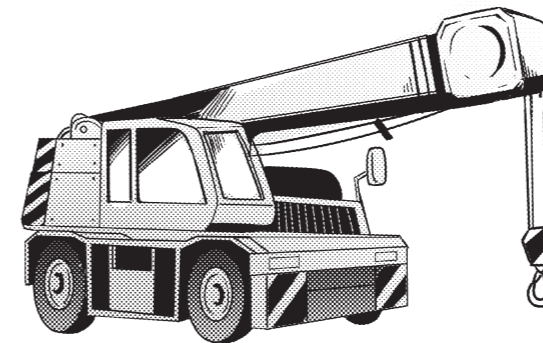
Truck-mounted cranes

Trucks with a crane device mounted in between the truck's cargo area and cab. Used for carrying materials at construction sites.



Crawler cranes

Because crawler cranes have crawler tracks, the footprint is wider with high stability compared to rough terrain cranes.



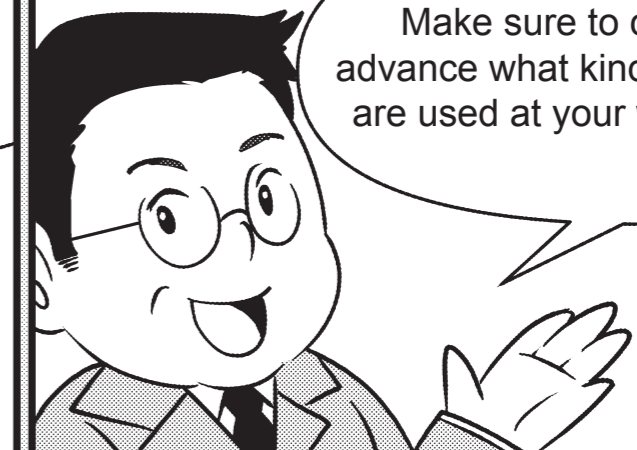
Rough terrain cranes

Rough terrain cranes can be used in a tight space as they can turn in a small radius.

Different types of cranes are used depending on the site and task!



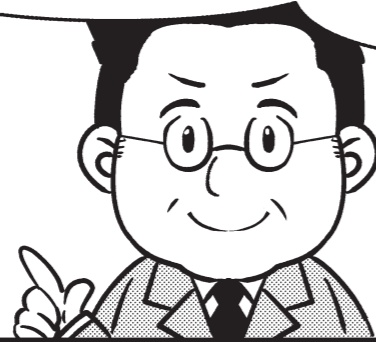
Make sure to check in advance what kinds of cranes are used at your workplace.



Hardware used for rigging work and how to rig loads

Rigging work uses different methods of rigging and types of rigging hardware depending on the load being moved.

Let's take a look at how to rig first.



Rigging with eye bolts	Choker hitch	Double choker hitch	Double-wrapped choker hitch	Basket hitch
When a load has rigging hardware, you can use eye bolts to rig the load.	This is the most common rigging method.	This method is used to hoist multiple loads at one time.	This is the most effective method for preventing slippage of wire ropes.	It is the most optimal method for round, flat objects.

At the basic level, rigging is performed mostly just with wire ropes, but rigging hardware is sometimes used.



Clamps	Hooks	Spreader beams

With these methods and hardware, you can hoist anything. It's amazing!



I heard that types of rigging hardware vary by country, so we need to be aware.

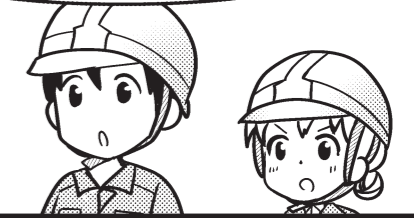
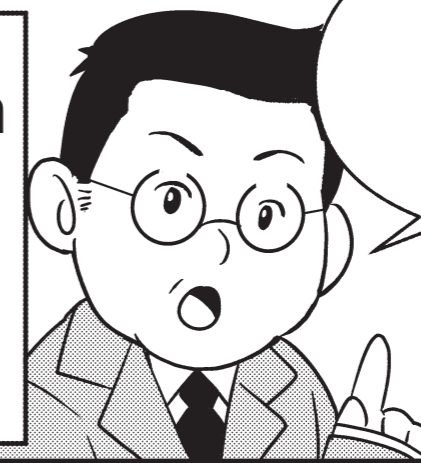


When performing rigging work, use the rigging hardware properly and follow the rules. Otherwise, a suspended load could fall, so be careful.



Qualification and training courses

In order to operate a crane or perform rigging work, one has to take a course and become qualified.

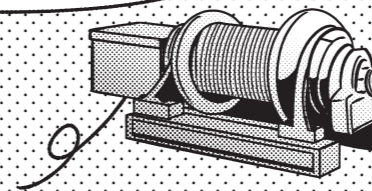


Qualifications necessary to operate a crane	
For a load capacity of 5t or more	Crane/Derrick Operator License [no limitation] Crane/Derrick Operator License [limited to cranes]
For overhead cranes (pulpit-operated) with a load capacity of 5t or more	Crane/Derrick Operator License [limited to overhead cranes (pulpit-operated)]
For overhead cranes (floor-operated) with a load capacity of 5t or more	Overhead Crane Operation Skill Training Course
For a load capacity of less than 5t	Special Training for Crane Operation
For monorail cranes with a load capacity of 5t or more	

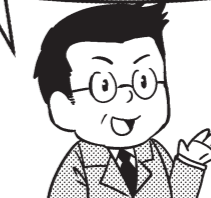
Qualifications necessary to operate a mobile crane	
For a load capacity of 5t or more	Mobile Crane Operator License
For a load capacity of 1t or more and less than 5t	Small Mobile Crane Operation Skill Training Course
For a load capacity of less than 1t	Special Training for Small Mobile Crane Operation

Qualifications necessary for rigging work	
For cranes with a load capacity of 1t or more	Rigging Operation Skill Training Course
For mobile cranes with a load capacity of 1t or more	
For derricks with a load capacity of 1t or more	
For cranes with a load capacity of less than 1t	Special Training for Rigging Operation
For mobile cranes with a load capacity of less than 1t	
For derricks with a load capacity of less than 1t	

When using a winch, you need a Winch Operator License.



Of course, if driving a crane on a public road to transport it, you'll need a driver's license valid in Japan.

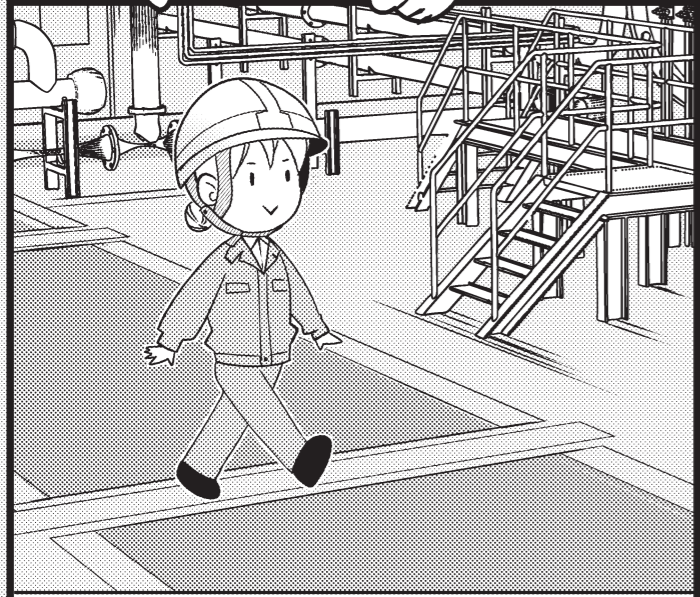
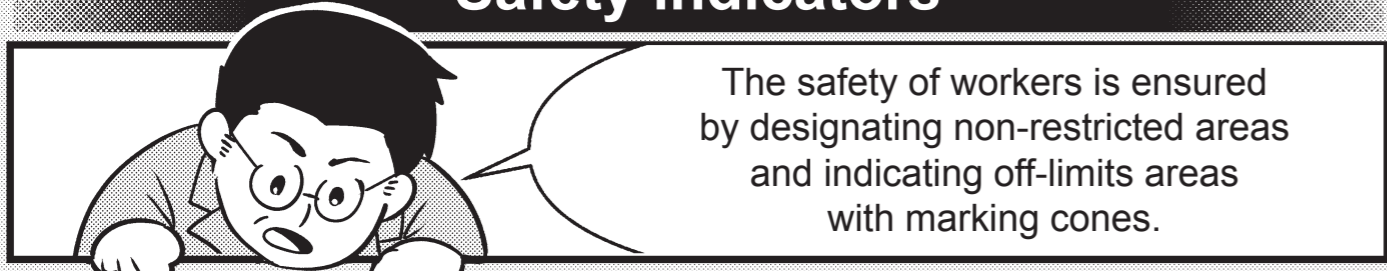


* Reference: "Knowledge on rigging work" from the website of Japan Crane Association

Indicators and signals for safety



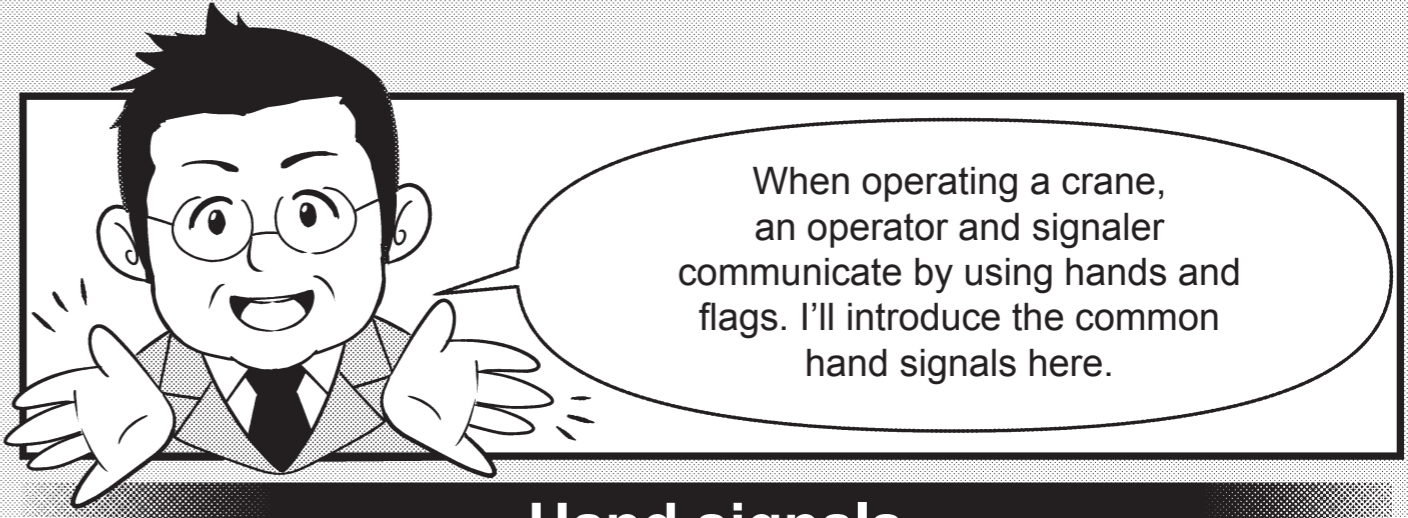
Safety indicators



Non-restricted areas
(The color of the floor is green.)

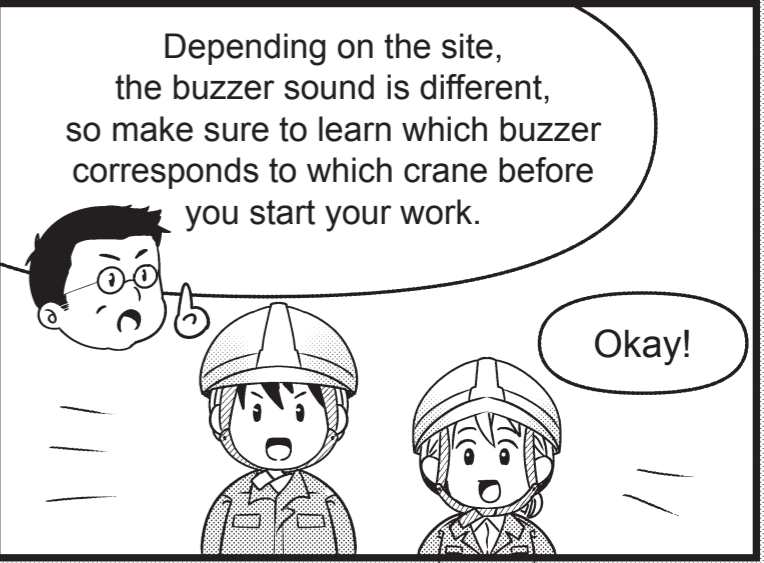


Marking cones
(or barricades)



Hand signals

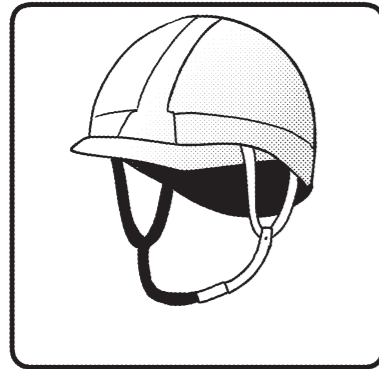
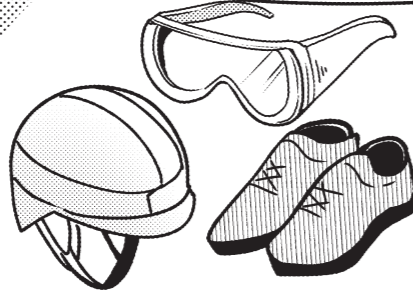
1. Calling 	2. Indication of position 	3. Use main hoist (hoist) 	4. Use main hoist (lower) 	5. Use whipline (hoist)
6. Use whipline (lower) 	7. Hoist jib 	8. Lower jib 	9. Travel 	10. Move slightly
11. Turn over 	12. Extend/Retract jib 	13. Stop 	14. Emergency stop 	15. Task complete



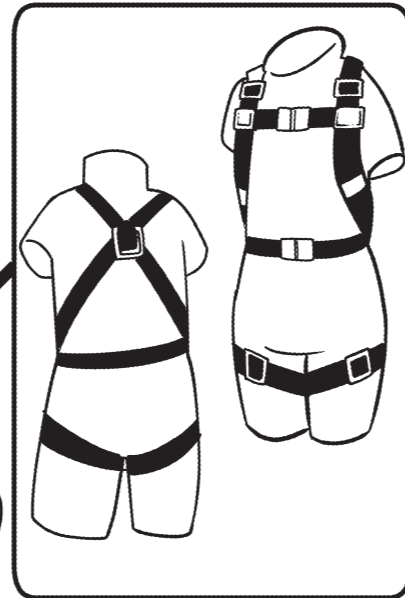
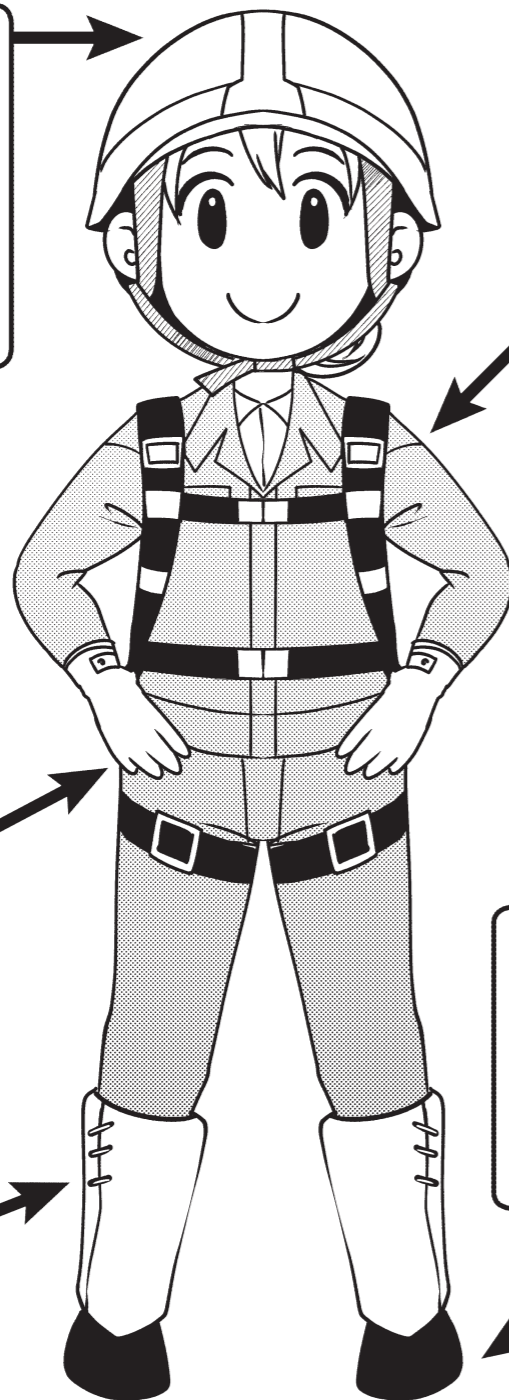
* Reference: "Signals for crane operation" from the website of Japan Crane Association

Occupational health and safety protective gear

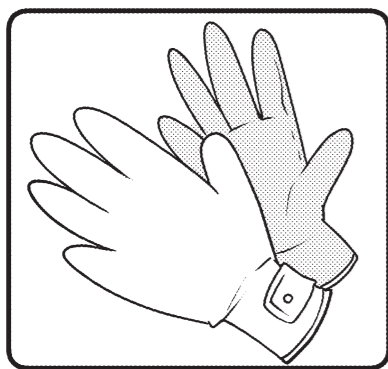
Protective gear is a necessary measure to protect the safety of workers.



