

"SUBWAY FIRE PROTECTION MEASURES"

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Learns from the subway fire which occurred in Daegu city in Korean and so on.

"SUBWAY FIRE MEASURES"

Little before 10 am February 18th, 2003, big subway fire which occurred at the subway central station Deagu city in Korean became the major disaster which lets out the dead person who burns down about 200 persons in 12 subway vehicles and the station building.

It was the fire which occurred on the prolongation of a series of incendiary fires that this fire scattered the combustible liquid which occurs recently in world every country and that it sets the fire by it.

The incendiary means of scattering gasoline is imitation of the incendiary fire such as the jewelry shop fire died six persons which occurred in Utsunomiya City Japan 2000, the financial institution fire died five persons which occurred in Hirosaki City Japan 2001, the Internet cafe fire died 24 Persons which occurred in Beijing city China 2002 .

Also, it thinks that the incendiarism to aim at large-scale fire prevention objects by combustible liquid was the imitation of the World Trade Center Building Fire with about 3000 deaths in New York U.S.A. and that it is the imitation of the sarin poisons case which occurred in Tokyo Japan 1995 that made so-called " subway " a target.

Arson by gasoline have been occurred after Deagu city subway fire in the world, too.

The 8th floors building fire which occurred in Nagoy city in Japan on September 16th, 2003 will be fire to have copied an incendiary means.

Then I propose the following subway fire measure based on the result and the other subway fire case which investigated the subway fire as a member of investigation about Deagu City Subway Fire in Korea in the Construction Traffic Department of Surface Transportation Bureau the committee and so on.

Learns from the Deagu city subway fire

In Japan, the train fire occurred in the corporation subway Hibiya line in 1968 and the train fire occurred in old Japanese National Railway Hokuriku tunnel in the occurrence, in 1972. In the opportunity of that these train fires occurred, it lectured to the measure which improves the performance of the fire prevention of the material and the equipment of the upholstery, the exterior, the floor, the seat of the vehicle which

contains a subway and so on and as for the underground station, the incombustible of the structure and the interior material of the facilities such as the station building or the installation of the smoke discharge facilities and so on were strengthened.

After the incombustible of the vehicle, the facilities and so on strengthen a fireproofing measure in 1987, in the Ikoma tunnel of the Kintetsu Higashiosaka line in 1983 and the fire occurred in Nagoya city subway Higashiyama line Sakae station substation and the passenger and the fire fighting died. However, there was not a case that the fire occurs to vehicle itself and that the dead person goes out.

However, in the Deagu city subway incendiary fire, many people dead and injured. This subway fire give severely shock to users in the world.

It decides to attempt to examine about the state of the subway and so on fireproofing measure's there being based on the lesson which the arsonist sin got from the investigation result of this fire because it was strong in the copy-ability and that the same species fire occurred in the future, too, was worried about.

The measure with soft ware

(1) The edification of the consciousness of the protection against disasters

The consciousness of the protection against disasters means being thinking now to prevent a disaster if saying concisely. The consciousness of the protection against disasters touches off an act of the protection against disasters and improves power of the act of the protection against disasters. The consciousness of the protection against disasters is the important element which is charged with a mental role to put an act of the protection against disasters in the motive. Therefore, it wants to propose to participate in the public relations, and the study and training of the protection against disasters and the training of protection against disasters because it is a necessary element and to edify consciousness of the protection against disasters to promote a measure of the protection against disasters to all the disasters in addition to the subway fire. However, if consciousness of the protection against disasters isn't continuously edified, it conforms to the constant principle with the elapse in the time and it declines by it. This is called " the law of the gradual diminution of the consciousness of the protection against disasters ". Therefore, the edification of the consciousness of the protection against disasters must be always made an effort toward.

It should be possible to have done a prevention act if there is consciousness of the protection against disasters that the criminal made a lighter slightly the passenger who rided because it got into omen actions such as setting broth fire from the station one ahead in the Deagu subway fire.

