

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
2-7	Stop switch	● Switch working condition.	1/1	■ If any strange condition is founded, inform Maintenance Company immediately.
2-8	Use, Load, Capacity board.	● The following items must be displayed where anybody can see easily. ※Manufacturer ※Capacity(Load) ※Speed ※Passenger guide board ※Telephone Number in Emergency ※Maintenance Company	1/2	■ Do not remove these displays and stickers. If they were damaged, inform Maintenance Company.
2-9	Emergence Light	● Lighting condition under power failure. ● Lux on floor : over 1Lux	1/1	■ If any strange condition is founded, inform Maintenance Company immediately
2-10	Car sill to hoistway wall distance	● Standard: less than 125mm. ● Fixed fascia plate condition	1/12	■ If any strange condition is founded, inform Maintenance Company immediately

5.5.2.3 Car top

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
3-1	Emergency exit switch	● Close and open condition of EME Exit ● Switch working condition(If it is opened, a lift must stop). ● Damages of EME Exit cover.	1/1	■ If any strange condition is founded, inform Maintenance Company.
3-2	Door operator	● Serous noise on door operation ● Abrasion and abnormal extension ● Manual door open condition during power failure	1/1	■ Clean the car and landing doorsills. But in case noise is not disappeared, inform Maintenance Company. ■ If any strange condition is founded, inform Maintenance Company..
3-3	Lock device	● Serious abrasion condition of open device. ● Lock and release condition.	1/1	■ If any strange condition is founded, inform Maintenance Company.
3-4	Stop switch	● Switch working condition. ● Checking car stop by switch working.	1/1	■ If any strange condition is founded, inform Maintenance Company.
3-5	Car top Pulley	● Good rotating condition. ● Noise. ● Belt Slip.	1/6	■ If any strange condition is founded, inform Maintenance Company.
3-6	Safety catch switch	● Serious rust, foreign substances and corrosion. ● Checking car stop by switch working.	1/3	■ If any strange condition is founded, inform Maintenance Company.

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
3-7	Governor rope	● Rope replacement standard ● State of wear and broken strand ● Breaks are uniformly distributed: 4 or less broken wires in 1 strand in 1 lay are allowed b. Rope severely rusted, or the cross-sectional area of the broken wire is less than 70% of the initial cross-sectional area of the wire: 2 or less broken wires in 1 strand in 1 lay are allowed c. Breaks are unequally distributed, or concentrated on a particular strand: 12 or less broken wires per 1 lay for a 6-strand rope, 16 or less for an 8 strand rope are allowed	1/6	■ If any strange condition is founded, inform Maintenance Company.
3-8	Guide shoe(roller)	● Serious abrasion on roller. ● Interruption on traveling.	1/3	■ If any strange condition is founded, inform Maintenance Company.
3-9	Main rope	● Same rope tension ● Damage and foreign substances ● The condition above 3-7 is required	1/6	■ If any strange condition is founded, inform Maintenance Company.
3-10	Load detector	● Setting and adjustment condition	1/1	■ If any strange condition is founded, inform Maintenance Company.
3-11	Guide rail & Bracket	● Serious rust and corrosion on rail ● Fixed condition by bolt and welding.	1/12	■ If any strange condition is founded, inform Maintenance Company.
3-12	Counter weight	● Serious rust and corrosion on bolt of CWT. ● Pulley condition ● Interruption on traveling.	1/12	■ If any strange condition is founded, inform Maintenance Company.
3-13	Counter weight side emergency stop switch	● Serious rust and corrosion on switch. ● Emergency stop switch can act correctly.	1/3	■ If any strange condition is founded, inform Maintenance Company.
3-14	CWT pulley	● Good rotating condition.	1/6	■ If any strange condition is founded, inform Maintenance Company.
3-15	Top floor final limit switch	● Switch contact condition. ● Normal working condition ● Rust on contact point.	1/3	■ If any strange condition is founded, inform Maintenance Company.
3-16	Landing sill	● Serious shape change, abrasion, rust, and corrosion. ● Door open & close condition ● Abrasion of door shoe and its break-away.	1/1	■ If any strange condition is founded, inform Maintenance Company. ■ Clean the car and landing doorsills. But in case noise is not disappeared, inform Maintenance Company.
3-17	Door inter lock	● Checking car start in case unlocked condition. ● Serious shape change, abrasion, rust, and corrosion on inter lock.	1/1	■ If any strange condition is founded, stop the elevator operation and inform Maintenance Company immediately.
3-18	Door closer	● Close function test ● Serious shape change, abrasion, rust, and corrosion.	1/3	■ If any strange condition is founded, inform Maintenance Company.

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
3-19	Traveling cable	● Damage of traveling cable and interruption with other device in hoistway. ● Damage of end part and bending part.	1/6	■ If any strange condition is founded, stop the elevator operation and inform Maintenance Company immediately.
3-20	Hoistway wall	● Break or water leakage on hoistway wall. ● Foreign device or equipment. (Exception : speaker, smoke detector)	1/12	■ If any strange condition is founded, inform Maintenance Company.
3-21	Counter action for hoistway against earthquake	● Damage or extension on rope guard of CWT and Car. ● Logical application of belt and traveling cable protection. ● Break away of main belt. ● Break away from main rail. ● Supposed breakdown and malfunction must not effect on operation	1/12	■ If any strange condition is founded, inform Maintenance Company.