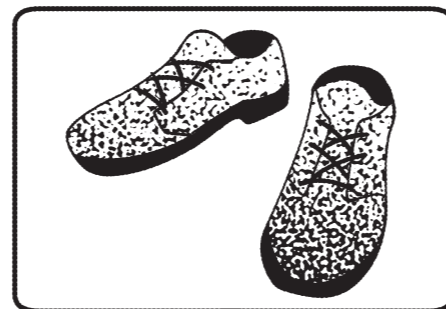
Helmet



Safety harness



Gloves



Safety shoes

Gaiters

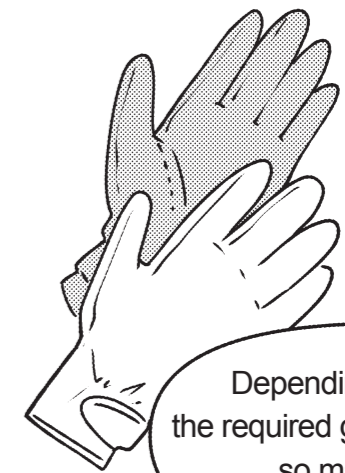
Helmet



How to wear a helmet

- Headband should match the size of the head.
- Do not tilt the helmet. Wear straight and keep it firmly on your head.
- Make sure to tighten and fasten the chin strap.
- Do not use if the helmet is deformed or damaged.
- Do not use gear which has passed the end of its service life.

Gloves



Depending on the task, the required gloves can change, so make sure to check.

Gloves protect your hands and wrists from injuries and accidents.

Safety harness



Safety harnesses should be worn when working in high places.

Safety harnesses can stop a fall from a high place.

Safety shoes

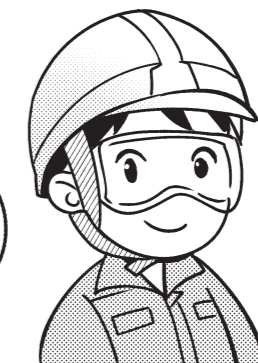


Safety shoes protect your feet when a heavy object falls on them.

They also protect your feet from punctures such as when nails go through your foot if stepping on one, and can protect your feet from being crushed in machinery.

There are also safety goggles and respiratory protective gear.

Depending on the site, the required protective gear changes, so make sure to check the rules.



Examples of incidents resulting in fatalities

This is the summary of fatal accidents in the past 10 years in crane operation and rigging work. Let's take a look at crane operation first.



Fatal accidents in crane operation

(2009-2018)

1	Strikes by falling objects	182 cases
2	Getting caught in machinery or loads	170 cases
3	Falls from elevated areas	61 cases
4	Snapped and broken/Collapsed/Fallen machinery	59 cases
5	Collisions	37 cases

Reference: The number of per phenomena/machine type fatal accidents by cranes from "Crane Annual Data Book" (2009-2018)

Strikes by falling objects are the most common.



What kind of situations are they happening in?

Let's take a look at the details!



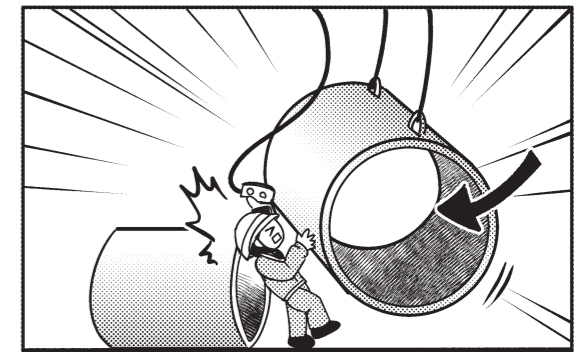
Strikes by falling objects

A load of steel beams that were being adjusted on a truck fell on a worker.



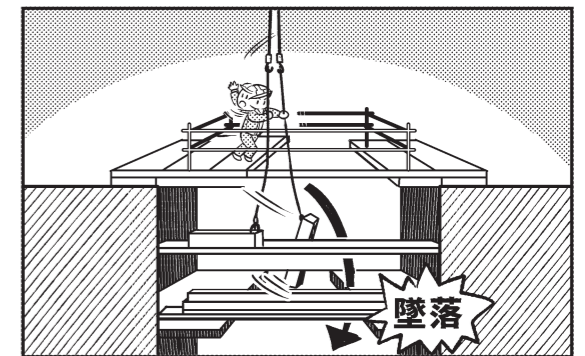
Getting caught in machinery or loads

A worker got caught under a load that was being moved.



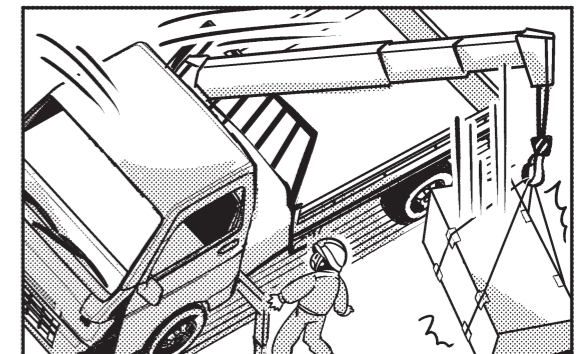
Falls from elevated areas

A signaler was guiding a wire rope while signaling. When the load was lifted off the ground, the recoil from the wire rope knocked them off balance and they fell to the ground from a height of over 10m.



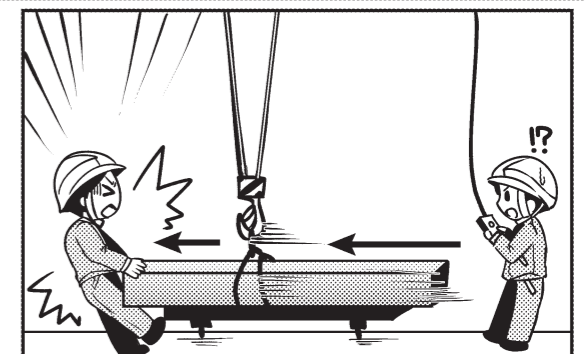
Snapped and broken/Collapsed/Fallen machinery

When a load was suspended and being moved, it was over load capacity and a truck-mounted crane fell over.

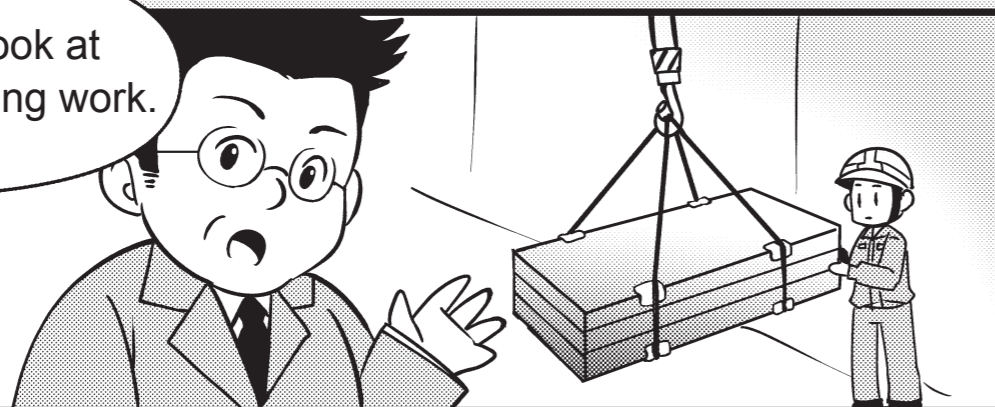


Collisions

Due to an operator error, a load collided with a signaler.



Next, let's take a look at fatal accidents in rigging work.



Fatal accidents in rigging work

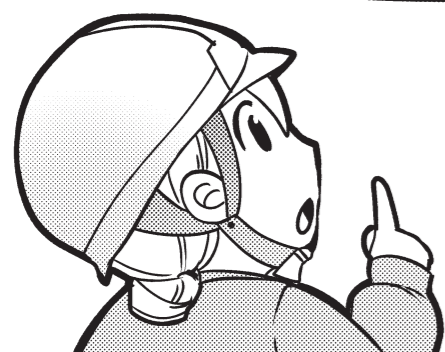
(2009-2018)

1	Loads detaching from wire ropes, etc.	62 cases
2	Severing or breaking of wire ropes, etc.	23 cases
3	Wire ropes, etc. detaching from hooks	19 cases
4	Loads detaching from hooks	19 cases
5	Severing or breaking of wire ropes, etc. under tension	6 cases

Reference: The number of per phenomena/machine type fatal accidents by cranes from "Crane Annual Data Book" (*)

(*) Among fatal accidents due to fallen loads and snapped and broken/collapsed/fallen machinery, strikes by fallen loads have been isolated. (2009-2018)

The most common fatal accident in rigging work is due to strikes from fallen loads.

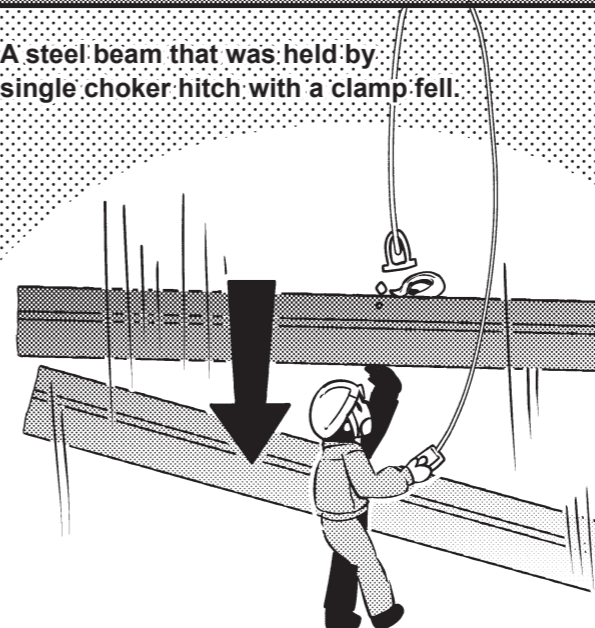


Yeah.



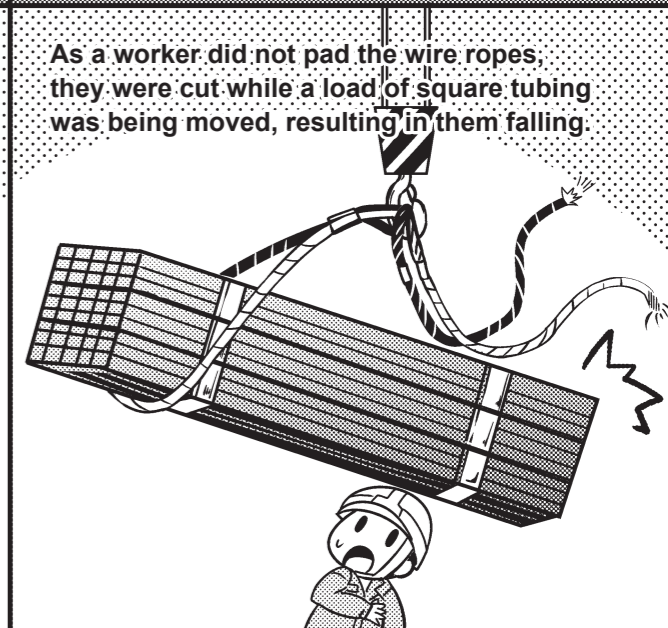
Loads detaching from wire ropes, etc.

A steel beam that was held by single choker hitch with a clamp fell.



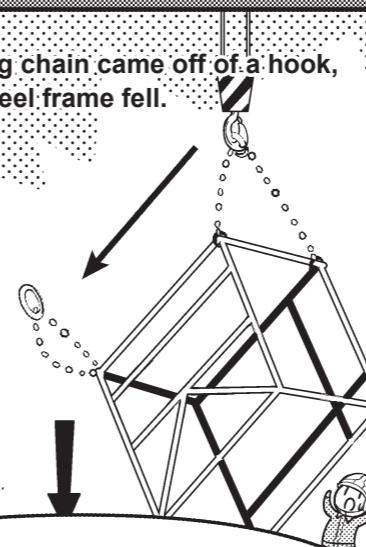
Severing or breaking of wire ropes, etc.

As a worker did not pad the wire ropes, they were cut while a load of square tubing was being moved, resulting in them falling.



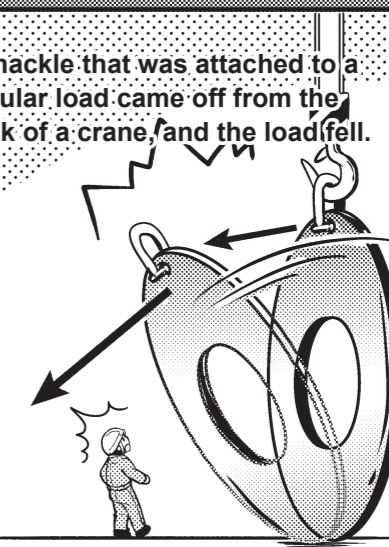
Wire ropes, etc. detaching from hooks

A rigging chain came off of a hook, and a steel frame fell.



Loads detaching from hooks

A shackle that was attached to a circular load came off from the hook of a crane, and the load fell.