For example, one passenger try contact with a driver and the other passenger watches over the criminal meanwhile, and the passenger cooperates and make attention to the doubtful act of the criminal and whom of the passenger it is picks up a lighter by it immediately before incendiary, and so on. Then, the act to prepare for the incendiary and to confirm the position and the way of the non- common use tap for the taking refuge from the train of opening, to come out for the spare act to look for the taking refuge mouth, and so on, and to do an activity of the extinguishing a fire by confirming the position of the extinguisher immediately after incendiary, and so on, and so on should have been able to be done.

It is possible if there is very ordinary consciousness of the protection against disasters in these acts. When incendiary is executed, the passenger is taking an act contrary to the act of the protection against disasters to fall into the panic, facing an extraordinary happening. It tells that the driver pulled out a key and that he ran away but it thinks that it does the one to have taken an act daily because the driver didn't have consciousness of the protection against disasters.

When seeing the photograph to have been provided by the inside of the fire scene investigation, though the smoke invades a vehicle, the passenger doesn't get into an action of the protection against disasters in the condition as only it sat on the seat.

It thinks whether or not this, too, will are not the evidence which falls into the panic with consciousness of the protection against disasters there not being.

When incendiary is executed, it isn't possible to correspond if there is not consciousness of the protection against disasters to have made firm which becomes the motive power of the act of the protection against disasters because to be very severe on short time vs. are approached.

I advice you that participating aggressively in the study and training and the training which the fire fighting authority does in the area and increasing consciousness of the protection against disasters beforehand. When the fire occurs at the subway and the tunnel, the alternative of the extinguishing a fire, the rescue and the taking refuge and so on is limited. Flame and smoke exhaust apace are also limited. Therefore, it becomes necessary to correspond under the condition to be severe.

And then, it is necessary that the person concerned and the citizen who goes in and out of these object ones and uses cultivate consciousness of the protection against disasters according to the danger first beforehand.

(2) Prevent bring in subway dangerous goods

The following measure is not to make bring in to the subway station hazardous materials. The fact not to make bring the subway station connects with not making

bring the train. It is that it is necessary to watch not to make bring, to arrange a person in the ticket gate and to check the luggage of the passenger. It is very difficult and it is impossible to check the luggage of all the passengers. However, it is to establish beforehand the system to check when finding the person who has doubtful luggage.

In short, it appeals for watch system's being ready and it checks an arsonist.

Such checking will be difficult because automatic ticket gate increases recently to promote reduce labor and the place to be arranging one station employee in front of the manual ticket gate increases. However, to secure safety, it should arrange one watch member at each gate. When thinking of incendiary's being executed because it neglected a little safe investment and compensating, it thinks that to deploy one watch member is never expensive.

(3) Prevent incendiary activities immediately before and the immediately after measure

① By yourself of the fire protection measure

It finds that there is a limit in the policy which the fire fighting authority can implement because the arson by gasoline is explosive, the burning is high-speed and it reaches a maximum burning time before the fire fighting corps arrives as above-mentioned.

Therefore, passengers, crewmember and station employee cooperate and must implement arson prevention act. However, because it is very difficult, the act which prevents arson must do beforehand to do the training which is severe as the incendiaryism can be prevented.

② The measure immediately before arson : 1

As for this step, immediately before incendiary, the measure is when finding the person who does a doubtful act by shouting when setting fire in the train and at the subway station

building.

In this step, the person who is around is the measure which prevents the execution of arsonist, paying attention to the act of the arsonist.

In this step, it is necessary to be for the acts such as reporting a direct bell in the car to the crewmember plainly by pushing it without hesitating.

Also, the person to prevent the act to try to lift a gasoline container and to be near the extinguisher is the fact to leave the person who tries to take out the extinguisher from the box and tries to hold it, and so on, or it it tries to set on the fire to the distance as much as possible and so on.

Incidentally, when holding an extinguisher, it assumes a posture by the figure and so on so as not to stimulate a criminal and it should choose a criminal place of doing noticeable difficulty being.