5.5.2.4 Landing hall

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
4-1	Hall button & Indicator	■ Damage of push buttons and switches. ■ Clear identification of switch and display device ● Malfunction of buttons	1/1	■ If any strange condition is founded, inform Maintenance Company immediately.
4-2	Emergency key	● Good condition of open and lock.	1/3	■ If any strange condition is founded, inform Maintenance Company

5.5.2.5 Pit

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
5-1	Buffer	● Serious rust on buffer body. ● Enough oil filling in oil buffer. ● Fixed condition. ● Damage of spring buffer.	1/3	■ If any strange condition is founded, inform Maintenance Company
5-2	Governor pulley	● Noise and vibration on elevator operation. ● Rope and pulley gap. ● Break away possibility of rope.	1/6	■ If any strange condition is founded, inform Maintenance Company
5-3	Pit floor	● Cleaned condition. ● Waterproofing condition.	1/1	■ If any strange condition is founded, inform Maintenance Company
5-4	Bottom floor final limit switch	● Switch contact condition. ● Normal working condition ● Rust on contact point.	1/3	■ If any strange condition is founded, inform Maintenance Company.
5-5	Emergency stop switch	● Serious rust, corrosion and foreign substances. ● Normal working condition.	1/3	■ If any strange condition is founded, inform Maintenance Company
5-6	Pulley below car	● There is no damage in groove ● Can rotary fluently		■ If any strange condition is founded, inform Maintenance Company

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
5-7	Compensation rope/chain	● Rope/Chain tension.	1/6	■ If any strange condition is founded, inform Maintenance Company
5-8	Run-by (Buffer distance)	● Refer to table 1. ● In case of spring type the distance must longer than final limit switch activating position.	1/6	■ If any strange condition is founded, inform Maintenance Company
5-9	Traveling cable	● Damage of traveling cable and interruption with other device in hoistway. ● Damage of end part and bending part.	1/6	■ If any strange condition is founded, stop the elevator operation and inform Maintenance Company immediately.
5-10	Load detector	● Fixed condition and proper working.	1/1	■ If any strange condition is founded, inform Maintenance Company
5-11	Counter action for pit against earthquake	● Fixed condition of buffer, governor pulley. ● Break way possibility of Governor rope.	1/12	■ If any strange condition is founded, inform Maintenance Company

5.5.2.6 Emergency elevator

No.	Inspection part & item	Check point	Inspection term (time/month)	Action to be taken
6-1	Car Recall switch	● Exact recall operation.	1/12	■ If any strange condition is founded, inform Maintenance Company
6-2	Fire operation	● Normal operation sequence according to regulation	1/12	■ If any strange condition is founded, inform Maintenance Company
6-3	Emergency light and guide	● Clear identification.	1/12	■ If any strange condition is founded, inform Maintenance Company
6-4	Stand-by power (generator)	● Exact generator operation	1/12	■ If any strange condition is founded, inform Maintenance Company

Above checking items can be changed due to addition of option part, new part development or maintenance skill improvement.

The inspection and maintenance for the auto announcement device and ESMI are omitted because they have no relation to normal elevator operation. SIGMA

Elevator Company has not a responsibility or assurance such as CCTV, Card key system, and other foreign items that are applied by owner's requirement.

[Table 1]

Speed(m/min)		Minimum distance(mm)	Maximum distance (mm)	
			Car side	CWT side
Spring buffer	90m/min ↓	150	600	900
Oil buffer	90m/min ↑	N/A		

5.5.3 Inspection and counter action

Improper action and careless inspection against elevator that is under unstable condition will bring accident.

The elevator operation manager must check elevator through patrol checking before auto operation.

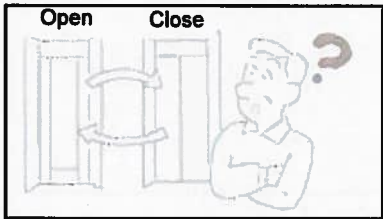
If any strange phenomenon is occurred during patrol checking, be proper counter action as following table. But in case the problem is not solved, inform Maintenance Company immediately.

[Patrol Checking]

Item	Check point	Action to take
Passengers	• Wrong using by passengers • Nuisance calling by emergency unit • Child alone in a car	• Instruct right using way. • Instruct that not to get in alone.
Car Inside	• Car light • Pasting condition of warning and use regulation? • Cleaning condition of floor and wall of car	• If car light is not turned on or broken, inform Maintenance Company • Clean the wall and car floor.
Hall	• Cigarette butt in hall • Material or stuff that is easily burn	• Pick them up and clean hall. • Remove them.
Machine room	• Improper items, explosive liquid • Cleaning condition of wall and floor • Temperature in machine room : Less than 40°C • Strange noise and smell • Tools and their setting position • Hindrances or obstacles in front of entrance (Including CP)	• Remove the improper items in machine room • Clean machine room periodically. • Stop elevators, and inform Maintenance Company. • Clean the obstacles and hindrances.

5.5.4 When it is considered a breakdown.

Some of strange matter can be solved by simple action. Please take counter action as followings before informing Maintenance Company. In case it does not solved, contact to Maintenance Company immediately.

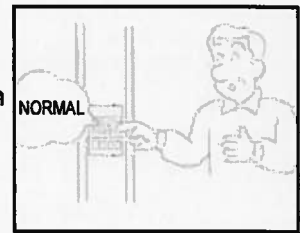
Strange phenomenon	Action to be take
• Burning smell, noise and vibration during traveling. 	• Stop elevator, and inform Maintenance Company. 
• Car call does not work by car call button when car stays at floor normally. 	• Check if the operation mode is auto operation Change 'ATT' and 'INDEP' mode to 'NORMAL'. • Stop elevator, and inform Maintenance Company 
• Car arrives service floor, but door does not open. 	• Do not allow to use elevator for passengers, and inform Maintenance Company. 
• Door repeats open and close operation 	• Door cannot be closed by foreign substances in groove of sill. Clean the foreign substances. • If this problem is not solved, Inform Maintenance Company 

-
- Door cannot be closed.



- Check if DCO switch in COP is turned on. Set the switch to 'NORMAL'.

- Check if the door open button is jammed. And press it 2~3 times.