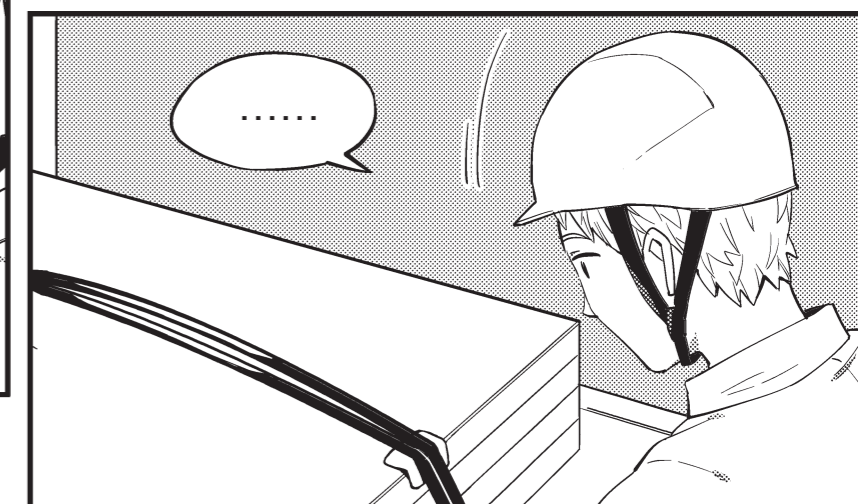
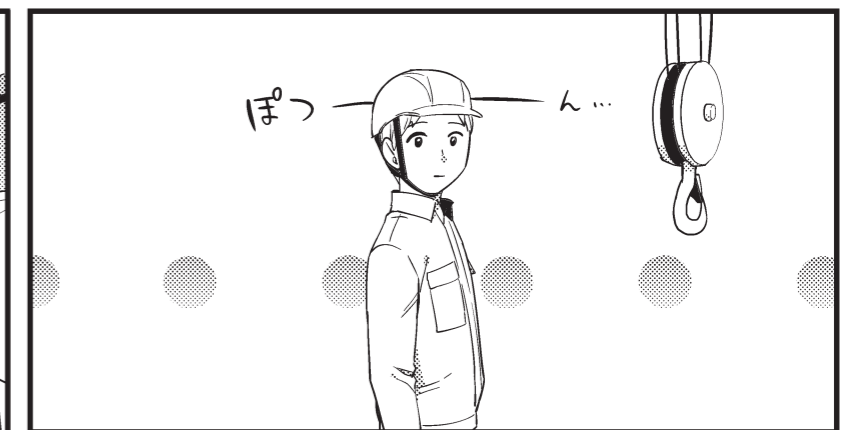
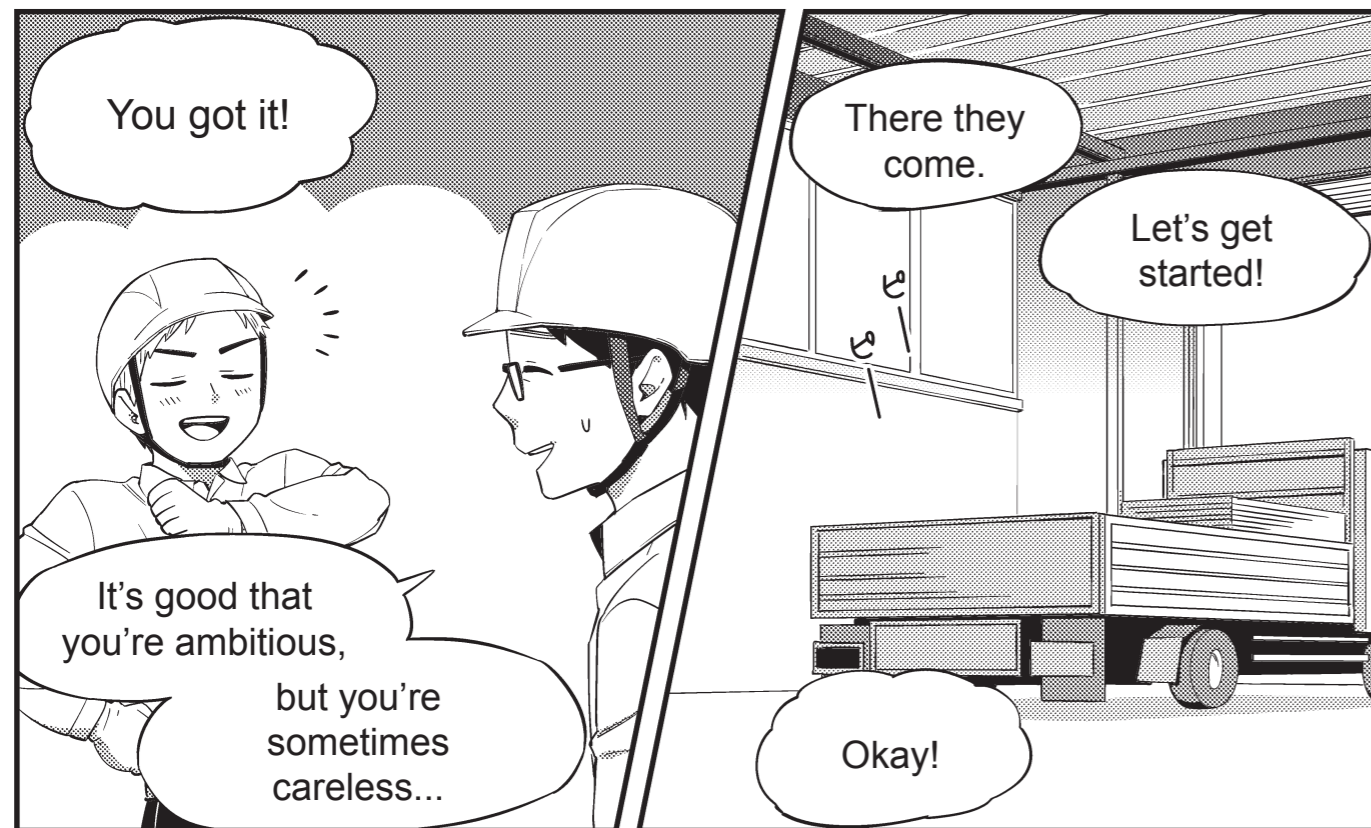
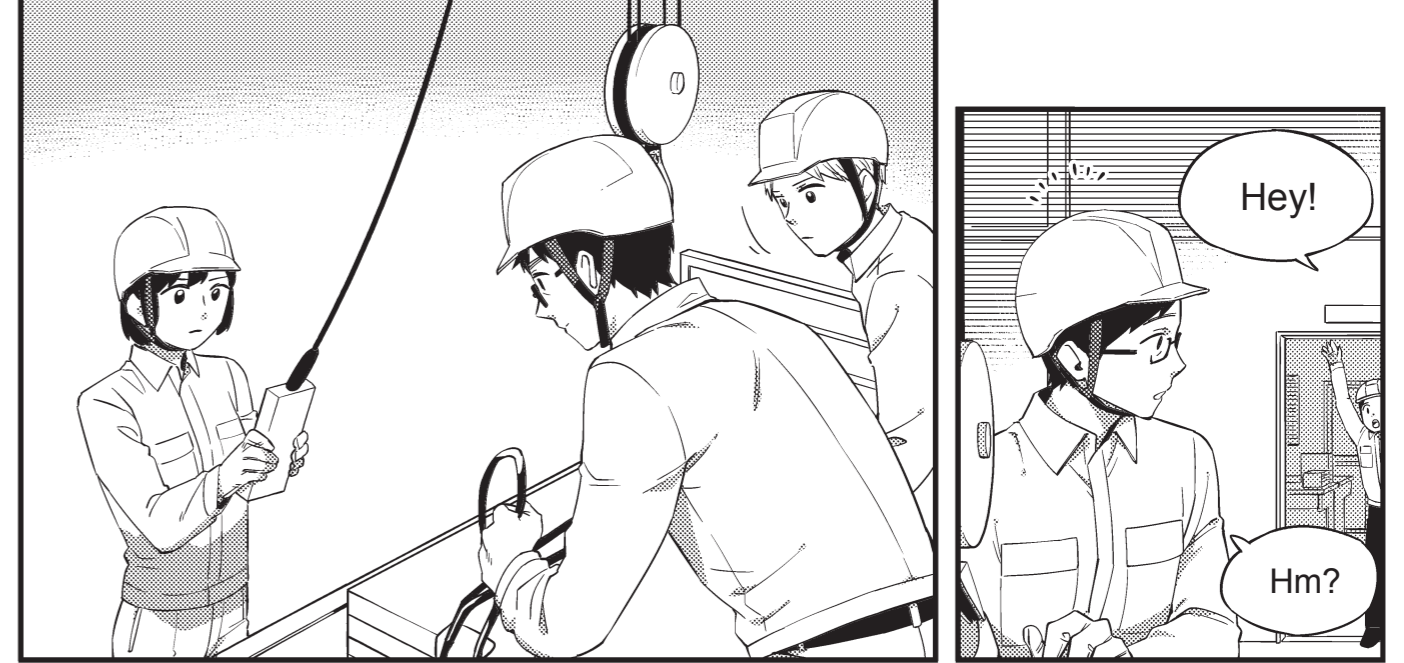
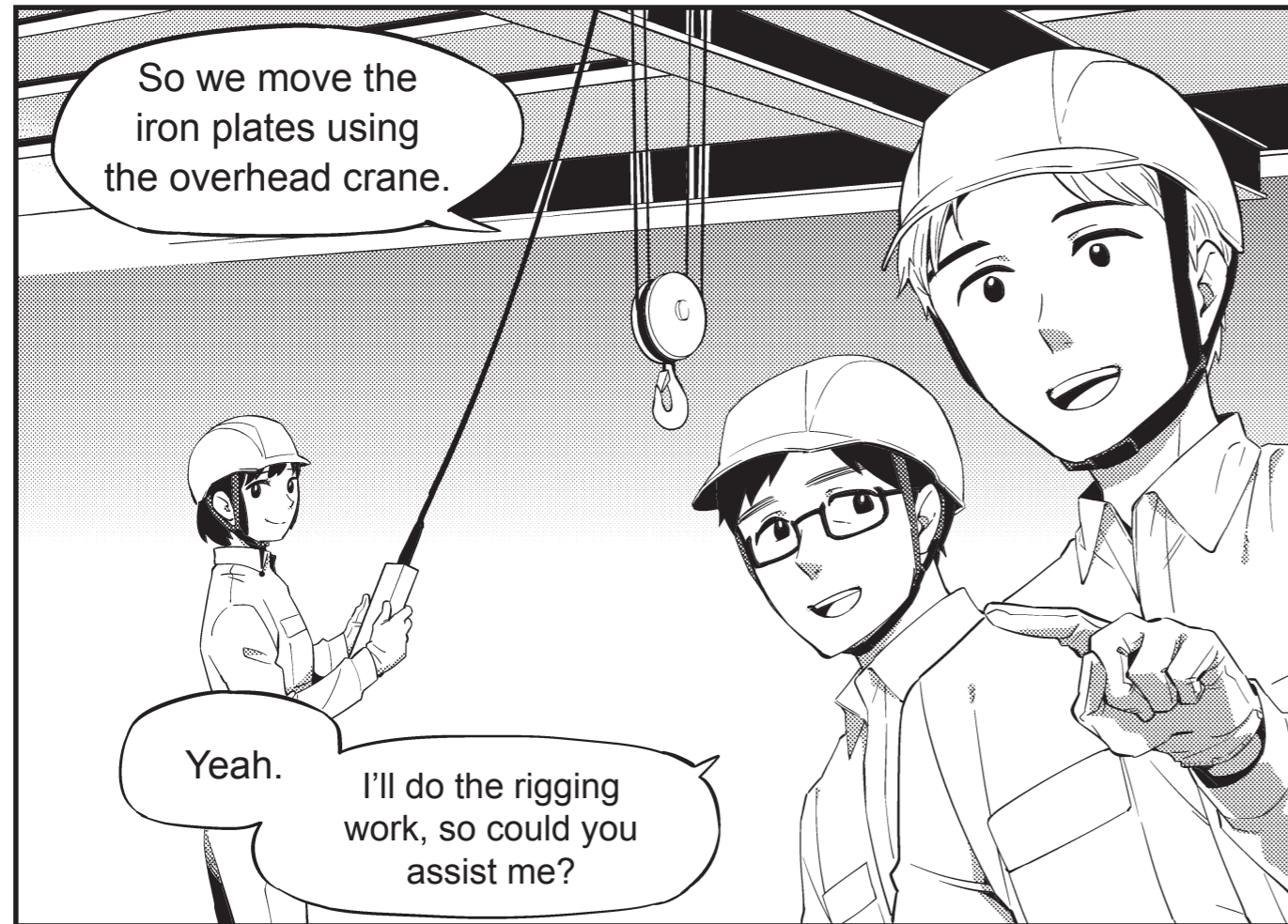
Next, let's learn about accidents which can happen around cranes in operation and rigging work, and how to ensure our safety.

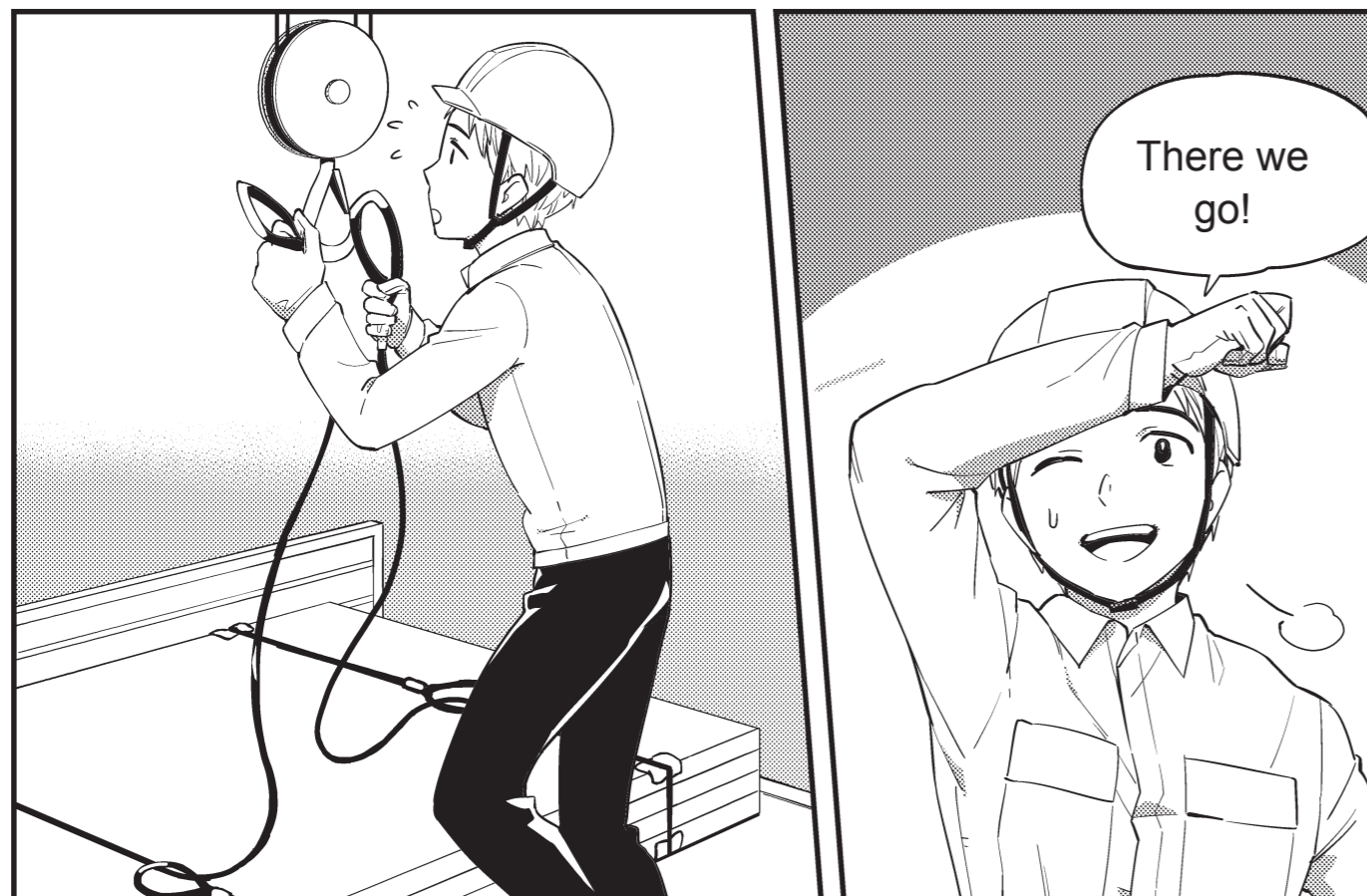
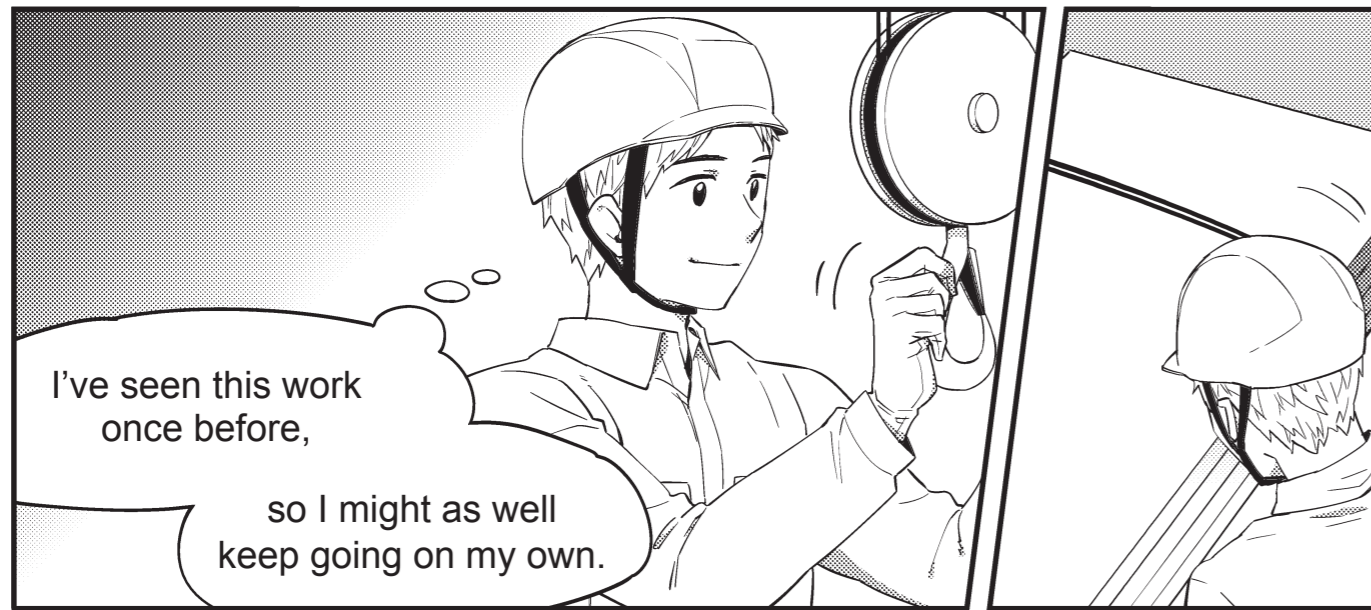


Okay!



CASE 1

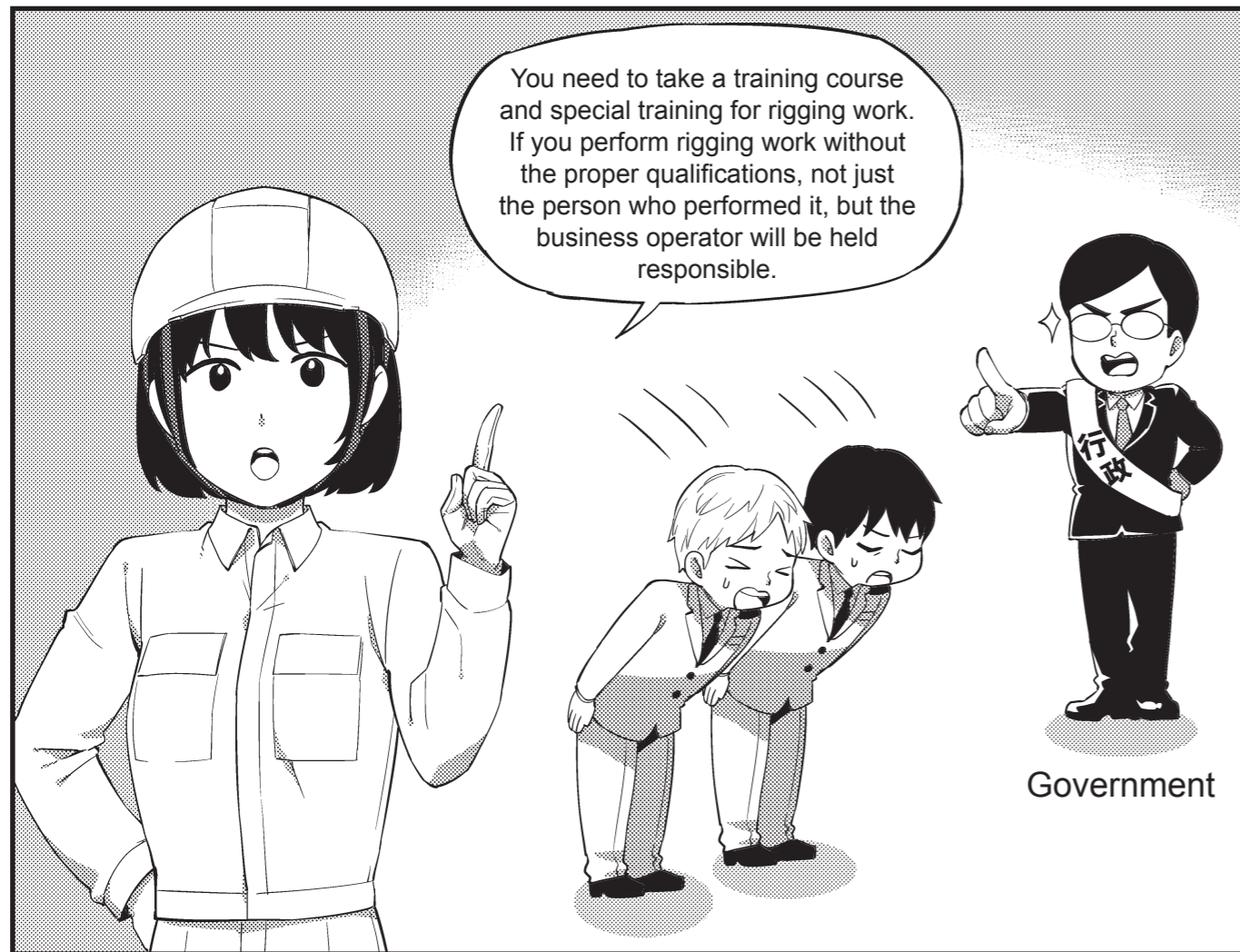






You need a qualification to do this?