When the criminal switches over to the following step, it should make the position where it is easy for there to be effective radiation at once.

③ The measure immediately before arson : 2

This step is when going in the act that the arsonist warns the can to have increasingly said " the fact to set fire and so on " to and for the one of the gasoline style to have entered it

more and so on and that he opens the lid of the container, and so on.

At this case, the person except the person who has an extinguisher in the passenger who is in the identical vehicle with the criminal must take refuge to the other vehicle all together.

Also, the person who is holding an extinguisher must be for the act which radiates powder of the extinguishing a fire for the criminal, turning an extinguisher to the criminal.

This is the 2nd step of the risk management practical effect.

④ The prevention measure immediately before arson : 3

This step is the 3rd step of the risk management practical effect increasingly in the case to have begun to scatter gasoline.

In this case, it arranges and it switches over the system of which the safety pin of the powder extinguisher can be radiated at once by preparing for the incendiary execution and pulling out it to the act to radiate an extinguisher all together for the gasoline and the criminal which an assuming a posture employee and so on were scattered on.

⑤ The measure when executed, being incendiary

By the criminal of this step

1 When getting into an action which puts a hand in the pocket to take out a match

2 When taking out a match and a lighter

3 The case to have gotten into an action which strikes a match and When getting into a firing action in the lighter

4 When getting into an incendiary execution action to gasoline

It is.

In a series of act time of this criminal, it is as much as several seconds of from 10 second to 1 minutes.

It assumes that the criminal gets into an action which increasingly sets fire more for this act to be done after scattering gasoline and it mistakes and it is not.

Therefore, the person who is near the criminal must pick up the match and the lighter

because of which he held the pocket of the criminal and it was made not to make take out a match and a lighter and took out them.

When the criminal gets into an action which fires and strikes a match in the lighter by that these prevention acts fail, it leaves an extinguisher and the criminal must be left as much as possible.

Or, it is same as gasoline when getting into an action which sets fire, too.

Don't forget that the passenger whom the identical vehicle is riding with the criminal

moves quickly to the vehicle of the inheritance and closing down a door in the connection part, too.

When scattering a combustible hazardous material like gasoline and so on, a danger with the specifically low flash point and setting fire is high possibility that itself burns explosively, and that he ignites the other articles and that whole indoors reaches the maximum burning time quickly.

As for the activity such as the extinguishing a fire, the report and the taking refuge, it is required that the experiencing with being considerable, being very difficult is done.

Incidentally, when getting into an action which sets fire to the gasoline which the criminal scattered, it is to get into an action which defends its body quickly from the criminal if it isn't possible to fad away.

For example, act as it protects a face with the hand and the clothes.

That it is necessary to try most is to hold a knack from about 10 seconds to about 20 seconds from the exploded moment.

The hot air enters into the trachea, the trachea raises up a respiratory tract heat flow, and the trachea reflects and becomes that it isn't possible to breathe when surprised in the moment to have set fire and doing a big knack.

This is a risk management with the execution step.

To progress, the incendiary prevention act immediately ahead of being above mentioned seems to be very difficult to short time.

However, it corresponds more than whether or not nothing corresponds and whether or not all the members die or assume a serious injury and how many or all the members should choose the way of escaping danger.

A measure from the step of 1st of the above to the execution step was described but it sometimes progresses in case of order's moving ahead slowly step-by-step and to short time of moving.

As for the arson by gasoline, the time which results by the execution step at most of the cases is short and because it is often immediately pressed to do compatible, I advice you being arranged beforehand in preceding compatible system.

Moreover, incidentally, above compatible is a dangerous risk management technique to the emergency to use as the last means in the case where that all the members take refuge to the safe place to short time is under a difficult state.

Therefore, it wants to emphasize that to be taking refuge priority when all the members are under a state which can take refuge to the safe place all together to short time is to be consequential beforehand.

Also, when implementing these risk management systems, in no step, the employee

and the passenger who takes charge of the extinguisher must implement acts such as the report and the taking refuge quickly.