- Check if the hall button is jammed. And press it 2~3 times.

- Check if the safety edge shoe is lodged by foreign substances. (In case of photo sensor, check that the hole is taped) Clean the entrance

-
- Door is closed but elevator does not run.



- Open the door again to check foreign substance in groove of car & landing sill.
- Clean the groove of sills.



5.6 Information about examination & tests after an important modification or after an accident

The important modifications and accidents shall be recorded in the technical part of the register. In particular the following are considered as important modifications :

For tests after an important modification or after an accident, the documents and informations necessary must be subject to the person or responsible organization. This person or this organization will judge the opportunity to carry out to test of modified or replaced element.

The important modifications and accidents shall be recorded in the technical part of the register. In particular,

the following are considered as important modifications :

a) Change of :

- the rated speed - the mass of the car
- the rated load - the travel

b) change or replacement of :

- the type of locking devices (the replacement of a locking device by a device of the same type is not considered as an important modification);
- the type of door (or the addition of one or more landing or car doors) ;
- the type of guide rail ; - the control system ;
- the machine; - the safety gear;
- the sheave brake; - the buffers ;
- the over speed governor ; - the jack;
- the protection device against the exceed speed of the car in "up" ;
- the pressure relief valve; - the rupture valve;

For the tests after an important modification or after an accident the documents and the necessary information shall be submitted to the responsible person or organization. Such person or organization will decide on the advisability of carrying out tests on the modified or replaced components. These tests will, at the most, be those required for the original components before the lift was put into service.

5.7 Environmental aspects

Lubricants, oils and other substances or materials which pollute the environment must be taken back by the maintenance company and disposed off in conformity with the regulations. If the building owner takes responsibility for the disposal, he shall carry it out in accordance with the legal requirements, and shall follow the instructions of the maintenance company too. Parts, components and subsystems which are replaced during repair and modernization of the lift shall be disposed off by the building owner. When an installation is completely replaced, its disposal shall be arranged between the building owner and the installer.

5.8 National statutory requirements

There are a number of legal regulations which apply specifically to the operation and use of lift. In addition, there are requirements for a lift owner to carry suitable insurance and each lift installation is to be subjected to mandatory inspection. Overall, responsibility for ensuring that lift is properly maintained rests with the owner and the occupier of the premises in which the lift is installed. The owner and occupier carry similar responsibility to ensure safe working when lift is being serviced or maintained.

The mandatory examinations carried out under the law are not a substitute for maintenance and service which should be carried out in accordance with Otis recommendations.

■ 6.Maintenance

Here, we explain how to maintain the elevators.

	 Warning
	<u>Qualified workers only</u> Only qualified and skillful employee is permitted to maintain elevator. Maintenance requires qualified and skillful employee.

Note: Pictures in the manual are sample. So, some of them can be differ from yours.

6.1 General maintenance

6.1.1. General

Elevator is a synthetic product that high level mechanic, electric and electronic technologies are integrated. So, the regular maintenance is required for the long use of elevator with safe and function.

We SIGMA Elevator Company, provide 3 months free charge maintenance after installation for safety and normal operation in case of Korea domestic if elevators are operated and managed normally by owner. After 3 months, owner can make a maintenance contract with us officially. The free charge maintenance term is different according to local condition. Please contact our local agent or subsidiary for details. The quality assurance term is 3 years. If there is any strange break down even though owner had been managed with normal use according to the operation manual, we will repair or replace some parts for free charge. But some items that are required to replace regularly are excluded. The quality assurance term is also different according to local condition. Please, contact our local agent or subsidiary for detail local regulation and law.

6.1.2. Maintenance method for owner (Operation Managing)

Elevator owner has a responsibility to maintain/maintenance elevator. So, owner must make a plan that decides a maintenance policy before use of elevators. This is very important item. Managing elevator that is operated in good condition will decrease breakdown and its repair cost. If you ignore the importance, it will bring opposite result. We recommend you that hire operation manager(s) who is entrusted by owner. Check list that should be proceeded by operation manager:

1. Strange noise, vibration and smell during traveling.
2. Posting position of warning board, needless advertisement board or sticker
3. Lighting and its working condition.
4. Inter-phone and emergency communication device condition.
5. Door open button and safety edge shoe-working condition.
6. Leveling gap when car stops at floor.
7. Glass condition (Cracks, scratches)
8. Slippery car floor condition, (protecting of fall down)
9. Foreign substances or wastes in doorsills.
10. Indicator and OPB working condition.

11. Key management (Landing door, control panel, rescue key, OPB)

	Caution <u>Strange things on operation</u> If there is any big noise, vibration, smoke, disgusting smell, leveling error and abnormal operation, let the passenger get off to hall, and turn off main power. And inform Maintenance company to remove abnormal condition.
---	--

Note of Part replacement

When elevator requires replacement, only pure part replacement is accepted. Used part will give bad affection on elevator system and function.

Ask to manufacturer or installation manager.

Please, refer to maintenance part list. And if you want to get more information, contact to manufacturer or installation manager about elevator management inquiry.

6.1.3. General inspection

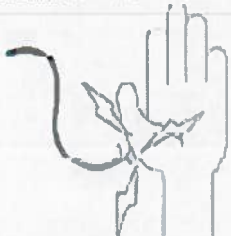
This is a maintenance work of Elevator Company. We describe here simple work to ensure safe operation.

	Warning <u>Qualified workers only</u> Only qualified and skillful employee is permitted to maintain elevator. Maintenance requires qualified and skillful employee.
--	---

	Caution
If car is nothing when you open door, You must set the protection guard around door. Do not open the door without protection plate, You may fall down to pit. Turn off the main power of change the operation mode to maintenance during maintenance work The main power should be turned off or operation mode must be changed to maintenance mode to protect non-expected car moving. Take action to inform maintenance work during inspection.	