Yes.



You need to take a training course and special training for rigging work. If you perform rigging work without the proper qualifications, not just the person who performed it, but the business operator will be held responsible.

Government

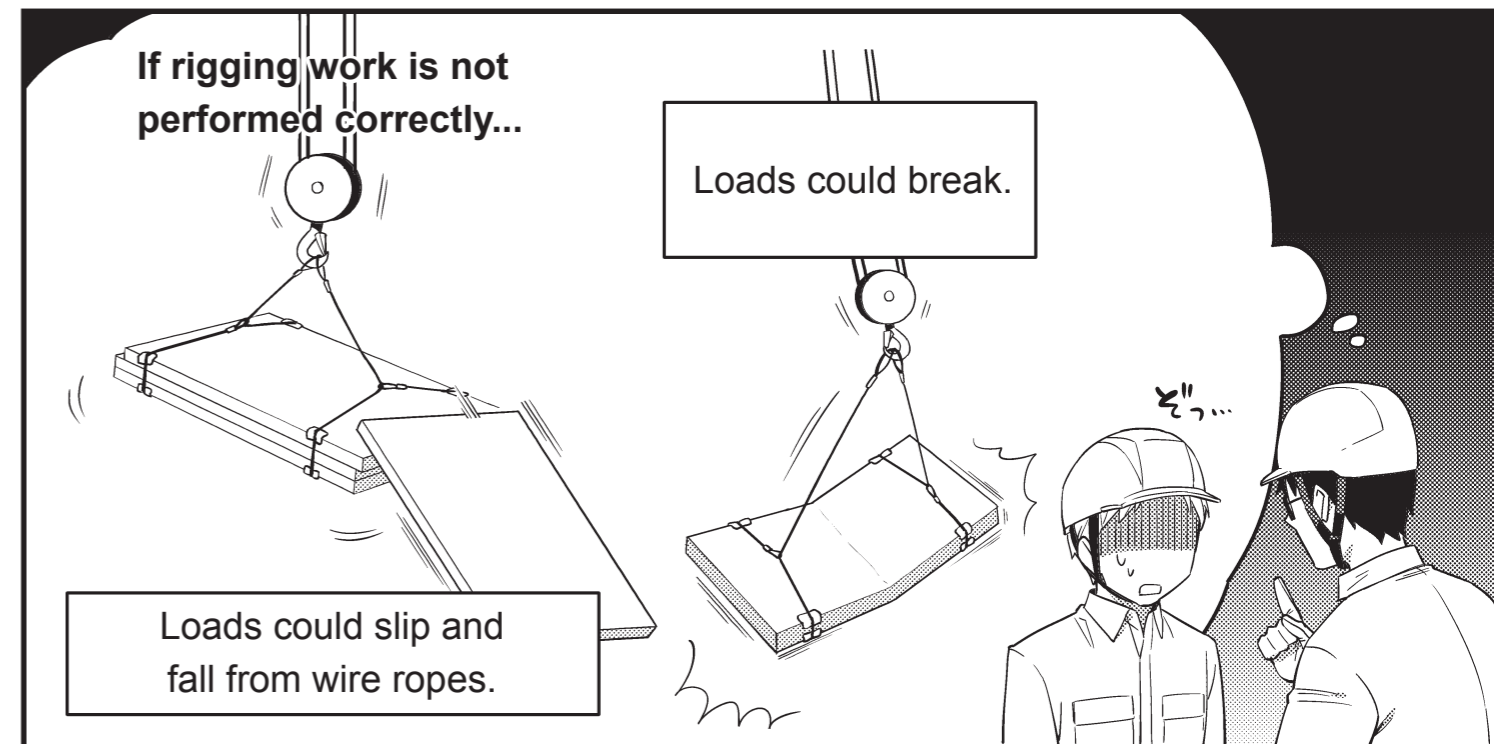


Ah, I see.

Rigging work is a very dangerous task that could lead to a serious accident if one mistake is made.

So not everyone can do it.

If you do it wrong and the iron plates fall, it'd be dangerous, right?



If rigging work is not performed correctly...

Loads could break.

Loads could slip and fall from wire ropes.

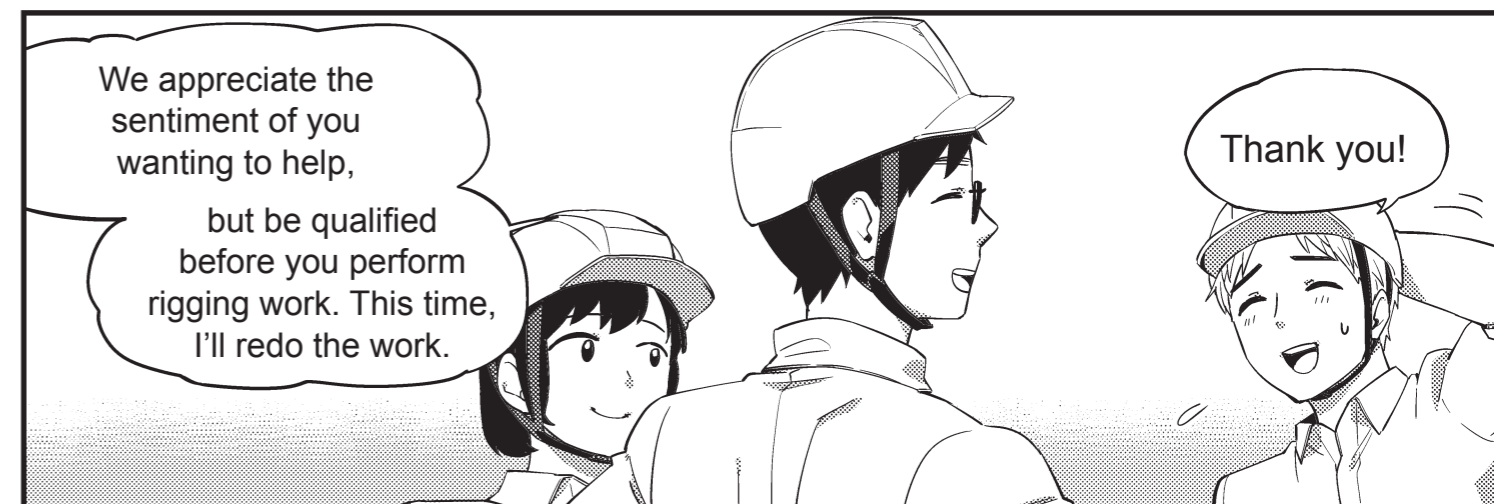


I didn't know... I'm sorry I worked on my own.



Hm? Did something happen?

Yes... I, um...

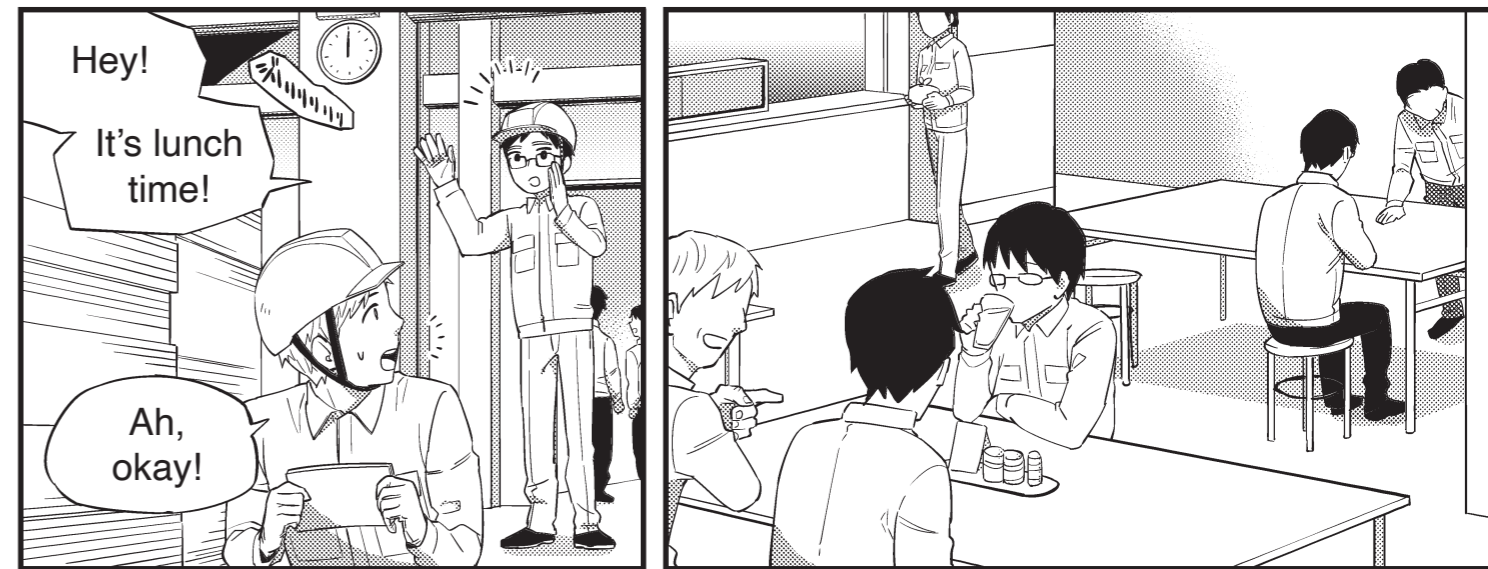
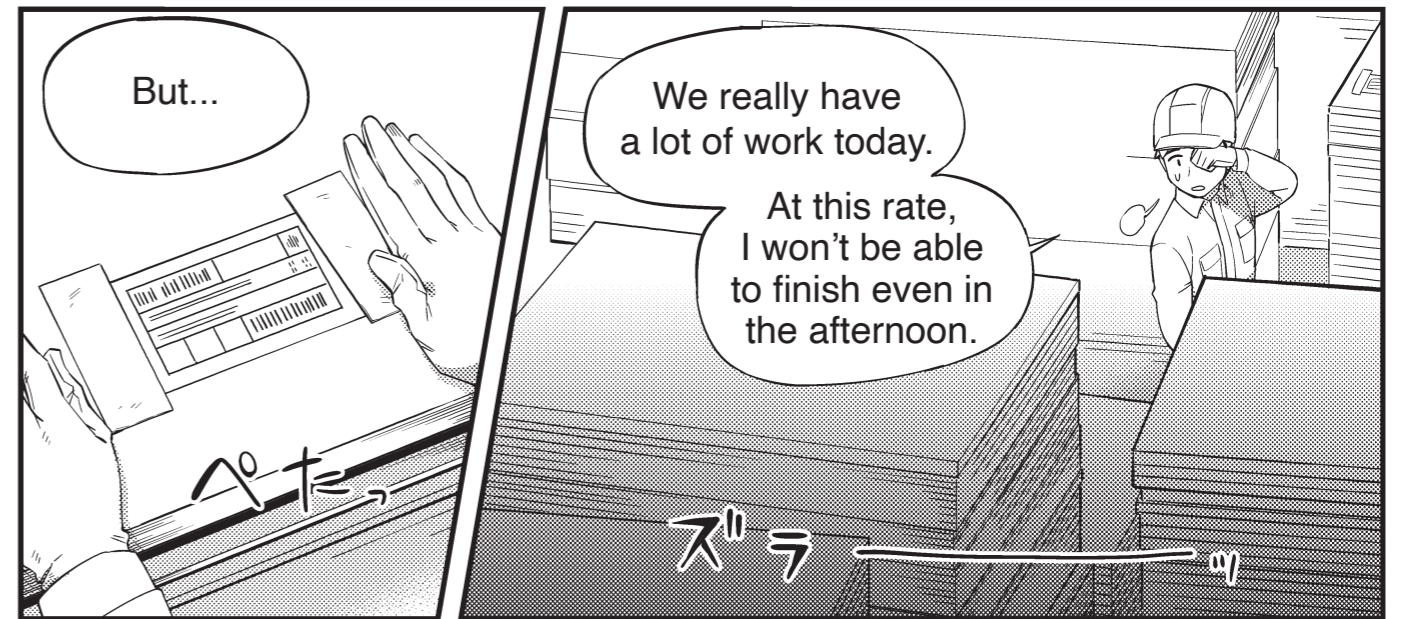
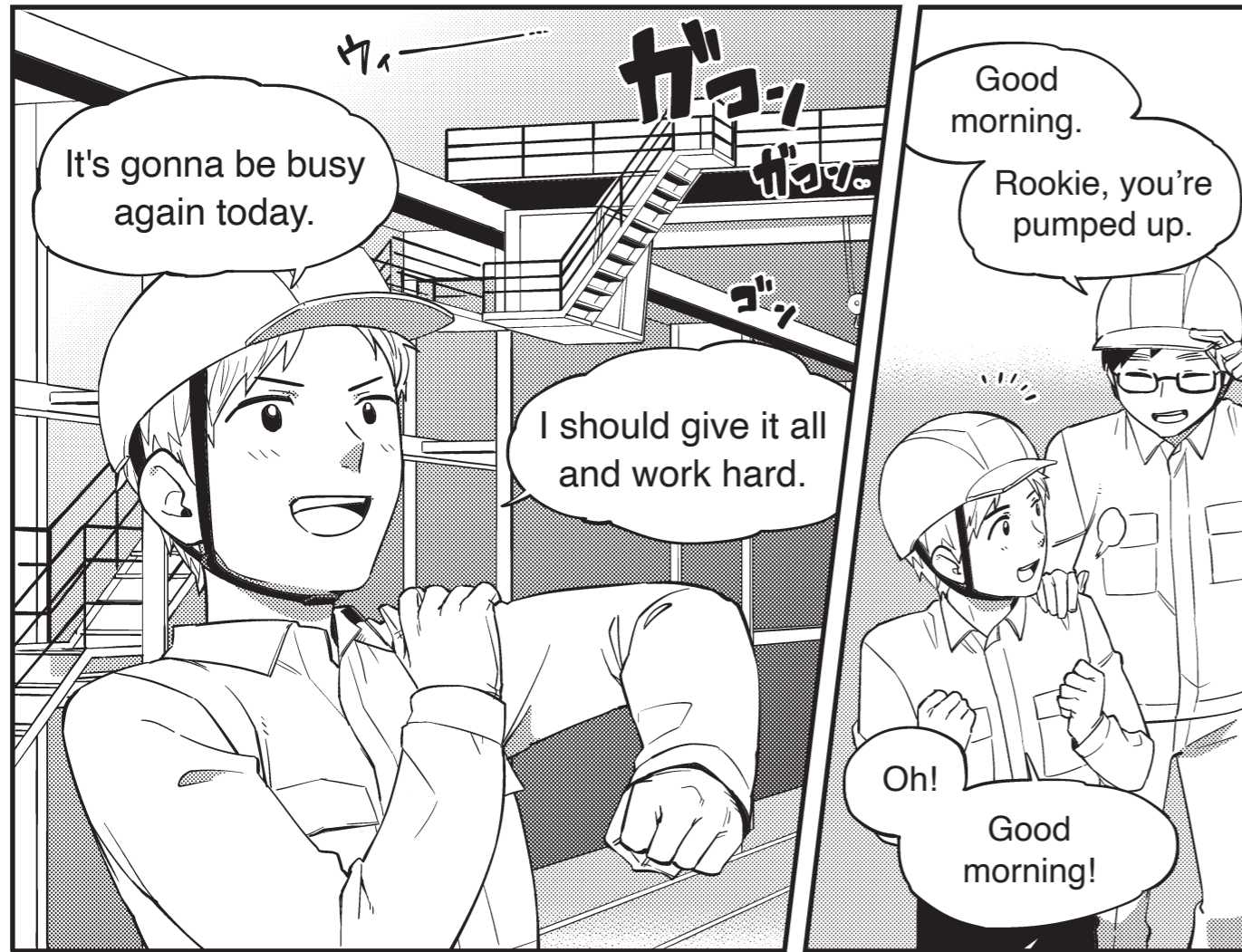