⑥ The extinguisher establishes one as much as type 20

The inside of the subway vehicle and the incendiary fire which occurs at the station building are executed limited indoors but there are many cases which occur under a state as the position of the extinguisher and the indoor hydrant can not be moved from.

Therefore, it is expected that it is put in the difficult situation, that to go to take the hydrant and the extinguisher which is in the home and the lobby and so on is temporal and that it is physical go.

Therefore, the extinguisher to install in the vehicle should install the powder extinguisher like 20 types and so on which is large-sized comparatively.

As for the powder extinguisher of 20 types, the radiation time is long with about 20 seconds and the radiation distance, too, is a maximum of 7 - 8 m.

Therefore, there is a privilege that it is possible to radiate safely from the position which left a fire point and a criminal fairly and it is easy to secure the safety of the person who radiates a radiation range, too, widely, too.

It is desirable to install the two extinguishers in the vehicle in 1 vehicle beforehand.

There are an ignition prevention effect, a fire restraint effect or an effect of the extinguishing a fire to gasoline and so on from the fire source when beginning to set about the execution in case of criminal's beginning to scatter oil as the effect which radiates a powder extinguisher and warming a lighter, and so on.

Also, there is an execution intention disturbance effect of the criminal by the diffusion of powder of the extinguishing a fire, too.

⑦ The risk management is important.

As far as it sees a fire case with all kinds in the past, the risk management is sound and implements fire fighting training seriously, in the place to be educated, compatible in case of the emergency is smoothly done and the damage becomes very small.

When a risk management isn't done, the reaction which wasn't trained is expressed.

Even to operate surprise crying, caution equipment doesn't have the feeling and it becomes conditions such as not understanding even a location at the operation button.

At this case, many cases which end in the result which falls into the panic and lets out big damage occur.

It is not an end in it if spending energy on making a risk management system and making a risk management plan be complete.

Also, will there are not much office such as falling into " the prejudice of the normalization

" that the fire which was needed so and the needed case don't happen and risk

management system's being formalized in the office which itself belongs to?

That the risk management plan is composed of risk management, too, is important but the thing that to execute the system smoothly is more important must be recognized.

Also, irrespective of the scale of the office, the risk management is necessary and the education training must be made that will fall into what state, too, beforehand by it for the risk management system to function.

⑧ Take the sign of the disaster and the fire and correspond.

It mistakes to countermeasure's being a very difficult fire about the arson fire and it is not.

However, the place which is not the fire about which it is difficult to estimate at all from the case in the past can be found a countermeasure.

Always, and it is necessary and it is in the characteristic that there is a sign as much as the saying.

The sign is following

1 of the long-range sign which occurs before for a long time

2 There is a sign immediately before occurring immediately before.

By the incendiary case,

To be thought of as being only a sign immediately before tends, but it causes some trouble from fairly before and it is doing things such as the doing the preliminary reading by becoming the condition that the criminal will execute incendiary.

To execute the incendiary which brings about a large-scale result, there is a plan step and there is a long-range sign.

Therefore, by where it is, if there is trouble, to provide the trouble information for all the station buildings at once is important.

That is, it is the early sharing of information.

Therefore, the relation station must be provided when not missing a long-range sign and sensing 1,000,000,000,000 and when missing and sensing, the risk management system must be reconfirmed.

The other hand, sign is immediately before the act which scatters gasoline by saying "it is possible to withdraw money" OBJ DO and to develop, having a container, to yell when scattering gasoline and to warm a container.

Also, it is, and it is the time of ㄗ and the passenger catches quickly and in the sign immediately before necessary so, he must correspond to the act which turns on match a lighter.

When sensing a sign immediately before, the act that all the members who are there do

a sign by cooperating and that they push the bell of the direct report machine and the caution machine, and so on, must be begun.

The acts such as entering the radiation system of the extinguisher and beginning taking refuge, too, are same.