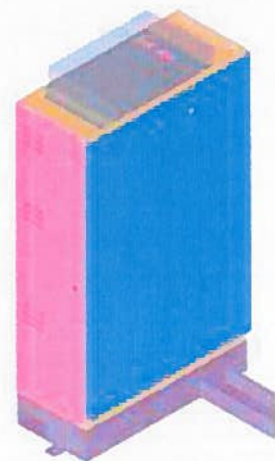
1. Check car interiors that there is any sharp or dangerous thing exist. And repair them.
2. Check the stop and start of elevator. And check if there is any sign of breakdown or old.
3. Check if the leveling gap is within allowable error.
4. Check the safety edge shoe and photo-sensor that they work normally (Re-open status)
5. Check the OPB, inter-phone and emergency devices
6. Top floor temperature. (Normal : 0°C ~ +40°C)
7. Handle and brake lever in the proper position in machine room.
8. Car light condition including emergency light.

6.1.4 Control panel

	 Warning
	<u>Electric energy control</u> Turn off the main power when control panel is under inspection

 Caution
Caution in adjustment Do not change or adjust the function of adjustable part without enough comprehension.

1. Check if all electric wiring are firmly connected.
2. Fan and grill must be cleaned and work normally.
3. Check fuses.
4. All part must be maintained clean condition.
5. All relay working condition.
6. CP panel must be locked after inspection.



6.1.5 Governor

	Warning <u>Rotating wheel caution</u> Whenever you inspect rotating items, turn off the main power. If you are so close to rotating instrument, you may get hurt.
---	--

1. Remove dirt and foreign substances in the groove of governor sheave.
2. Check if there is any strange noise, vibration, heat and heavy abrasion.
3. Check the switch setting and working condition.
4. Check if governor assembly is firmly fixed.

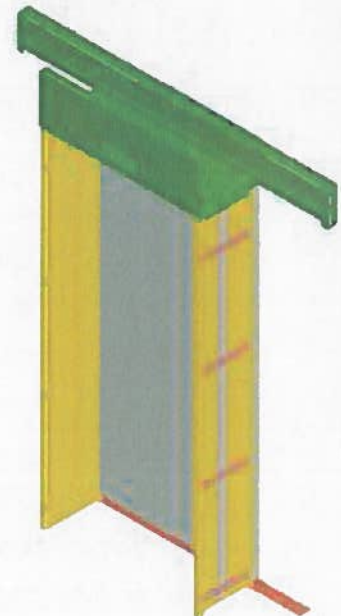


6.1.6 Hall buttons and indicators

1. Check if the hall button, indicators and lanterns at all floors are working normally.
2. Check the fire switch and other special switches at hall.

6.1.7 Hall entrance

1. Check if there is any interrupt to close/open door
2. Check if the door close automatically by itself.
3. Check the door-closed status and interlock contact.
4. Check that the door shoes worn out
5. Check the door rope and coupling devices.
6. Check the bolts and fixed condition.
7. Door panel damages.
8. Glass of door, if it is broken, replace it with new one.
9. Check if the up trust devices is normally adjusted.
10. Check if the door rail and sill are firmly fixed.
11. Check if the jamb is broken or damaged.



6.1.8 Guide rail



Caution

Indicated oil

Use only indicated lubrication oil.

Other kinds of lubrication oil may decrease the life cycle of part or interrupt function of part. And it will be a cause of accident.

1. Check all parts are firmly fixed.
2. Clean dirt and foreign substances.
3. Lubricate rail.



6.1.9 Main Rope

1. Check the rust, worn-out of rope.
2. Check the ends of ropes are firmly fixed.
3. Check the rope length to maintain normal run-by height
4. All rope tension should be same.

6.1.10 Car entrance and door operator

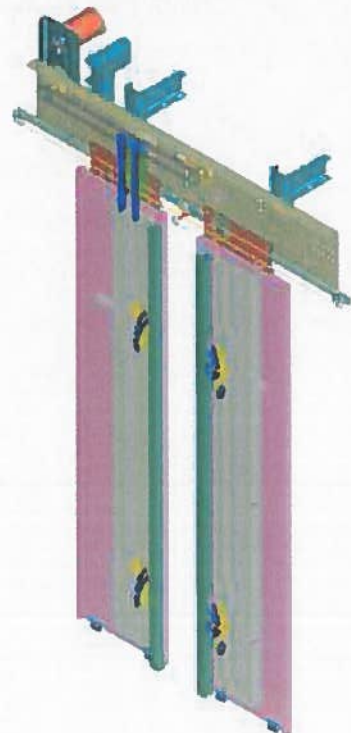


Warning

Car top access and egress guideline(see Appendix1)

Whenever you access or egress to car top, follow the guideline surely. Because you may be fallen down by unexpected car operation. Place the car operation mode to 'INPECTION' whenever you get on the car

1. Clean the door rail of car door.
2. Check the bolts and fixed condition.
3. Check the coupling devices.
4. Check that the door shoes worn out.
5. Check if the up trust devices is normally adjusted.
6. Check if any wire is damaged.
7. Check if car door rail is firmly fixed.
8. Check the door lock device
9. Check the door close speed and power.
10. Check the door open button and reopen devices.
11. Check the door close limit switch



6.1.11 Hoistway switches



Caution

Caution in adjustment

Do not change or adjust the function of adjustable part without enough comprehension.

6.1.12 Car frame

1. Clean the dirt.
2. All devices must be firmly fixed.
3. Check the guide shoe setting condition.
4. Check if there is any strange noise, heat and vibration.
5. Check the safety link status and its working condition.
6. Safety blocks and wedge condition, gap to rail
7. Check the fitting plate status and adjustment condition.
8. Check the traveling cable (tail cord).
9. Check the load-weighing device.