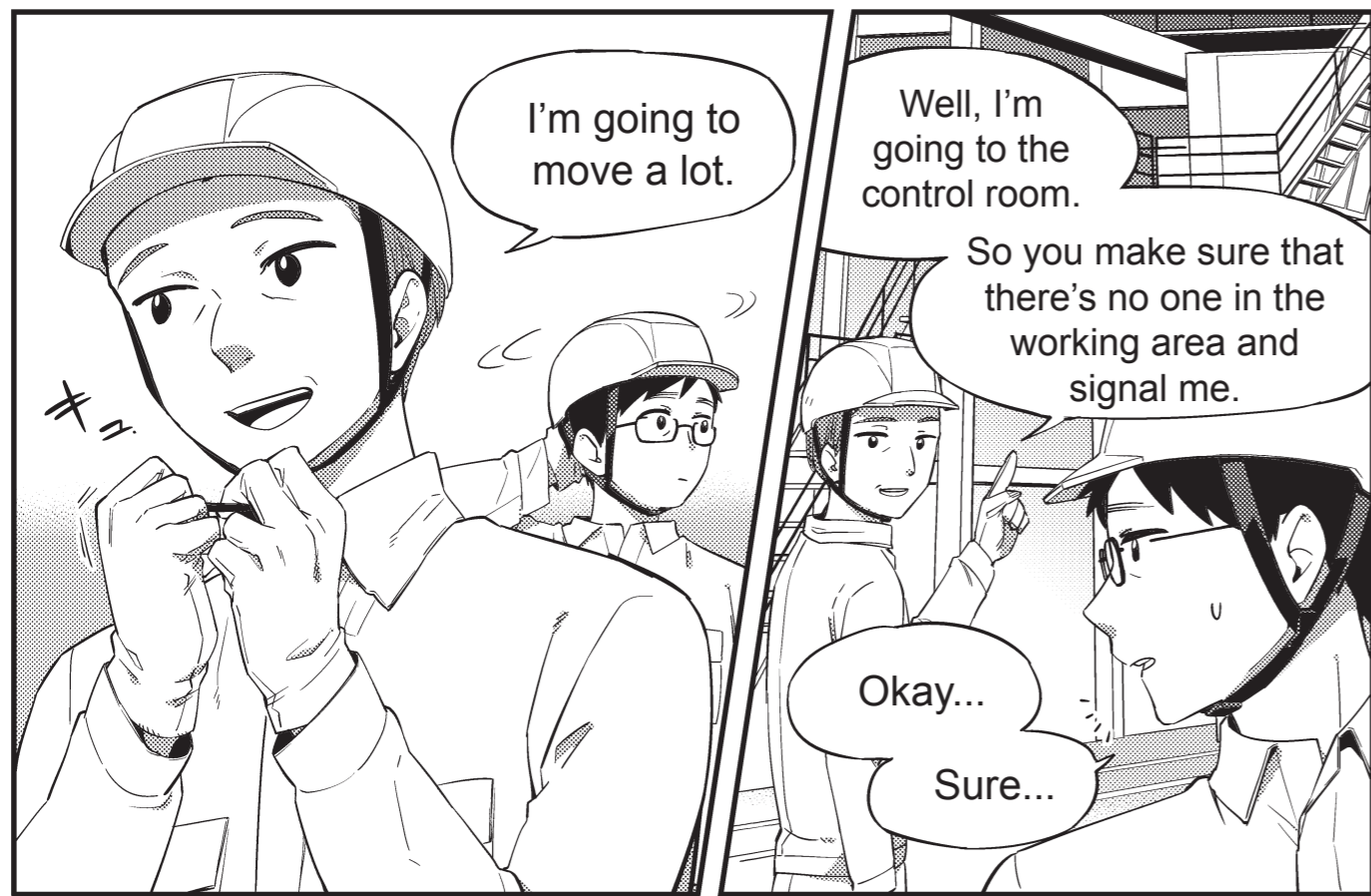
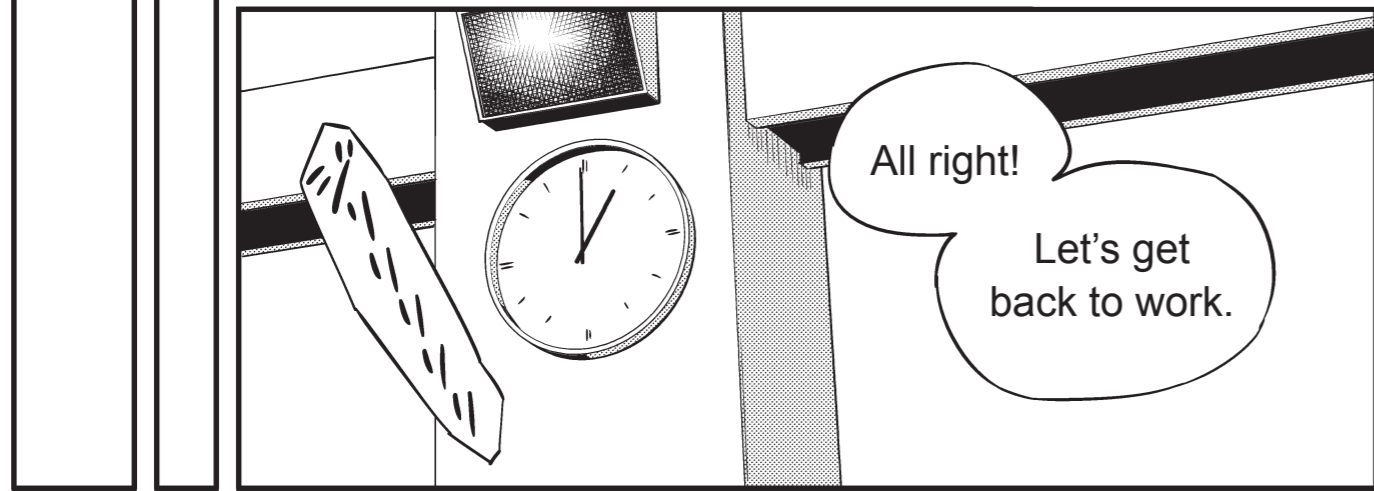
We appreciate the sentiment of you wanting to help,

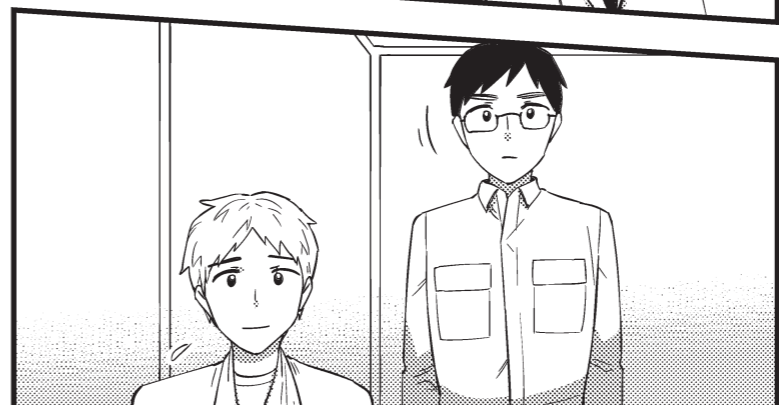
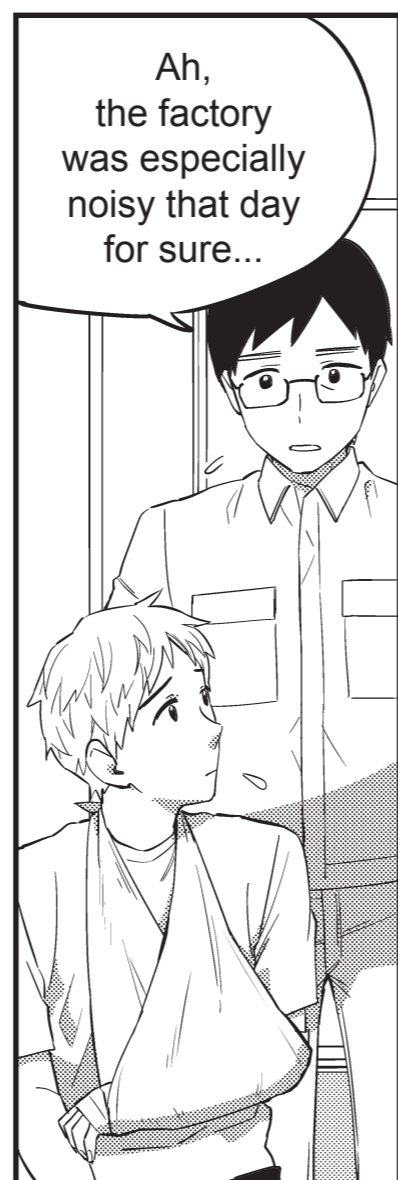
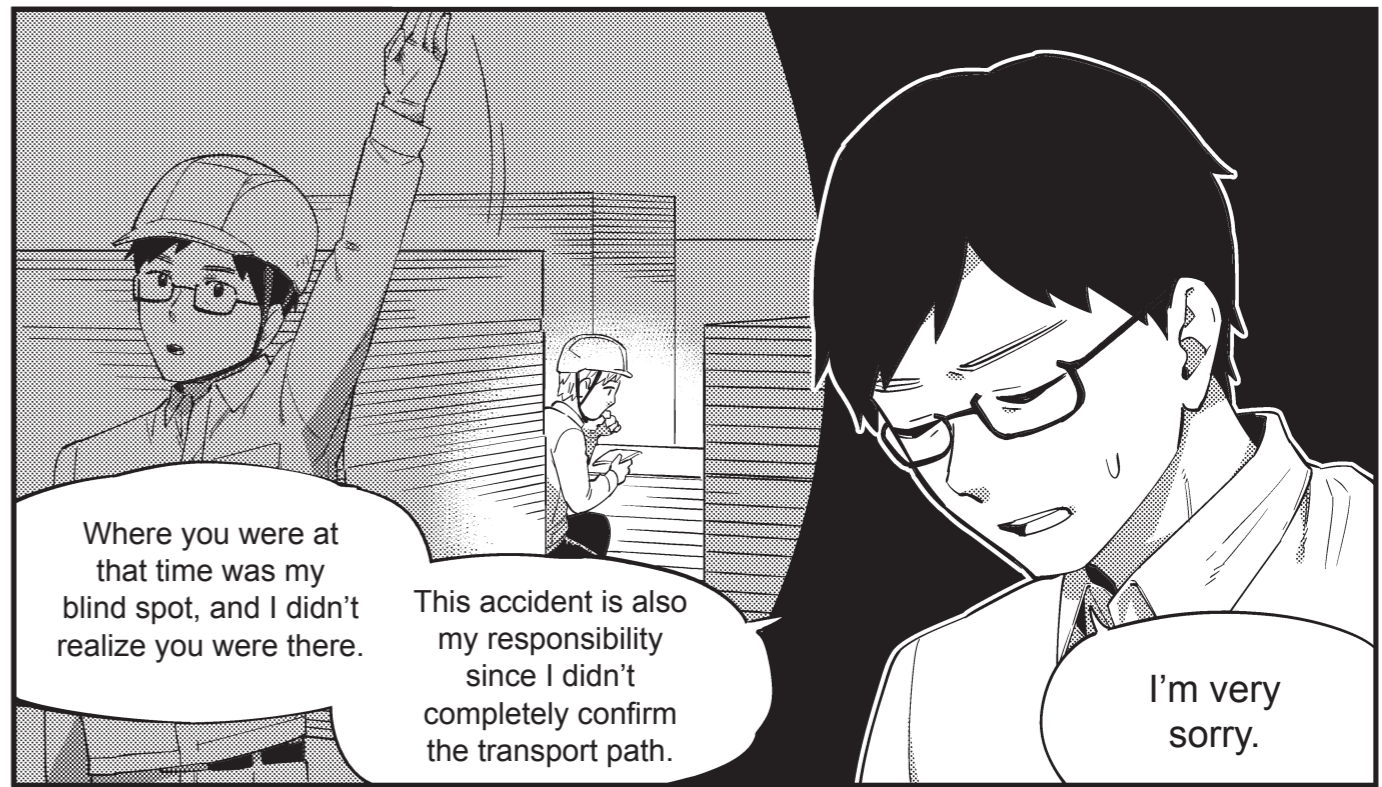
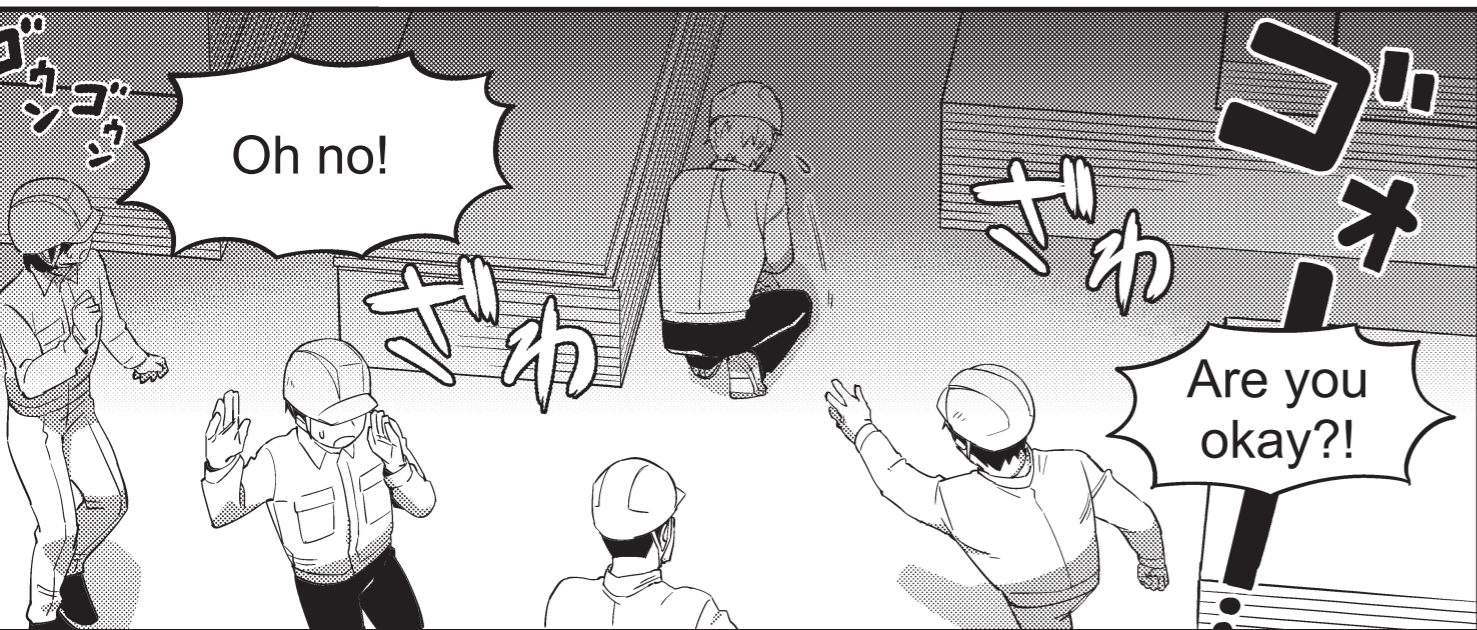
but be qualified before you perform rigging work. This time, I'll redo the work.

Thank you!