Will to establish to have taken such a sign vs. a plan beforehand, too, not be important?

⑨ The case study

At the office, will it be doing a case research about the incendiary case which occurred before and so on?

To study beforehand about the case which occurred at the other office and so on because the incendiary is the copy-ability is important as above-mentioned.

Also, it is accessible such as this species case, specifically the going up in flames case and the case that many victim went out, the information which becomes reference in case of fire prevention in the one of being mainly reported.

In their information, when the same case occurs at its office as the data, the case research as it said how it should cope must be done.

⑩ The activity immediately ahead parts success or failure.

It supposes that it did the speech and action which the criminal suggests arson.

How will the passenger who is present near it take this state?

Will the passenger whether or not to see this state and whether or not will take it with "surely" or take it, saying "the approach of the crisis"?

The difference of the state recognition seems to influence an activity and damage after that.

If catching with "surely", it sets fire as open and it must fall into bedlam.

However, saying "the crisis is approaching", when catching, it should get into some action and the passenger who is behind will get into a spare doing action in the look at the extinguisher and in the taking refuge route.

The result appears in the difference in the damage.

In short, it is the fact that the system which passenger all the members cope with breaks up the success or failure.

Therefore, it does a state judgement of the crisis and the ability that it is possible to correspond must be brought up beforehand.

⑪ The psychological measure

When dealing with such an arsonist, there is alternative such as "becoming saying" or "does it refuse".

The handling method is a problem in the area of the psychology and will need the guide of the expert of the psychology.

(4) The user puts the power of the act of the protection against disasters to have recognized that there was a human activity limit of the station employee and the crewmember and so on beforehand.

Only the personnel to make a street move around the subway generally at the normal time are arranged by the station employee and the crewmember.

Moreover, the place where it is possible to automate it to keep haulage cheaply automates and is suppressing the arrangement of the person to the utmost.

Therefore, it is possible to correspond but it is impossible to correspond for the small accident and the fire at the normal time if becoming a big disaster.

If trying to arrange a person that it is possible to do enough compatible when the big disaster occurs, tens of times of present personnel are necessary. Also, when doing such personnel arrangement, the haulage is many time impossible economically because it becomes necessary to raise. Therefore, it maintains reasonable haulage, generally, it arranges the personnel that to happen can correspond to the accident and the fire which is thought of and it is keeping safety.

Moreover, it corresponds to the disaster which is as big as possible, too, and the present personnel try to attempt to utmost-ize damage, install an automatic fire alarm, a sprinkler, a connection pipe or a watch camera and an effort is done.

However, that the disaster as those facilities become useless happens is thought of. That is, it is the fact that it isn't possible to deny that the personnel of the subway and the disaster which can not correspond even if it has and it does facilities occur fully.

It is the disaster which exceeds the limit of the subway staff and the facilities.

One piece of the example is a subway fire in Deagu.

The situation which gets for the station employee and the crewmember to receive study and training and training about compatible way to such a disaster but not to be able to correspond even *of* them occurred.

The subway user understands such a situation well and it should cultivate power of the act of the protection against disasters beforehand.

(5) The user puts the power of the act of the protection against disasters to have recognized the human activity limit of the station employee and the crewmember and so on beforehand.

In case of the underground space fire, the expansion pressure and the rise pressure by the fire are gained and form a strong updraft and the fire smoke diffuses early to the loft along the stairs.

Therefore, the fire smoke attains to the people who take refuge using the stairs and

makes taking refuge difficult.

The subway can not newly set flame and smoke exhaust space with an exit limited.

That is, it is the fact that the heat and the smoke can be missed only about the place to have been limited, the exit with the present and the heat and smoke exhaust space.

If the fire occurs in the subway premises and at the tunnel from such a state, a great deal of smoke and flame press against the taking refuge stairs and the taking refuge mouth early.

Then, in the environment temperature in the station building and the tunnel, make above rise and it makes the taking refuge of the people difficult.

This is the fear of the underground space fire.