6.1.13 Traction model elevator

6.1.13.1 Traction machine and brake

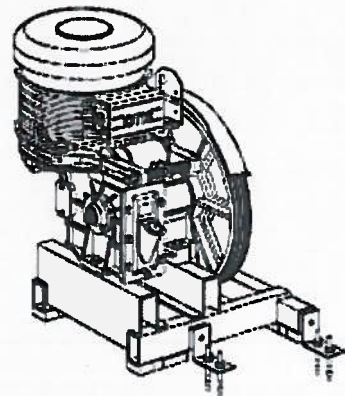


Warning

Rotating wheel caution

Whenever you inspect rotating items, turn off the main power. If you are so close to rotating instrument, you may get hurt.

1. Investigate for any unusual noise, heat, vibration or excessive movement of parts.
2. Check security of all bolts and fixings.
3. Check security of the traction sheave.
4. Inspect the sheave for wear and damage.
5. Observe operation for signs and rope slippage.
6. Check security and condition of all electrical connections.
7. Inspect brake for free operation and minimum lift.
8. Check the machine brake release.



6.1.13.2 Counterweight

1. Check security of the weights.
2. Check the roller shoes for correct float and lubrication.
(See Lubrication Specification in section 6.3).
3. Check security of sheaves, frame, comp ropes, chain and guiding devices.
4. Check sheave for lubrication when provided
(See Lubrication Specification in section 6.3).
5. Check rope retainers where fitted.
6. Ensure free operation of any safety gear linkage.
7. Ensure adequate clearance is maintained between safety blocks and rails.
8. Check the safety gear for correct engagement.



6.1.13.3 Pit Equipment

1. Check free movement of the governor tension device, and check the switch.
2. Check security of the buffer.
3. Check correct hang of the compensating chains or free rope compensation.
4. Empty trip trays and ensure all equipment is clean.
5. Check the operation of the clamping device of the car and its electrical contact.

6.2 Cleaning



Warning

For safety reasons, the lift must be immobilized for cleaning operations.

1. The car top must be kept clean of oil, lint and rubbish to minimize the risk of fire.
2. The pit floor and its equipment must be kept clean, dry and free of rubbish.
3. The machine room, machine, control cabinet and other equipment must be free of lint, dust and oil.

6.2.1 Car interior surface

The elevator interior including doors and jambs are designed to maintain their origin status until elevator life cycle is finished. So, owner and operation manager must keep following items.

- Clean the interior surface in regular as following method.
- Specially, protect weak part and surface if elevator is used for carrying freight or similar proposes.

We recommend you to keep the following cleaning method

- **Glass:** Exclusive use of cleanser and smooth cloth or rag.
- **Stainless steel:** Exclusive use of cleanser for stainless steel and smooth cloth or rag.
 - Clean with moving to grain of stainless
 - In case of others, do not use detergent power, cream or wire brush.
- **Brass surface:** Use soap water with smooth cloth or rag first, and clean with dried rag.
 - Do not use detergent powder, cream.
- **Skin plate surface:** Use soap water with smooth cloth or rag.
 - Do not use any detergent power, cream or spray on OPB button.
- **Painted surface:** Use soap water with smooth cloth or rag.
 - Do not use any detergent powder or cream on OPB button.
- **Silicon finishing:** Use soap water with smooth cloth or rag.

6.2.2 Landing doors and jambs

Landing doors and jambs must be cleaned by above recommended method. And if it is required, they must be protected from damages.

6.2.3 Car & landing doorsills

Car and landing doorsills must be cleaned periodically.

After brushing, use vacuum clean machine.

6.3 Lubricating oil Specification

6.3.1 Lubricating oil Specification

6.3.1.1 TM Gear oil specification

Type	Meropa220	Meropa460	Clear
Density (15°C)	0.881	0.905	Kg/l@15°C
Viscosity (40°C)	213.7	435.5	cST
Viscosity (100°C)	20.45	31.92	cST
Viscosity exponent	111	106	(ASTM 2270)
Fluidity point	-21	-18	°C
Ignition point COC	216	224	COC °C
TM	WMC,WLC,Helical	TK,TY	

6.3.1.2 Guide rail & Guide shoe oil specification

Item name: HD 68(RANDO OIL)

General feature

Type	HD 68			Clear
Density (15°C)	0.884			Kg/l @15°C
Viscosity (40°C)	64.41			cST
Viscosity (100°C)	8.73			cST
Viscosity exponent	108			(ASTM 2270)
Fluidity point	-30			°C
Ignition point COC	220			COC °C

6.3.1.3 Pulley grease specification

Item name: EP2

Infuse quantity: 80%

General feature

Type	EP 2
Confusion degree(@25°C)	280
Accumulation (°C)	195
Additional (wt%)	Lithium soap 8
Load (kg)	18
4 Ball EP(kgf)	250
Temperature range (°C)	-30~120
Sump oil	Mineral oil

6.3.1.4 TR M/C sheave bearing grease specification

Item name: EP

NLGI Class	EP 2
Confusion degree(@25°C)	280
Accumulation (°C)	195
Additional (wt%)	Lithium soap 8
Load (kg)	18
4 Ball EP(kgf)	250
Temperature range (°C)	-30~120

■ Appendix1

Car top access guidelines

A recommended safe means of accessing to car top is:

Turn on the light in hoistway if switch is located outside the hoistway.

1. Call the car to which access is required.

(Ensure there are not passengers in car)

2. Register two car calls to lower floors.
3. As the car begins to descend, stop the car in position for access to car top by opening the landing door with door unlocking device (landing door key). At this time, do not open fully for your safety. Open door about 10cm~20cm
4. Check if car top accessing is easy.
5. Wait 10 seconds with opening door fully. And ensure that the car has not moved.
6. Place the Emergency stop switch on car top to the 'STOP' position.
7. Allow the door to close and lock. And register a hall call.