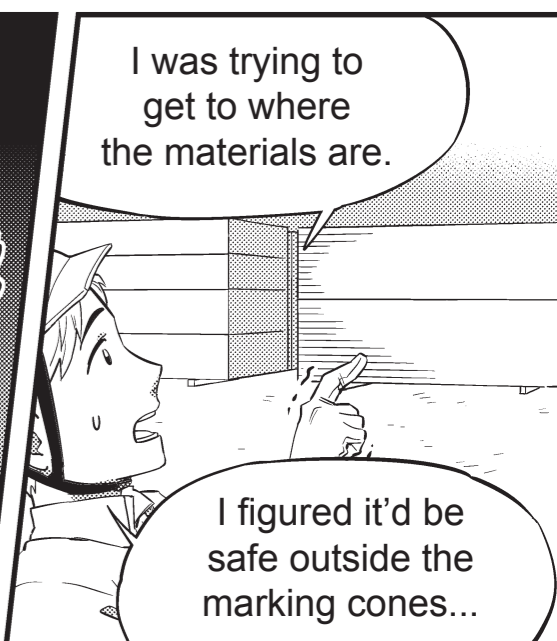
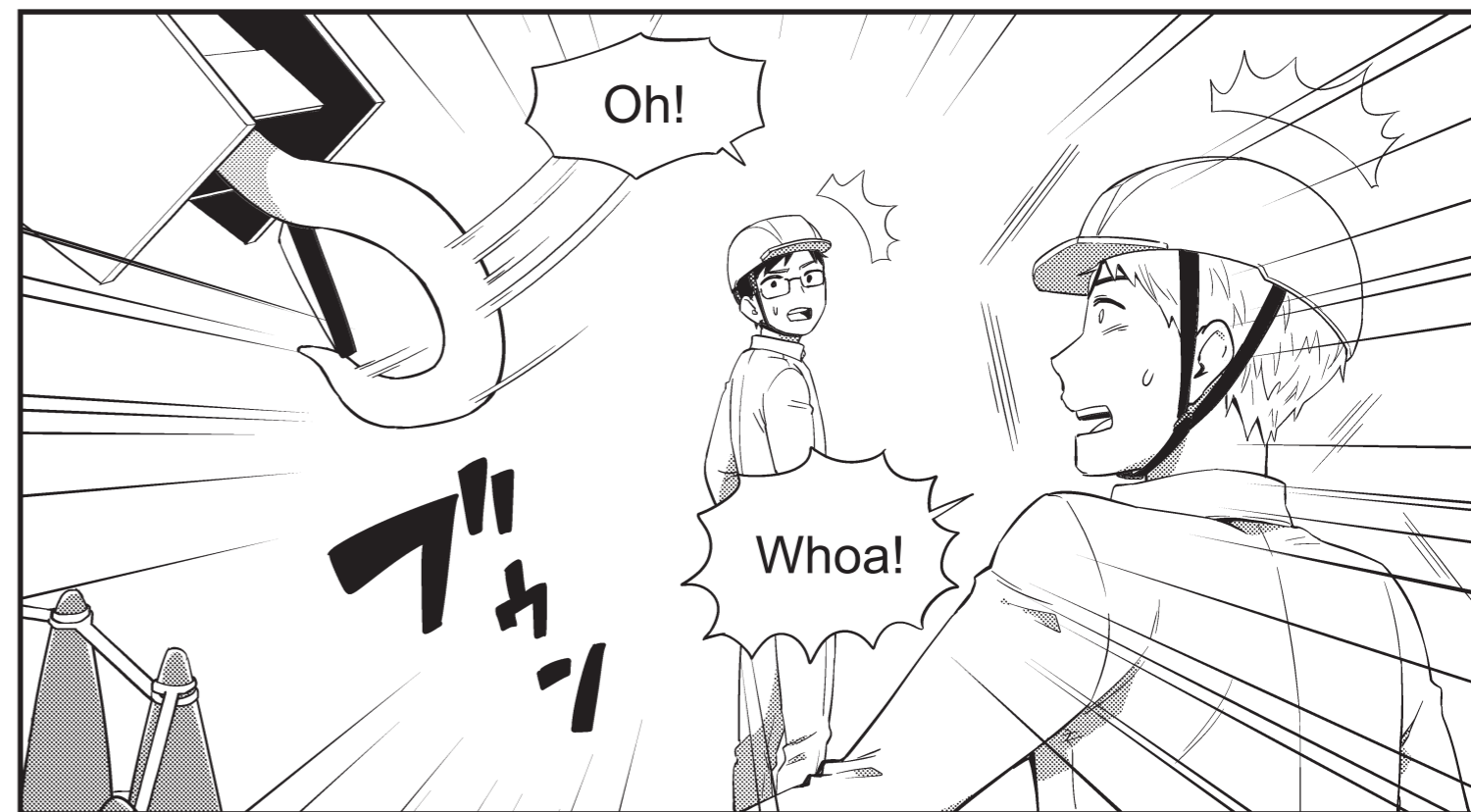
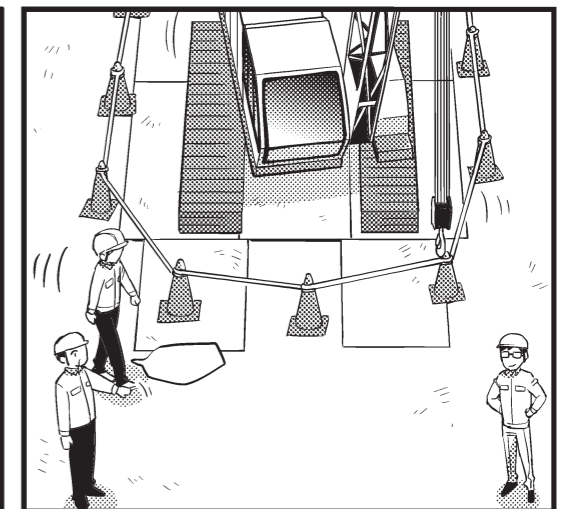
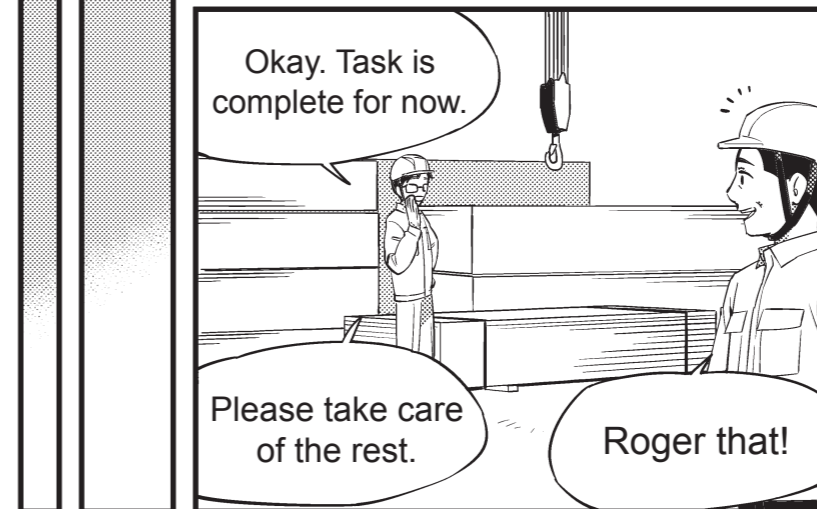
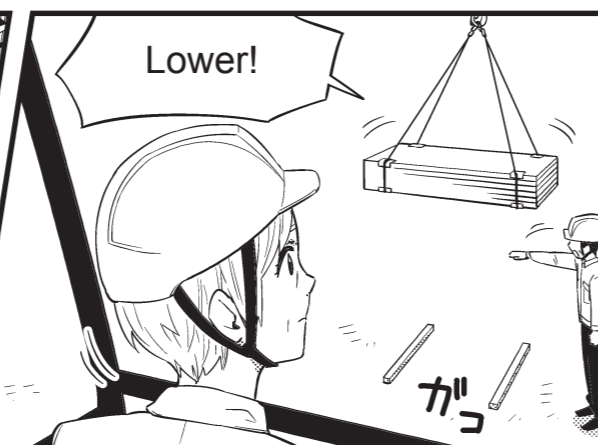
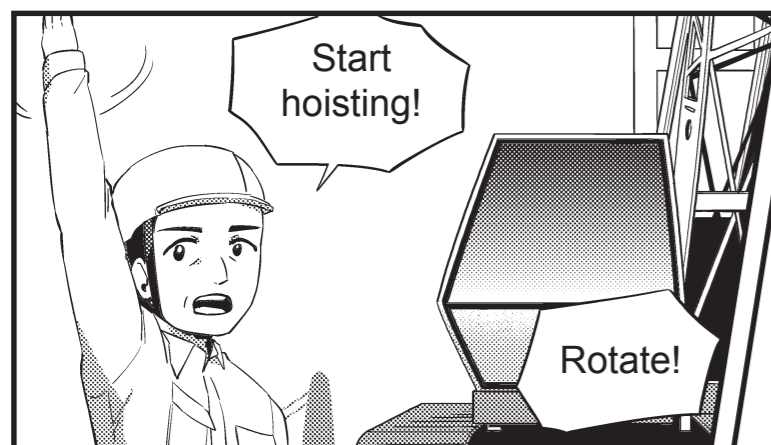
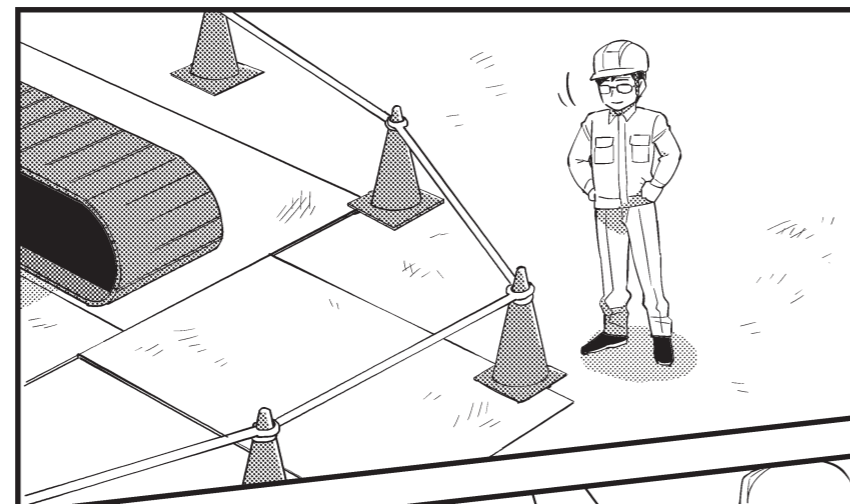
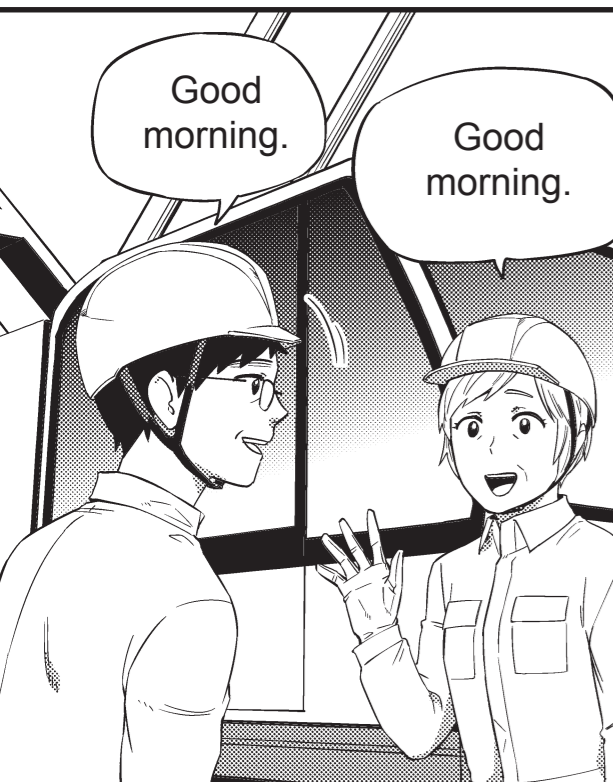
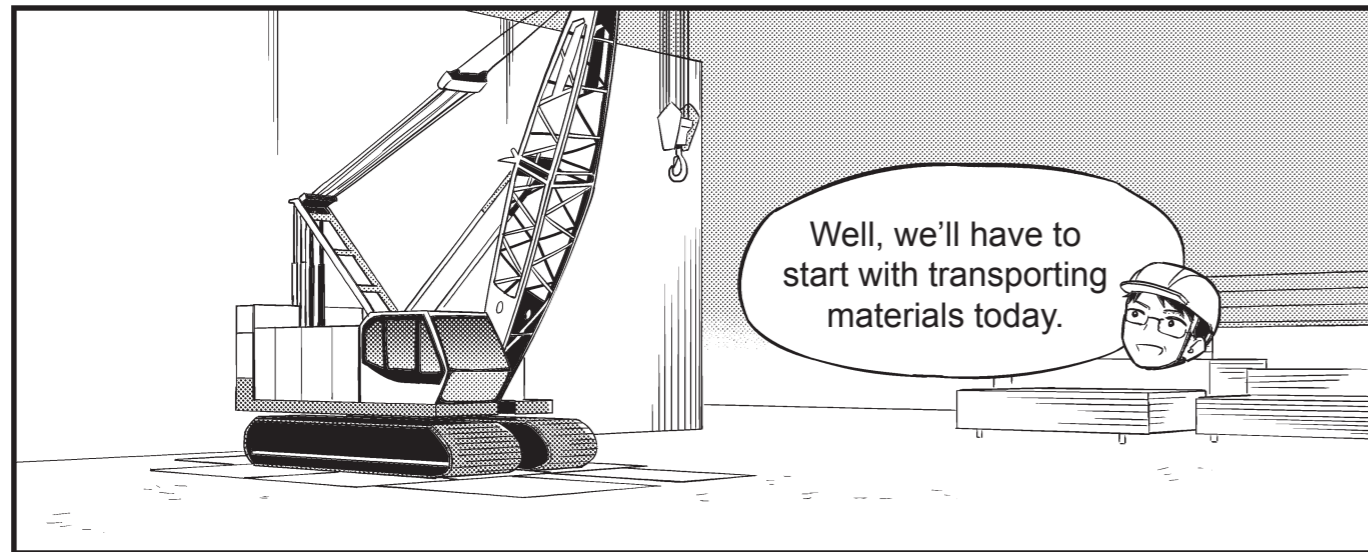
CASE 2

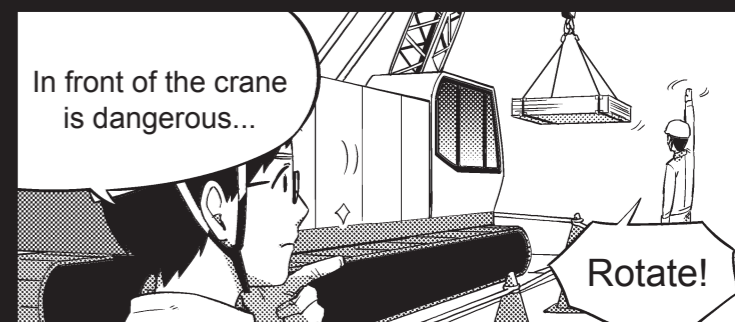
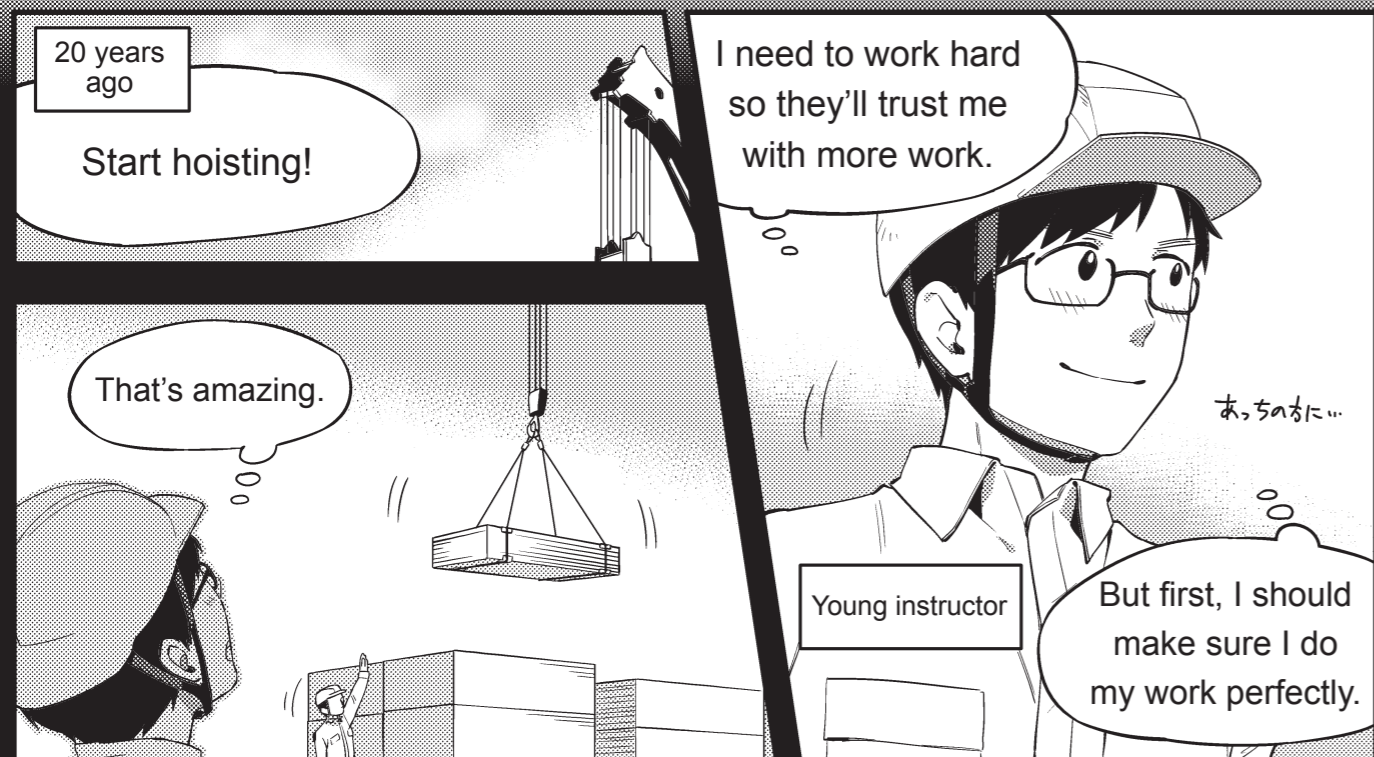
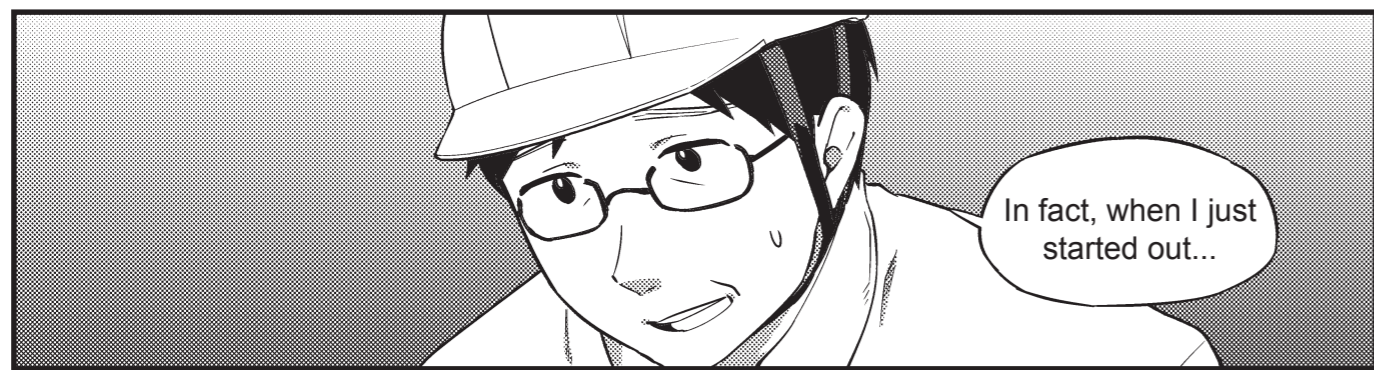
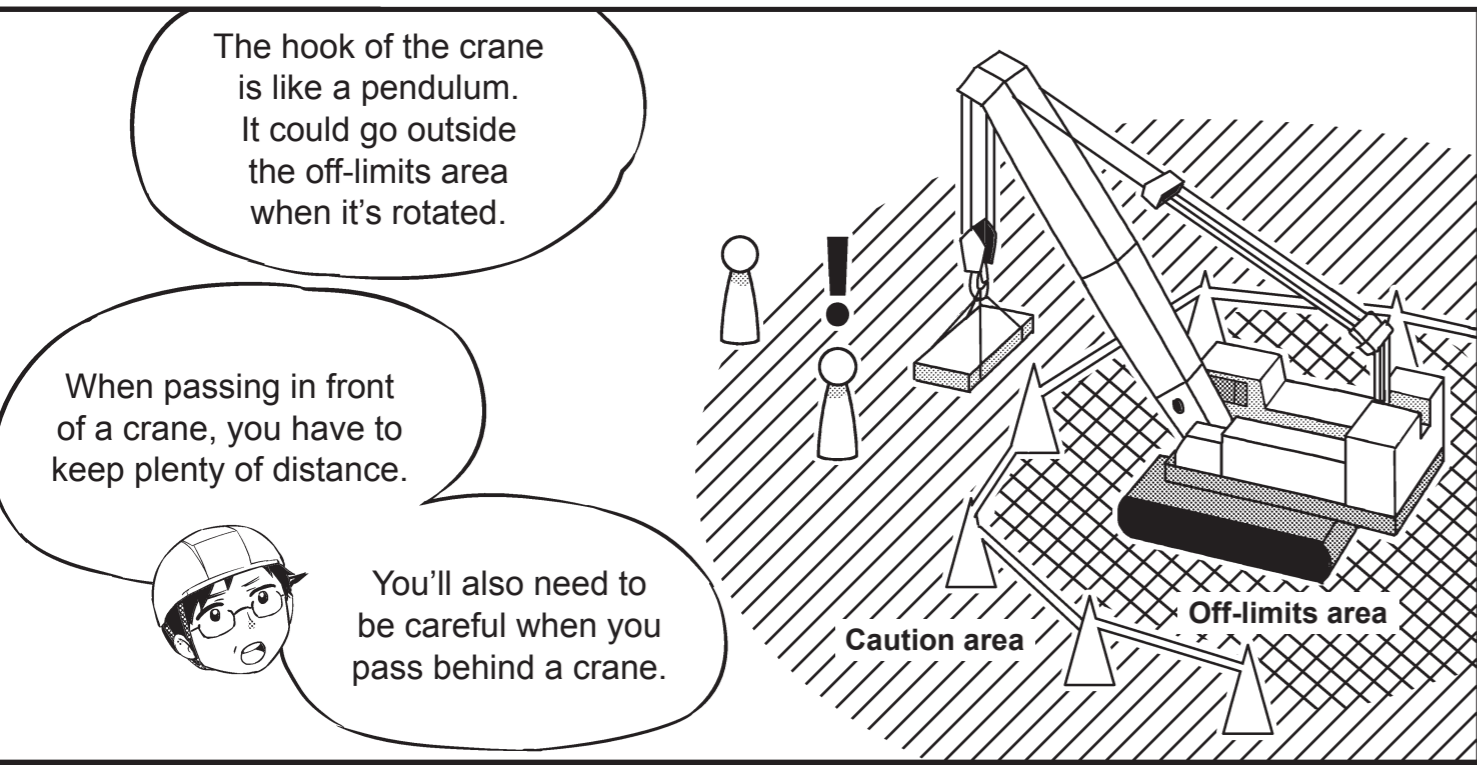