Moreover, in the track of the subway, if trying to take refuge, it gets off the subway vehicle to the track, it walks at the track and it is necessary to take refuge.

However, there is a track in the walking difficulty.

It is expected that the speed when taking refuge levelly falls below 0.3 m per second with the walking speed of the plane in the ground in mainly in the track.

However, because the smoke surges at the about 1 m speed per second, it makes the taking refuge of the people difficult to short time.

Also, when the fire occurs at the home and the station building, it is necessary to take refuge to climb the stairs.

If getting to climb the stairs which are filled with the smoke crowded by the that it is very difficult for the person to climb the stairs person, 4 - 5 cm can be estimated by making a speed per second.

In the stair part, because it is estimated at 4 - 5 m per second about the rising speed, the smoke has been immediately attained to.

Therefore, the passenger, the station employee and the crewmember understand a fire characteristic in the so needed space, and assume the case to have encountered to the fire and must implement thoroughgoing training beforehand.

Also, the training which supports the taking refuge of the disabled person and the old person or the infant and so on must be implemented beforehand.

The measure of hardware

(1) Incombustible measure of the vehicle and facilities

As for the incombustible-ization measure at the vehicle and the facilities of the subway, the place where it is possible to incombustible-ize as much as possible according to

the situation in each country is promoting an incombustible-ization measure. For example, it is a wall of the side of the vehicle and an outer wall or the wall body, the ceiling part, the stairs of the station building and so on. However, if incombustible-izing a vehicle and a station building fully because it moves around the dangerous space at the underground when thinking of the subway fire and it makes people move, if saying whether or not the fire doesn't happen, it doesn't meet. The result which investigated the scene of the subway fire in Deagu showed that there was a limit in the incombustible-ization. For example, the seat and the floor surface of the vehicle and so on can not be fully made from iron. It is relation with the comfortableness. The place where it isn't possible to incombustible-ize in this way is promoted, doing the difficulty becoming of fire retardant. However, of the full incombustible-ization it is impossible for the clothing and the luggage of the passenger and so on, too, to make fire retardant of the difficulty.

Because the subway fire in Taegu city happened to the winter season, the passenger has very many clothes and it thinks that they are the one that these burning media, too, promoted burning.

However, there should be a place where should still incombustible-ize. It is a hanging poster in the train, the signboard kind of the station building and so on.

It says that the combustibility of the subway vehicle and the station building can not be fully denied in this way but the place where incombustible-ization, to do the difficulty becoming of fire retardant are made should promote incombustible-ization, to do the difficulty becoming of fire retardant to the utmost.

(2) The improvement of the getting in touch system of the train

The getting in communication system to load a subway train in the present world with can get in touch with the train, the operation order room and the radio, but the train, and station office and the other train or seems to become the system which can not get in touch to the fire department and the police department.

Therefore, are behind in the contact with the train which arrives at the getting in report, the station employee and the opposite lane with the fire fighting and the police in. If such a system is supposed to be adopted, it informs station office and the other train, or fire fighting and the police and so on via the operation order room.

Of course, a watch camera was installed in the station office of Deagu subway. However, it is question about whether or not there were personnel who can always watch over the watch camera because it is managing a station with the scale only of this by six station employees.

In this fire, a report to the fire fighting and the police was done from the carrying telephone.

Then, state of the fire fighting and the fire which was reported to the police is told to the operation order room and is said to that it was state such as inquiring of the driver and the station from the operation order room, too.

The fire report must be early reported to the fire fighting organization at the moment, too. To report to the fire fighting organization from the crewmember who is a party is important to it. The crewmember and the station employee are because it grasps a state of the whole fire early. The big loss occurs to the time because the information communication goes via the organization somewhere.

Therefore, it should adopt the system which direct station office, the operation order room, the fire department, the police department and so on can be informed of from the train by the judgement of the crewmember.

(3) Installation of the automatic fire detector in the vehicle

It is say that the conductor wasn't taking the train of the Deagu city subway fire and that he was operating this train by one driver.