Wait again 10 seconds at hall.

8. Open the landing door and ensure that the car has not moved.
9. Open the landing door fully and place the inspection switch on car top to 'INSPECTION' position.
10. Place the Emergency stop switch on car top to the 'RUN' position.
11. Allow the door to close and lock. And register a hall call.
Wait again 10 seconds at hall.
12. Open the landing door and ensure that the car has not moved.
13. Open the landing door. And place the Emergency stop switch on car top to the 'STOP' position.
14. Shut down the power of car door and then close the access floor landing door.
15. Into the car from the access floor lower floor.
(If there is falling danger, please take proper actions.)
16. Place the inspection switch in car OPB to 'INSPECTION' position.
17. Close the landing door and return to the initial access level.
18. Open and fix the landing door with door blocking device. And turn on the car top light.

19. Remove the door-blocking device. And access to car top.

20. Close landing door.

21. Place the emergency stop switch on car top to the 'RUN' position.

22. Test up operation as pressing UP/Common buttons.

23. Test up operation as pressing DOWN/Common buttons.

24. Operate car with slow speed to destination floor.

(Place the Emergency stop switch on car top to the 'STOP' position during work.)

※ When on car top can place the inspection switch to 'INSPECTION'

position and move the car then ignore 15~17 items.

Car top Egress guidelines

1. Return the car to the initial access level on inspection mode
2. Place the emergency stop switch on car top to "STOP" position.
3. Egress from the access level and close the landing door.
4. Into the car then place the inspection mode to running mode on OPB board.
5. Return to the initial access level.
6. Fully open the landing door and install the door-blocking device.
7. Turn on power for the car door.
8. Place the top of car inspection switch to the "OFF" position
9. Turn off the light on car top
10. Place the top emergency stop switch on car top to the "RUN" position.
11. Remove the door-blocking device and close the landing door.
12. Register a hall call and check that the car is operating normally.

※ When on car top can place from inspection mode to running mode and running the car then ignore above 3~5 items.

※ When there is not Common button, then only press Up/Down button.

※ When on car top there is remote switch, before access or egress the top of the car, need to ensure the emergency stop switch on remote switch is safe.

※ If it is not possible to egress at the same landing as the initial access level then the landing door lock must be independently verified prior to egress from the car top through other floor.



Caution

1. Special attention must be paid in ensuring that the machine brake is correctly adjusted to specifications and verified to be in good working condition.
2. When the switch position is over the radius 750mm, then must install door-blocking device.
3. Car must always be operated in inspection mode when mechanic is working on the car top.
4. If there is a fall hazard possibility on the car top, fall protection system must be used.
5. In case of common hoistway, it must be always protected and guarded from all moving equipment.
6. Proper attire would be essential so as to prevent getting entangled with other hoistway equipment during movement on car top.
7. Car top must always be clean and free from any obstacles.

8. If possible, the mechanic must position himself in the center of the car top when operating the car on inspection mode.
9. Do not store any materials on the car top.
10. Always notify fellow personnel whenever car is required to be moved (Both way communication)

■ Appendix 2

Pit Access Procedure

1. Stick out of service label on hall button at Main Lobby to notify the public.
2. Verify that there is no passenger in the car by inter-phone and place a safety barricade at Main Lobby entrance to notify the public.
3. Register two car calls - one call to the floor directly above and another at a higher floor.
4. Open the landing door (10~20cm) before the car levels at the floor directly above to verify the door interlock functions and the car has stopped.
5. Wait 10 seconds to verify the car has not moved.
6. Fully open the landing door and install the door-blocking device.
7. Place the top (1st) pit emergency stop switch to the "STOP" position.
8. Close the landing door, register a hall call and wait 10 seconds.
9. Re-open the door partially (80mm) and verify that the car has not moved.
10. Fully open the landing door and install the door-blocking device.
11. Turn on the light switch.
12. Place the bottom (2nd) pit emergency stop switch to the "STOP" position
13. Exit the pit area and place the top (1st) pit emergency stop switch to the "RUN" position.
14. Close the landing door, register a hall call and wait 10 seconds.
15. Open the landing door hoistway (80mm) and verify that the car has not moved.
16. Fully open the landing door and install the door-blocking device.
17. Place the top (1st) pit emergency stop switch to the "STOP" position
18. Relocate and reinstall door-blocking device [Type "B"] at the center of both door panels after access into the pit.
19. Install the other door-blocking device at the edge of landing door [Type "A"] (Left side if the door-blocking device at the center is installed on the right landing door and vice versa.)
20. Start work in the lift pit

※ When there is not 2nd pit emergency stop switch then ignore above 12~17 items.

Pit Egress Procedure

1. Fully open the landing door and install the door-blocking device.
2. Bottom (2nd) pit emergency stop switch is turned to the "RUN" position.
3. Return pit light switch to "OFF" position.
4. Exit the pit area and place the 1st pit emergency stop switch to the "RUN" position, while at the lift landing entrance.
5. Remove the door-blocking device and close the landing door.
6. Check the car operation, prior to public usage.

※ If there is no bottom (2nd) pit emergency stop switch then ignore No.2 item.



Caution

1. Wet pit should not be accessed. If it is necessary, a Job Hazard Analysis must be performed before starting work.
2. When working under a hydraulic elevator system for more than 15 minutes, Pit prop (supporter) must be installed.
3. Moving to adjacent pit in a common hoist way is strictly prohibited.