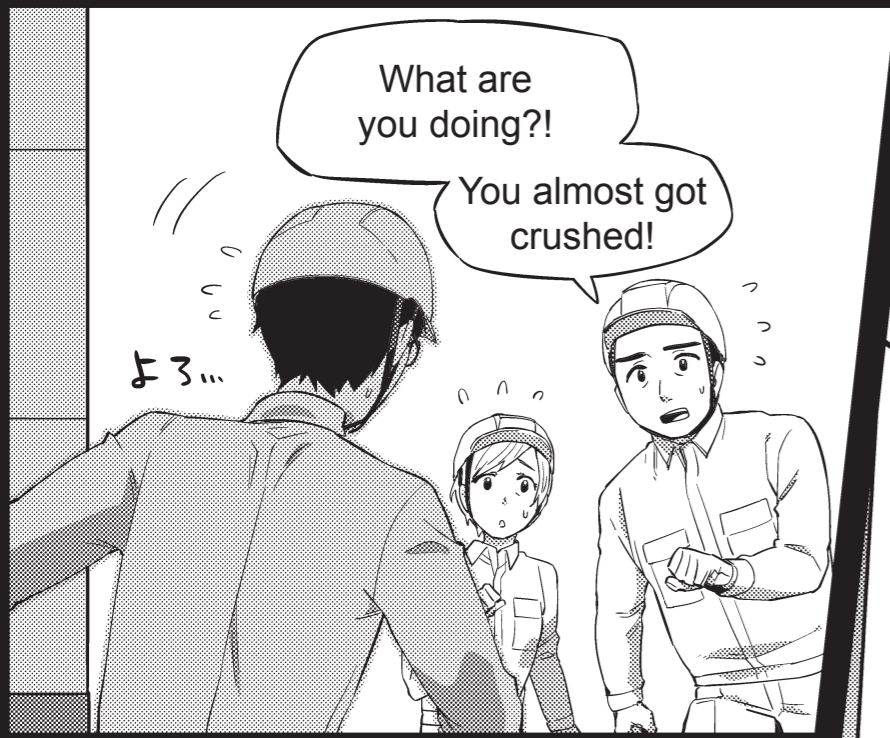




CASE 3



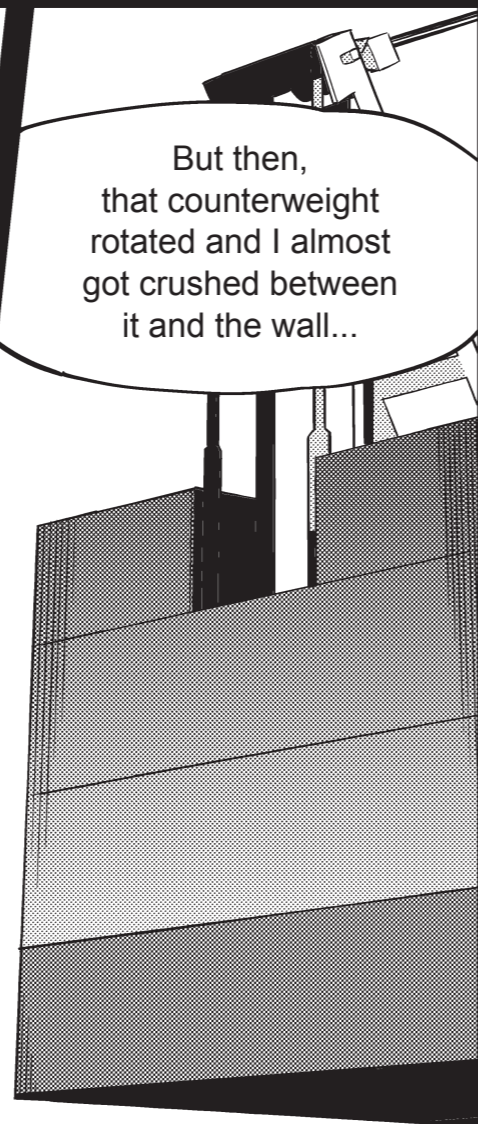




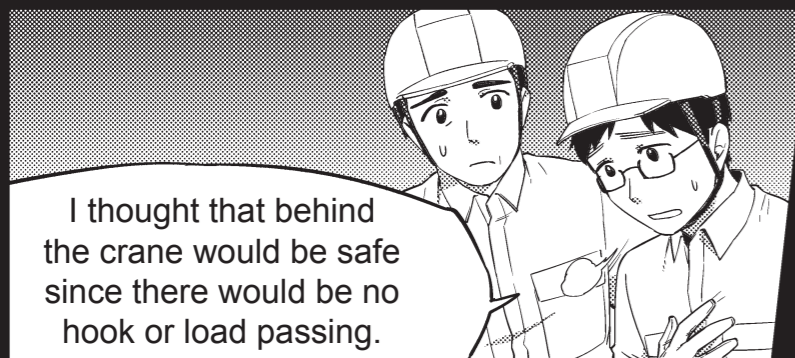
What are you doing?!

You almost got crushed!

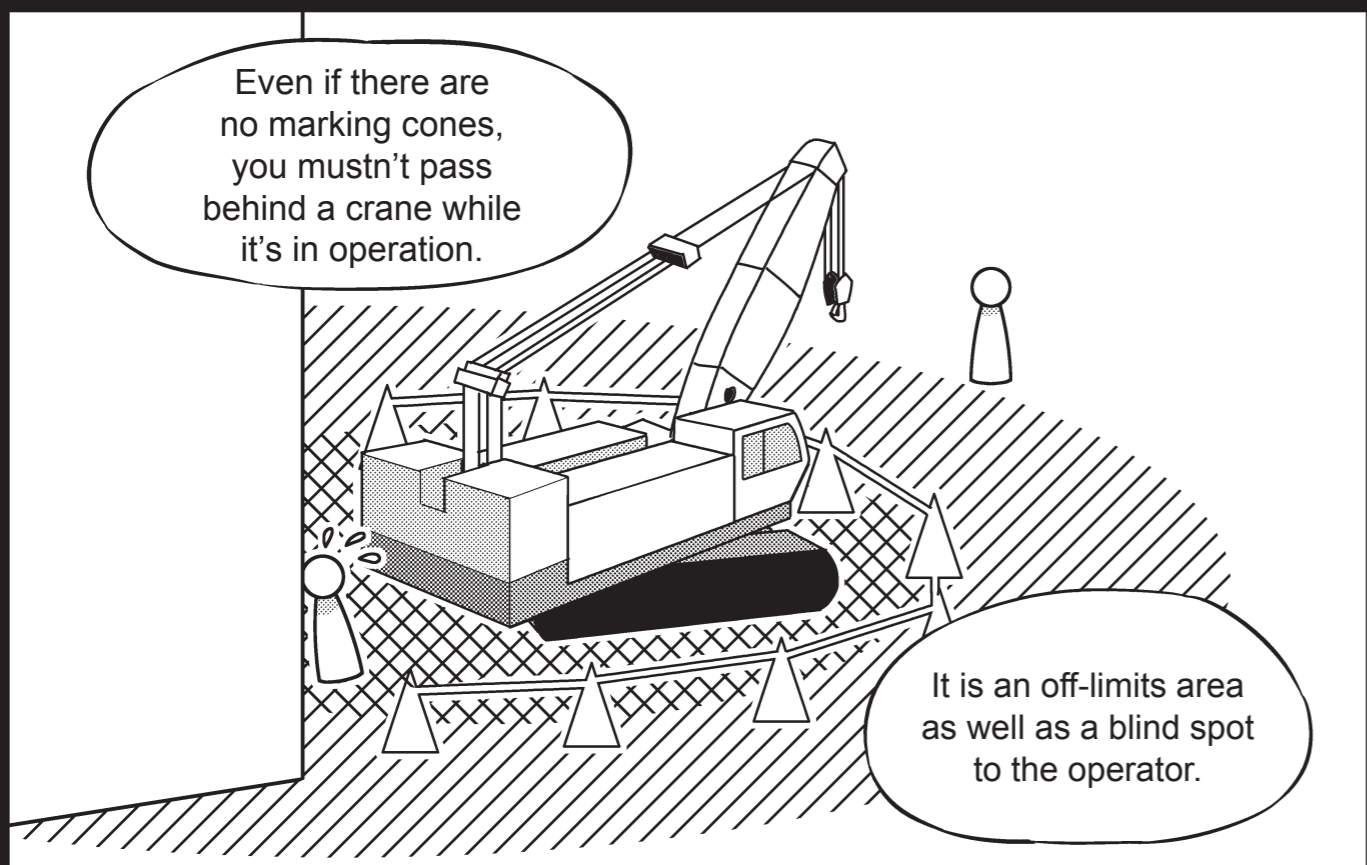
♪ 3...



But then, that counterweight rotated and I almost got crushed between it and the wall...

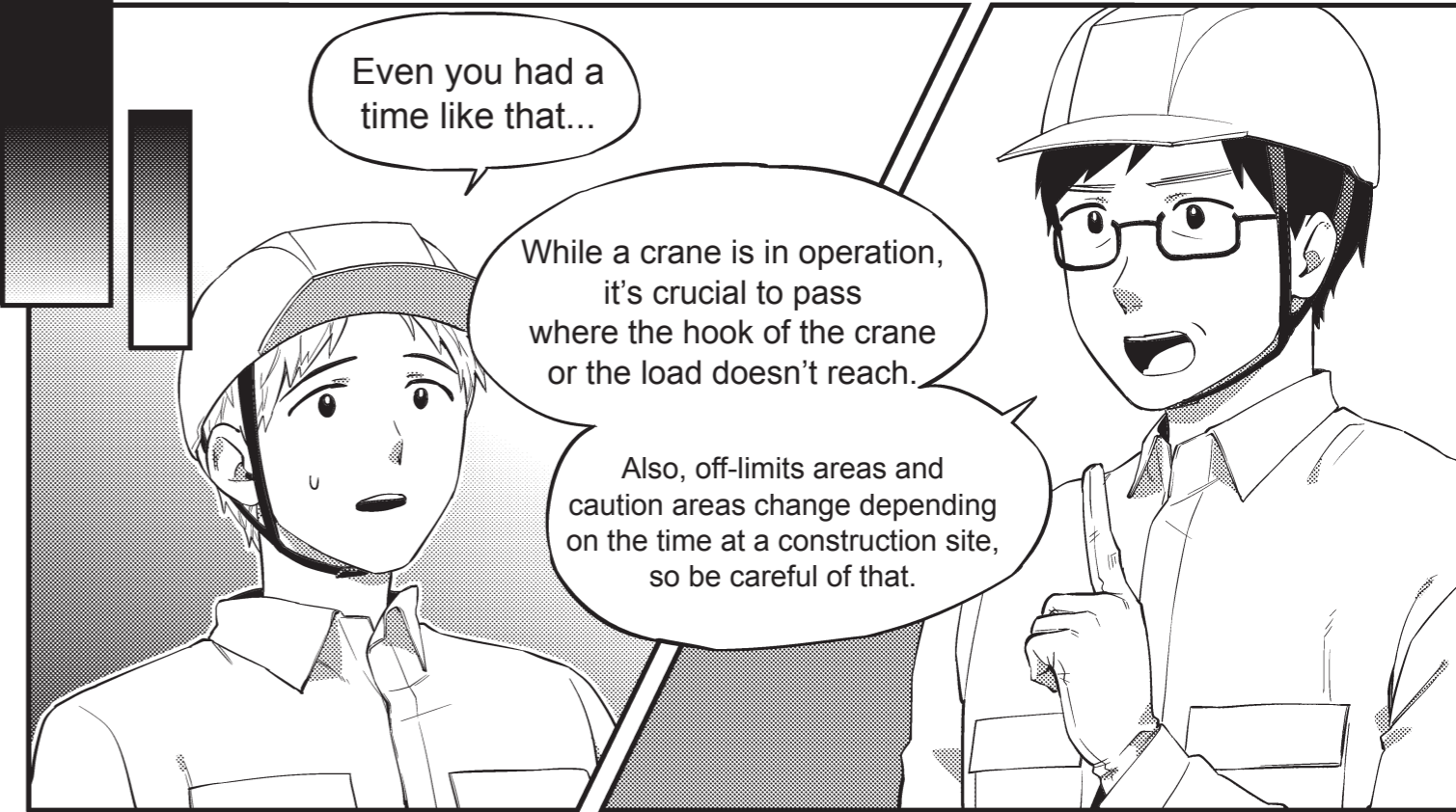


I thought that behind the crane would be safe since there would be no hook or load passing.



Even if there are no marking cones, you mustn't pass behind a crane while it's in operation.

It is an off-limits area as well as a blind spot to the operator.



Even you had a time like that...

While a crane is in operation, it's crucial to pass where the hook of the crane or the load doesn't reach.