By the way, will the extraordinary situation of this train have been able to be sufficiently corresponded to alone?

It is impossible to manage the train of six pieces of organization, to do driver alone.

Therefore, I want to propose the means to install an automatic fire sensing receptacle and so on in each vehicle to help a driver in case of the fire.

Now, manual getting in touch equipment is installed in each vehicle. However, if facing an extraordinary situation, it seems that it isn't possible to do similar opening and shutting valve operation by the door readily.

In the present-day society, automation system becomes more popular and will the manual operation not become difficult among the people?

To install an automatic fire detector and to automate for the purpose to inform a driver about the fire when thinking from such a state, too, are one means of early detect of the fire.

They should install a monitor camera in each train and it is the best measure that

monitors truth at the operation stand and the conductor room.

However, are there privacy and a problem and will it not be possible to be established by them?

(4) Make several windows an opening and shutting window.

As for the recent vehicle, the one of the structure that the window can not be opened and shut accounts for the crowd.

Several places per vehicle when thinking of the situation like this fire, at least, until the door, it will should make a window in one place an opening and shutting -type window beforehand from the door.

(5) Installation of the sprinkler facilities

A lot of sprinkler heads were installed in the subway station building in Korea except for the home part. However, it is question by whether or not a sprinkler head wasn't installed in the home part. It thinks that the result of this fire changed mainly when a sprinkler head was installed in the home part.

However, the both sides in the part where the sprinkler facilities are successful with this fire and the part which isn't successful could be seen.

It thinks that the part which wasn't successful is the one that a lot of sprinkler heads operated and that the balance of the pump and the ability of the flow of water of the plumbing fell into the collapse quantity of water lack.

In the future, it should examine about making to make the the sprinkler head number of the establishment and the watering quantity of it clear, or more than one piece of establishment and the plumbing system of the flow of water measure and the plumbing a system, the establishment place and so on.

Generally, sprinkler systems aren't installed in the underground station building. However, I think it should be installed sprinkler facilities in the underground station. But it thinks that that a sprinkler head was installed in the underground station in Deagu succeeded mainly in the utmost of the damage.

(6) Construction of the shelter

As above-mentioned, in the underground space fire, the taking refuge of the people becomes very difficult.

If anything, it is possible to say that it is near to be impossible. Therefore, it should take measures which can temporarily take refuge to the safe place

even if it doesn't take refuge to the ground.

It will should examine to establish space of the taking refuge of the shelter which it is possible to isolate from the fire smoke by both sides and the central part at the subway station home and so on and so on.

The shelter is made from ferroconcrete and makes the structure which is made in smoke and fire proof.

It makes an entrance the structure which prevents approaching by the smoke, being as it makes a double door, and so on.

Also, it installs fresh air replenishment facilities and it makes indoors positive pressure, making another system and replenishing the fresh air of the ground and it should make facilities the structure which can be fully isolated from the fire smoke with the station building.

The measure of the fire department

(1) Approaching measures to underground space and activity measure inside of the underground space

There are approaching from the station building and approaching from the tunnel part in the approaching by the fire fighting member to the underground space fire scene of the subway.

Any way reaches difficulty to the emergency to be against the fire smoke and to approach.

Heat-resistant and smoke measure to fire and smoke are necessary. It should try approaching while receiving that the support pouring is done by the high-pressure fog water discharge as heat-resistant and smoke measure.

However, in the lasting time of an air breathing apparatus, the way of fire fighters alternating rarely becomes a problem with 15 - 20 minutes.

Therefore, when approaching a station building directly using the stairs, it limits the approaching stairs of the fire fighting corps to several places and the approaching must be tried while more than one fire fighting corps pours each other in the support by the high-pressure fog water discharge.

In this case, it should secure a lot of backup fire corps beforehand.

On the other hand, because it is assumed that the distance becomes long when approaching from the tunnel part, the replenishment corps of the cylinder of the aerial respiratory organs must be specified and the hose to use for a high-pressure fog gun

must use hose with small-diameter. Incidentally, when among the stations the approaching to a tunnel part has an approaching gate, it should use an approaching mouth.