■ **Appendix 3**

Periodic replacement components

Items	Replacement Period	Remarks
Traction machine oil	2 years	
Door Guide Shoe	1 year(3 years)	First floor(1 year),Common floor(3 years)
Cushion Rubber	3 years	
Micro Switch	3 years	
Cam Contact	3 years	
Guide Shoe Metal	3 years	
Guide Roller Asy	3 years	
Battery	3 years	
Hanger Asy	3 years(5 years)	First floor(3 year),Common floor(5 years)
Oil Seal	2 years	
Interphone	3 years	

Expendables

Items	Remarks
All kinds of Signal Lamps	Not include fluorescent lamp interior lighting lamps
Fuse	
Examination expendables	Bolt,Nut etc
Oil	Not include Hydraulic Oil
Cleaning Cloth	

- Replacement period is defined by general office building elevator
- Periodic replacement components expenses only in stated in contract period handled by SIGMA elevator company.
- Expendable components will be provided by SIGMA elevator company during the period stated in contract.
- Car inside cleaning and fluorescent lamp replacement is not business of maintenance company.

 SIGMA	MRL Elevator	Rev. No.	0
		Doc. No.	DL EL)06-004
FOD Field Industrial Engineering	TCD (Trouble Code)	Page	1/114
		Date	Apr. 2006

Index

§ TCD (Trouble code)	1~114
1. TCD management SI220 control panel	2
2. TCD table for SI220 control panel.....	3
3. Detail description for TCD (Trouble code).....	8

1. TCD Management of SI220 Control Panel

1.1. TCD (Trouble Code) Design standards

- 1) TCD (Trouble Code), which are mentioned on this document, have been made for SI220 control panel.
- 2) The number of TCD is 1~239 and they are classified by function.

1.2. Word definition

- 1) Operation CPU: It designates Main CPU (i186/i960)
- 2) Speed CPU: It designates INV DSP CPU
- 3) Error Operation Flag: It decides a elevator operation condition according to this number that is Control Flag.

1.3. Classification of TCD Number

Number Classification	Functional Classification	Operation condition in case of Trouble
1 ~ 15	System Error	It is defined by Error Operation Flag of each TCD
16 ~ 29	Inverter Interface Error	
30 ~ 69	Inverter / Converter Error	
70 ~ 149	Device Error	
150 ~ 199	Control Error	
200 ~ 239	Network Error	

1.4. Bit definition of Error Operation Flag

8	7	6	5	4	3	2	1	0	Flag definition	Description
								●	R5SC Cut	Operation unable
							●		Qualified R5SC Cut	Inspection operation unable or operation unable in case Car stops within door zone.
						●			C1ST Cut	Starting unable
					●				Qualified C1ST Cut	Inspection operation unable or operation unable in case Car stops within door zone.
				●					FAST Run Cut	High speed operation unable
		●							REST Mode	Operation unable in case of emergency return switch off Returning escape floor and operation unable in case of emergency return switch on
	●								Hall Call Cut	Hall call service unable
●									Hold Type	Holding trouble condition

1.5. Trouble-shooting according to the grade

Grade	Operation flag	Description
R1	91	R5SC Off right after trouble
R2	94	C1ST Off right after trouble
R3	90	Slow speed able. Call service unable. immediate stop in case of the trouble during high-speed operation
R4	82	Stop at the nearest floor in case of the trouble during high-speed operation. R5SC off at the door zone
R5	88	Stop at the nearest floor in case of the trouble during high-speed operation. C1ST off at the door zone
R6	C0	Call service unable
R7	80	Hall call service unable

2. TCD Table for Si220 Control Panel

TCD	Definition	Description	Detection		Hold	Grade
			OPER.	SPD.		
1						
2						
3						
4						
5	ERR_SW_WDT	Operation CPU SW WDT trouble occurred	●			R1
6	ERR_MEM_ALLOC	Memory allocation failed	●			R1
7	ERR_TASK_CREATE	Task making failed	●			R1
8	ERR_SEM_CREATE	Semaphore making failed	●			R1
9	ERR_WDT_CREATE	Operation CPU WDT Timer making failed	●			R1
10	ERR_INT	Non definitional vector Interrupt occurred	●			XX
11						
12						
13						
14						
15						
16	ERR_INV	Speed CPU H/W WDT trouble occurred	●			R1
17	ERR_INV_RETRY	Speed CPU Retry failure	●		●	R1
18						
19						
20						
21	ERR_INV_DPRAM	Speed CPU DPRAM WRITE trouble	●		●	R1
22						
23						
24						
25						
26~						
29						



MRL Elevator

Rev. No.	0
Doc. No.	DL EL)06-004
Page	4/114
Date	Apr. 2006

FOD

Field Industrial Engineering

TCD (Trouble Code)

TCD	Definition	Description	Detection		Hold	Grade
			OPER.	SPD.		
30	ERR_INV_OC	INV over current (H/W detection)		●	●	R1
31	ERR_DC_OV	DC Link over voltage		●	●	R1
32	ERR_INV_U_SHORT	INV phase U IGBT trouble		●	●	R1
33	ERR_INV_V_SHORT	INV phase V IGBT trouble		●	●	R1
34	ERR_INV_W_SHORT	INV phase W IGBT trouble		●	●	R1
35	ERR_INV_TR	Regenerative IGBT trouble		●	●	R1
36	ERR_INV_H_CT	INV Hall CT trouble		●	●	R1
37	ERR_INV_U_STACK_TH ERMAL	INV stack over heat		●		R4
38	ER_LOTOR_ROCK_ERR	LRT operation error		●	●	R1
39						
40						
41	ERR_INV_C_CNTL	INV current control trouble		●		R1
42						
43						
44						
45						
46						
47						
48	ERR_INV_DC_LINK_UV	DC link under voltage		●		R2
49						
50						
51						
52	ERR_INV_REVERSE_RU N	INV reverse rotation detection		●		R1
53	ERR_INV_CHARGE	INV charging trouble		●	C	R1
54	ERR_INV_OVER_LOAD	INV over load detection		●		R1
55	ERR_INV_LOW_SPEED	INV under speed detection		●		R2
56	ERR_INV_HIGH_SPEED	INV over speed detection		●		R3
57						
58						
59	ERR_INV_ANTISTALL	INV. No operable for 24 sec.		●		R2
60	ERR_INV_SPEC	INV Spec Data trouble		●	●	R1
61	ERR_INV_SPEC_COM	INV Spec write trouble		●		R1
62	ERR_INV_V48	INV momentary power failure detection		●		R1
63						
64						
65						
66						
67						
68						
69	ERR_V100	Missed phase detection (100V)		●		R3
70	ERR_POWER	48V power trouble (missing phase)	●			R1
71	ERR_V48	Voltage drop detection (85% below)	●			R4
72	ER_C1SW_ON	C1SW ON error	●		●	R1
73	ER_C1SW_Off	C1SW Off error	●			R0