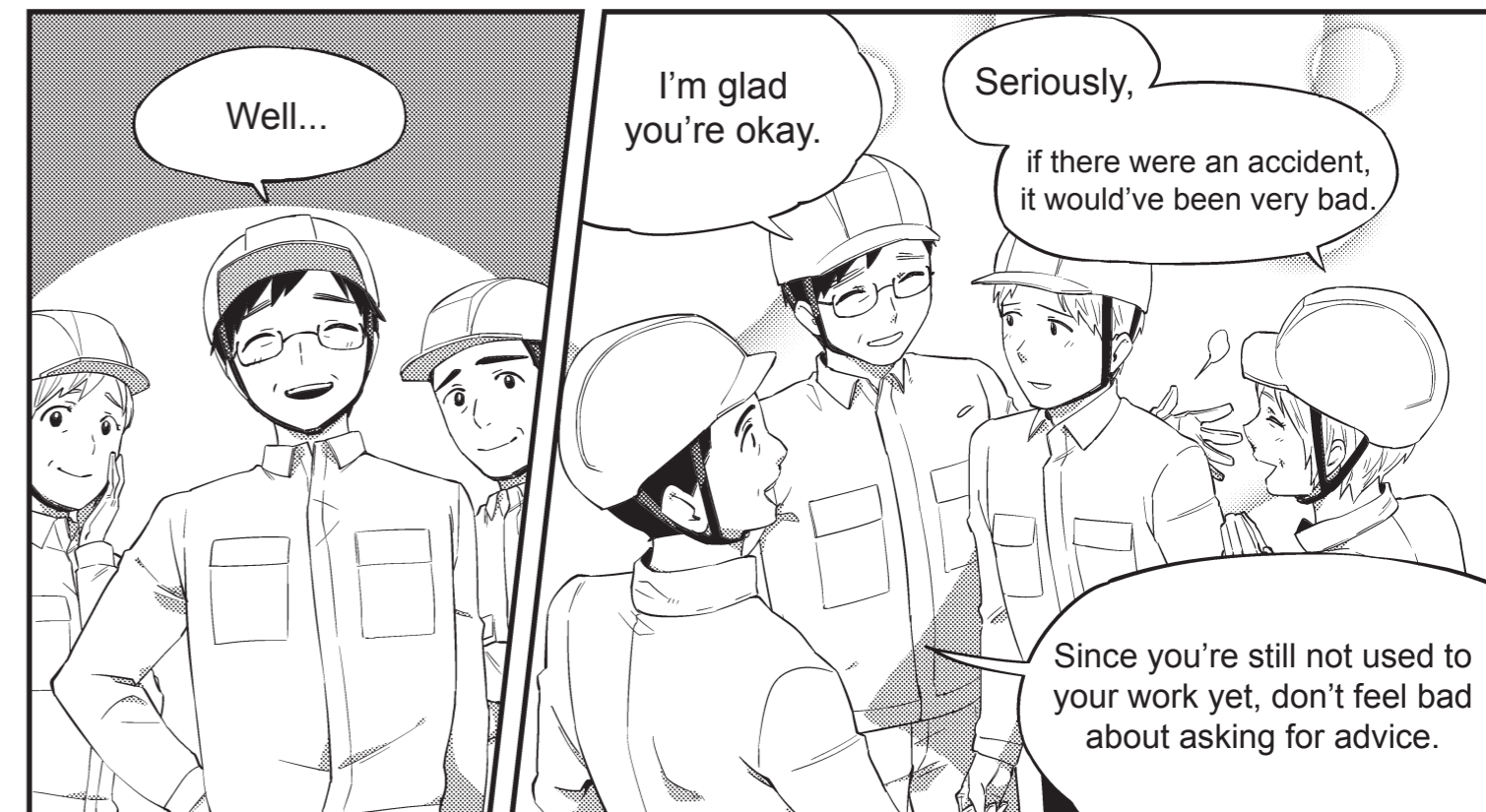
Also, off-limits areas and caution areas change depending on the time at a construction site, so be careful of that.



It's somewhat nostalgic isn't it?

The rookie from back then is now teaching people.

Hehehe... Thank you for your instructions back then.

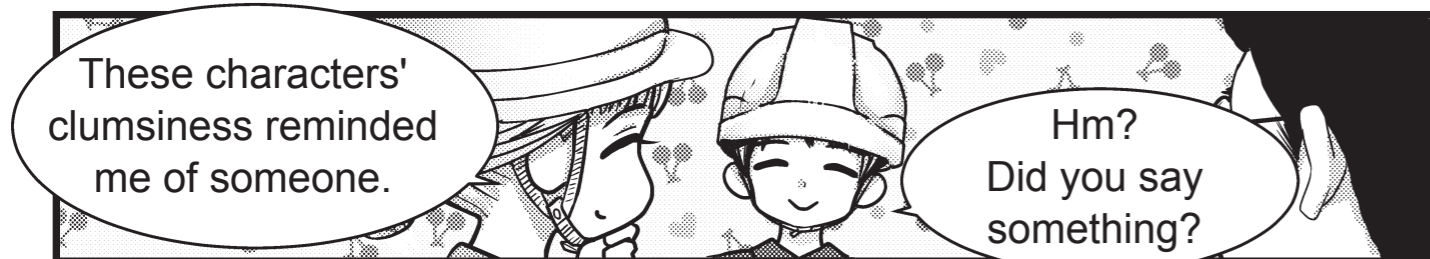
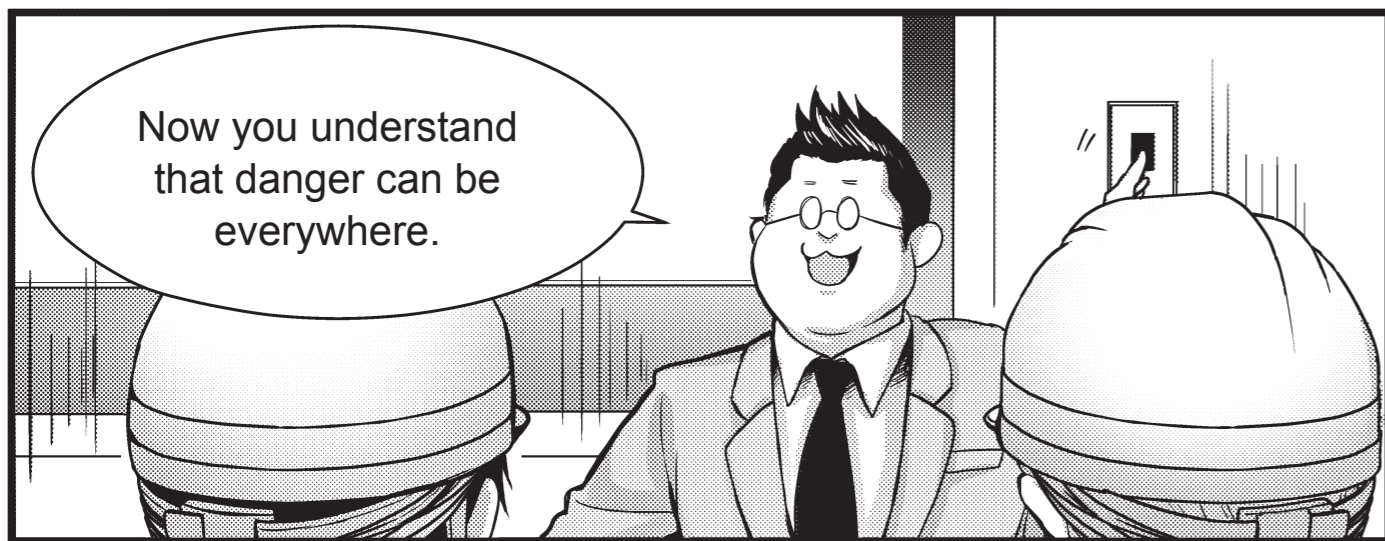


Well...

I'm glad you're okay.

Seriously, if there were an accident, it would've been very bad.

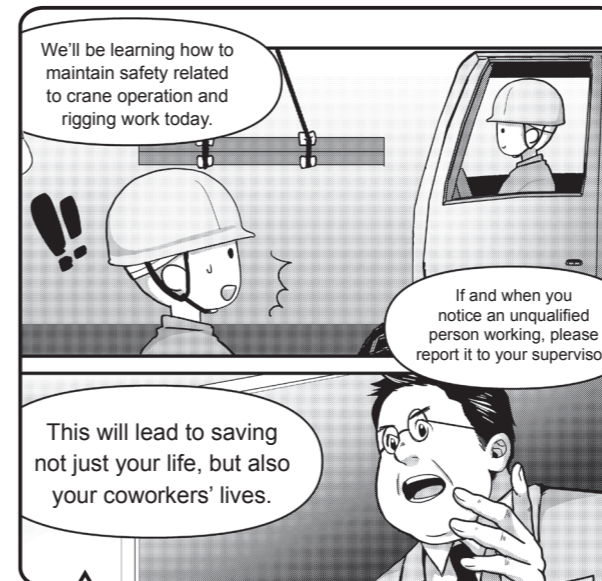
Since you're still not used to your work yet, don't feel bad about asking for advice.



Precautions to remember in crane operation and rigging work



1 Do not operate a crane or perform rigging work without the proper qualifications.



Crane operation requires either a license, training course, or special training depending on the load capacity.



Rigging work also requires either a training course or special training depending on the load capacity.

2 Do not go inside off-limits areas or the traffic line of a load.



Watch out for the movement of the crane, and do not get in the traffic line of the load.

Industrial injuries could happen to anyone.

It's important to remember that abiding by the rules is for the sake of protecting your physical health, family, and life.

Daily communication at a workplace is also important in case something happens.

Okay! I'll follow the rules and work hard every day!

Learn through pictures

Know the dangers that can be found within the workplace!

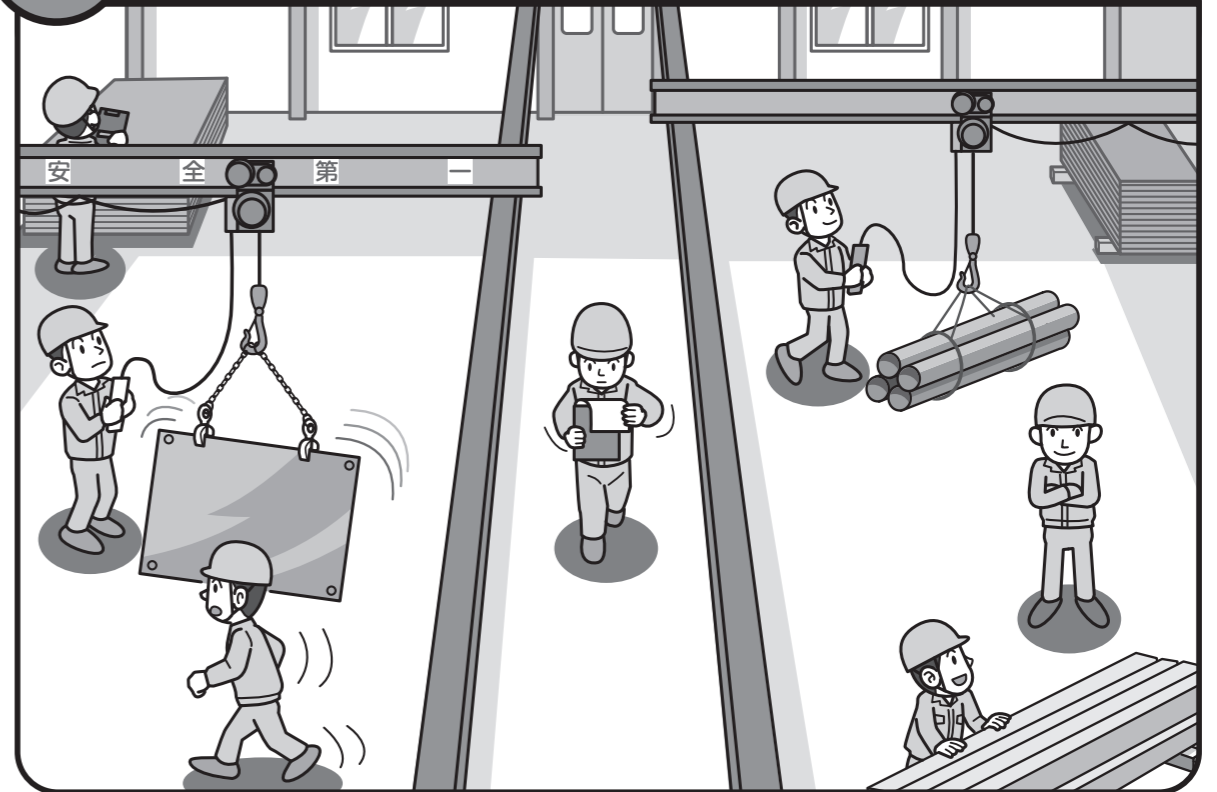
Hazard Awareness Training

(Kiken Yochi Training/KYT)

Part 1

Q

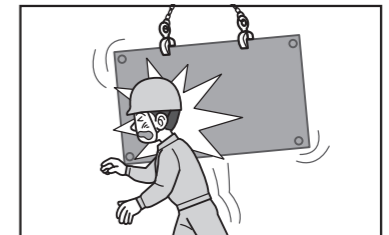
Spot where the hazards are!



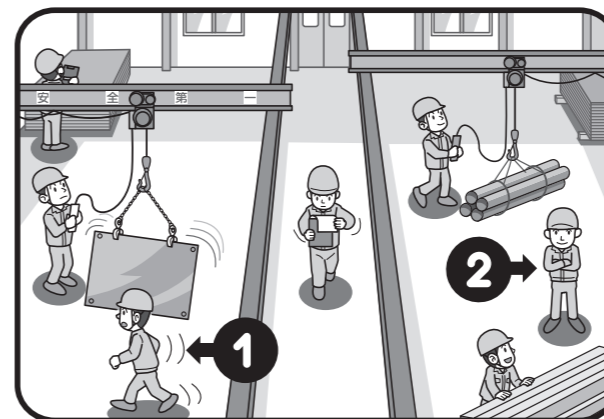
A

These are the hazards!

1 Do not get in the traffic line of the load.



2 Do not get close to the load.



Think carefully and see if you can spot any other possible hazards.

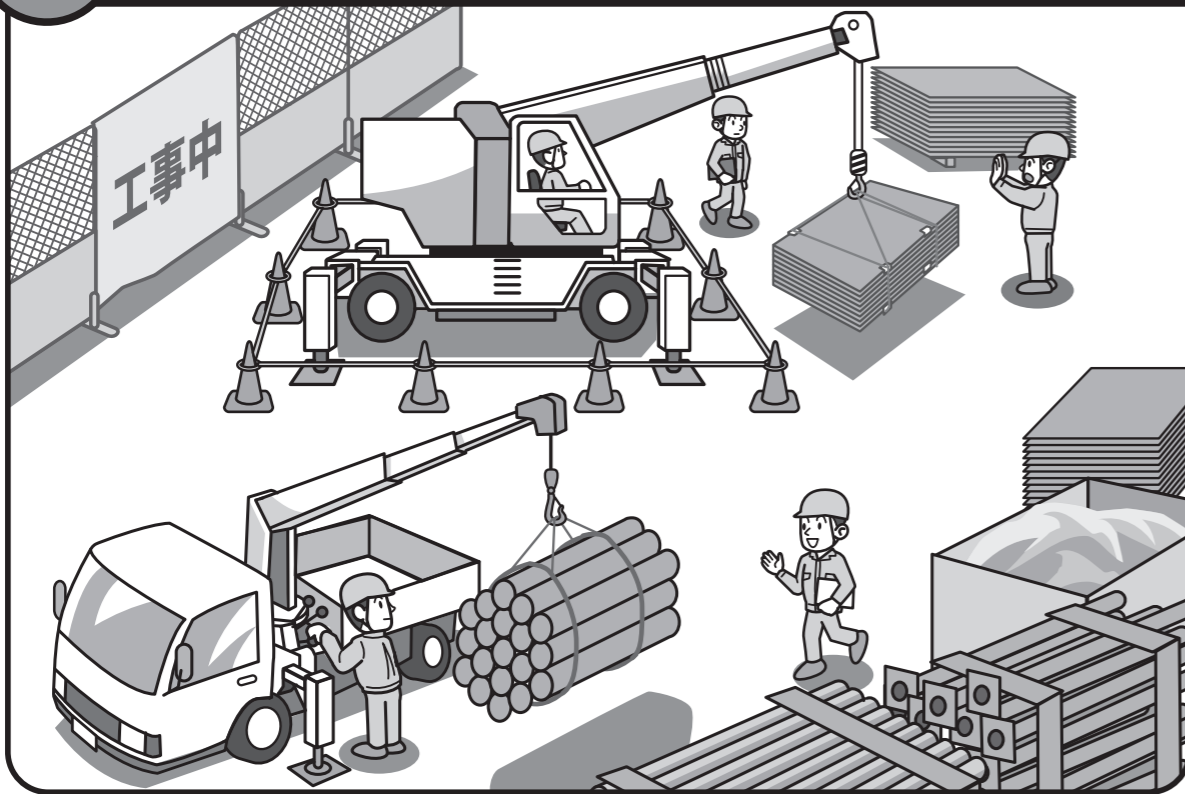
Know the dangers that can be found within the workplace!

Hazard Awareness Training

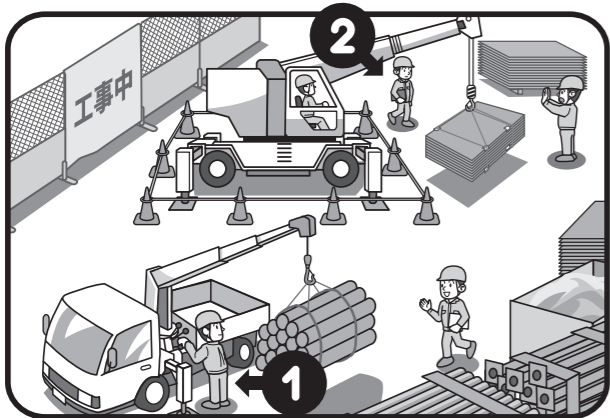
(Kiken Yochi Training/KYT)

Part 2

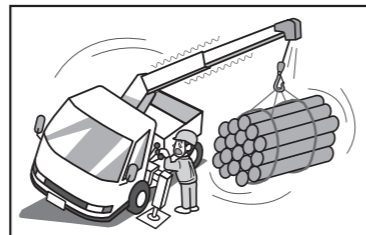
Q Spot where the hazards are!



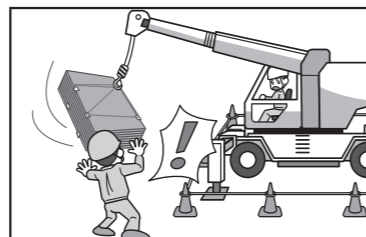
A These are the hazards!



1 If it looks dangerous, keep away.



2 Do not pass under the load or jib.



Think carefully and see if you can spot any other possible hazards.

Learn through Manga

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