(2) The rescue measure

On this fire scene, it seems to have needed 4 - 5 fire fighting members to convey one pivot savior to the ground using the stairs.

It thinks that the rescue activity using the stairs from this species underground object one very reaches difficulty.

Dividing into the rescue party and the corps except it formerly, it has implemented rescue training from the 1st floor underground and the 2nd floor underground.

In the rescue conveyance by two rescue workers from the 2nd floor underground, it needed rest with being considerable after conveyance if conveying a 60 kg person.

Then, it stores to have consumed physical strength to the extent that to implement any more if doing a rescue activity twice became an impossible condition.

Is there a person as it exceeds 100 kg, too, in and in the condition which is filled with the heat and the smoke, will he not reach difficulty more?

Of course, it should pour all together in the support by the fog watering gun and so on.

Also, a lot of pivot saviors become that it is possible to correspond only in the rescue party in some case like this fire.

Therefore, When there are a lot of people who need a rescue, it need another fire corps except the rescue party in the multitude rescue activity

Therefore, does it implement the rescue training which included a rescue party and the other corps and will it not have to be examined beforehand about the way of rescuing and conveying and so on, too?

(3) The development of the rescue car and the high-pressure fog water discharge vehicle

Examine about the smoke resistive fire engine which can approach underground.

As the fire engine which can approach underground, the type of two fire engines can be assumed.

The one is smoke resistive rescue engine and the other one is the high-pressure fog discharge truck to make it easy to act in the smoke.

The smoke resistive rescue engine is already uses as the underground town business in Japan. But, as for the high-pressure fog discharge truck, yet, it isn't hearing that it was deployed.

As the one which replaces a high-pressure fog watering engine at present, the research of the high-pressure fog gun is proceeded with.

However, in the condition which was filled with the wide area, and moreover the

flame and the smother after examining a successful state of the sprinkler in the fire this time, it finds that it isn't useful in the partial extinguishing a fire and smoke eject or at the high pressure fog gun which has a purpose of the cooling.

In the subway space fire, the high pressure small fog discharge quantity of 300 - 400 micron particle needs a jetting fire truck.

This fire truck discharge of small particle in the fog stream. And then wide area into underground space.

Of course, it does exhaust smoke and cooling down and it lowers an environment temperature. It makes it easy to do the rescue and fire fighting activity of the fire fighting corps.

As for the high-pressure fog discharge truck which loaded with turbo engine works already some countries in Europe.

It will expect that it reorganizes to dwarf this truck and to be able to be used in the underground space and that it is deployed beforehand.

At the end

As a result of investigation of the subway fire which occurred in the big city in Korean, I think that it became the more terrible result when imagining this fire as occurring in the rush hour of morning and evening.

Moreover, if supposing that there was a lot of people waiting at the platform and filled with people in the train, dead person of 1 wrong number of digit will have gone out.

Even though, there are many persons who think whether or not it is as the passenger sat on the seat though the smoke invaded a riding vehicle and why to say that it is will be ?

This shows that the consciousness of the protection against disasters is thin, and that it can not do a compatible act to the immediate extraordinary situation, judging calmly and to be in the panic condition.

Such an act is the act of the Hanshin Awaji Great Earthquake which was come across immediately after occurred too, and it is gazing silently only at the extraordinary situation which happens to the immediateness only and can not switch over it to the act of the protection against disasters.

The disaster and the arson by the terrorism show an increase tendency recently in world each place.

It is in the condition which it should be anxious for.

To cope with such a disaster, the severe training must be repeated beforehand with

taking measures of the protection against disasters beforehand conscious of the protection against disasters.

If neglecting protection against disasters, it wants to look forward to the recovery of the coordinate axis, the protection against disasters.

Also, not to neglect a little investment of the protection against disasters to arrange a watch member, and so on, too, is important.