TCD	Definition	Description	Detection		Hold	Grade
			OPER.	SPD.		
74	ERR_SPEC_OVER	Operation SPEC DATA trouble	●			R0
75						
76	ERR_EEPROM_WRITE	EEPROM Write trouble	●			R3
77	ERR_EEPROM_READ	EEPROM Read trouble	●		●	R1
78	ERR_EEPROM_FHT_SUM	EEPROM floor height measuring Table Sum trouble	●			R3
79	ERR_NVRAM_FHT_SUM	NVRAM floor height measuring Table Sum trouble	●			R3
80						
81						
82						
83						
84	ERR_R5SC_ON	R5SC RELAY ON trouble	●		●	R1
85	ERR_R5SC_OFF	R5SC RELAY OFF trouble	●			R1
86	ERR_C1BR_ON	C1BR CTT. ON error	●		●	R1
87	ERR_C1BR_OFF	C1BR CTT. OFF trouble	●		●	R1
88	ERR_C1ST_ON	C1ST CTT. ON trouble	●		●	R1
89	ERR_C1ST_OFF	C1ST CTT. OFF trouble	●		●	R1
90	ERR_SUPPRESS_ON	SUPPRESS ON trouble	●		●	R1
91	ERR_SUPPRESS_OFF	SUPPRESS OFF trouble	●		●	R1
92	ERR_ENCO	R.E disconnected	●		●	R1
93	ERR_ENCO_READ	R.E pulse counter read trouble	●		●	R1
94	ERR_ENCO_COUNTER	R.E pulse counter trouble	●		●	R1
95	ERR_MECHANICAL_SAFETY	R5SX OFF trouble (Safety line)	●			R1
96	ERR_ABNORMAL_MODE	Operation mode input trouble	●			R4
97	ERR_CDS,	CDS trouble	●			R2
98	ERR_LDS	LDS trouble	●			R2
99	ERR_DUP_IN	Dual input signal trouble	●		●	R1
100	ERR_SDS1D_ON	SD1D ON trouble	●			R3
101	ERR_SDS2D_ON	SD2D ON trouble	●			R3
102						
103						
104						
105						
106						
107	ERR_SDS1U_ON	SD1U ON trouble	●			R3
108	ERR_SDS2U_ON	SD2U ON trouble	●			R3
109						
110						
111						
112						
113						
114	ERR_POSI	POSI ON trouble (LDC)	●		●	R2
115						
116	ERR_LDU	POSI ON trouble (LDU)	●			XX



MRL Elevator

Rev. No.	0
Doc. No.	DL ELJ06-004
Page	6/114
Date	Apr. 2006

FOD
Field Industrial Engineering

TCD (Trouble Code)

TCD	Definition	Description	Detection		Hold	Grade
			OPER.	SPD.		
117	ERR_LDD	POSITION trouble (LDD)	●			XX
118						
119	ERR_SDS	SLOW DOWN SW trouble	●			R6
120						
121						
122	ER_DES_PARA_ERR	DES Parameter error	●		●	R1
123	ER_REGE_R_THERMAL	Regenerative resistor over heat	●			R1
124						
125	ERR_BRAKE_OFF	BRAKE open trouble	●		●	R3
126	ERR_MAIN_INV_SPEED	Speed different between operation / speed	●		●	R3
127	ER_HALL_TEMP_ERR	DES Temp. detection error	●		●	R5
128						
129	ER_MOTOR_THERMAL	MOTOR Over heat	●		●	R5
130	ERR_WEIGHT_SENSOR	Load detector input trouble	●			R3
131	ER_SLACK_ROPE_ERR	SLACK Rope error	●		●	R3
132	ERR_OPEN_LOCK	Door Open Lock detection	●			XX
133	ERR_OPEN_LOCK_3	OPEN_LOCK repeated trouble	●			R2
134	ERR_CLOSE_LOCK	Door Close Lock detection	●			XX
135	ERR_CLOSE_LOCK_REPEAT	Door Close Lock repeated trouble	●			R3
136	ERR_ALP	ALP trouble	●		●	R1
137						
138						
139	ERR_NUDGING	Nudging trouble	●			R7
140	ERR_NVRAM_BATTERY	Discharging voltage of Backup Battery under reference	●			XX
141	ERR_RTC	Clock Chip trouble	●			XX
142						
143						
144						
145	ERR_INV_DM	INV. Door CPU WDT trouble	●			R6
146	ERR_COOLER_FLAOT_SW	Air-conditioner Float S/W trouble	●			XX
147	ERR_OBS	OBS detection	●		●	R1
148						
149						
150	ERR_SDS1D_OS	SD1D Over Speed detection	●			R3
151	ERR_SDS2D_OS	SD2D Over Speed detection	●			R3
152						
153						
154						
155						
156						
157	ERR_SDS1U_OS	SD1U Over Speed detection	●			R3
158	ERR_SDS2U_OS	SD2U Over Speed detection	●			R3
159						