Installation Manual For Escalator

Business escalator

2015. V1. 0

Business Slim escalator
(Slim Normal)

Table of Contents

Chapter I Preparations before installation of escalator

1.1 Overview

Escalator installation work has closely relationship with the customer.In order to successfully carry out the work and improve efficiency, installation personnel should maintain good contact with customers. Try to get customers strong support for the installation work.

Before starting the installation work, the customer shall confirm the progress of the installation requirements. Installation company makes installation plan according to requirements, and installation work should be conducted as planned.

Installer should read the installation instructions before installing. When the actual parameters and civil engineering civil FIG parameters do not match, you shall notify relevant units and timely conduct treatment. Any damage or thus affecting the quality of the product due to installer's improper installation or non-compliant installation behavior, arising out of right, the Company will be held accountable.

1.2 Safety Precautions

1.2.1 Check Before Working

Installation personnel must hold special types of installation the operating permit.

Every day before starting work, do safety handover well, and conduct security checks for following items:

a. Security guards;

b. Mechanical, electrical facilities (such as welding, lifting equipment, especially safety devices);

c. Accessibility (such as oxygen, acetylene);

d. Other operating device.

e. Warning signs Description

No.	Item Description	Quantity	Identify suggested affixed position	Mark
1	Children must pull tabs	2	An upper end and a lower end of the glass at the glass head	 小孩必须拉住 PLEASE PULL CHILDREN HANDS

No.	Item Description	Quantity	Identify suggested affixed position	Mark
2	Pets must carry labels	2	An upper end and a lower end of the glass at the glass head	
3	Grip handrails tag	2	An upper end and a lower end of the glass at the glass head	
4	Prohibit the use of trolleys tag	2	An upper end and a lower end of the glass at the glass head	
5	Label IV\ escalator leading edge plate mark \ Chinese Version	2	The upper and lower ends at a large angle	**Warning!** **After the electrical system turns into overhaul state, you are allowed to enter the room**

No.	Item Description	Quantity	Identify suggested affixed position	Mark
6	Label III \ escalator leading edge plate mark \ Chinese Version	2	The upper and lower ends at a large angle	**Warning! You must leave the room before the escalator is started**
7	Label VII \ escalator leading edge plate mark \ Chinese Version	2	The upper and lower ends at a large angle	**Recovery Help For Manual Brake Firstly enter the machine room to cut off energy power of escalator, and then 2 professionals loosen the brake manually in cooperation. One of them reels the fly wheel and move slowly. After the completion of**
8	Label I \ escalator leading edge plate mark \ Chinese Version	2	The upper and lower ends at a large angle	**Warning! Note: Never touch moving parts.**
9	Label VI \ escalator leading edge plate mark \ Chinese Version	2	Big steel angle at the end of the upside	**Warning! When repair the main panel of the control cabinet, the main power must be cut off.**

No.	Item Description	Quantity	Identify suggested affixed position	Mark
10	Label V \ escalator leading edge plate mark \ Chinese Version	2	The upper and lower ends at a large angle	**Warning!** **When opening the moving cover plate, safety fence must be set up for surroundings.**
11	Label II \ escalator leading edge plate mark \ Chinese Version	1	On the hood of the host	**Warning!** **Flywheel is forbidden to stand on.**
12	Need to lace safe belt			
13	Take appointment with certificates (special)			

No.	Item Description	Quantity	Identify suggested affixed position	Mark
14	Need to wear a helmet			
15	Need to wear protective gloves			
16	Need to wear protective shoes			
17	Need to bring goggles			

1.2.2 Maintenance of the working environment

Site of installation work must be kept clean to prevent being tripped when working. And pay attention to fire protection.

1.2.3 Work site security matters

When entering the site, people should be unified for dressing, such as overalls, helmets, safety shoes, etc.

During installation, serval works at one time on different floors in vertical working area of the escalator should be tried to avoid. Complete area protection work to prevent person from damage caused by falling objects.

1.2.4 Confirmation of escalator's transporting corridor

Escalator is normally overall transportation. The delivery vehicle is longer and the loading height is higher. Before the delivery, transporting corridor and relative lifting plan must be confirmed. And relative functional department should approve the delivery and lifting plan.

1.3 Preparations of construction site

1.3.1 Communication with customers

Entrance to construction site should accord with customers' relative regulations. And you should communicate with customers and confirm relative installation specifications, such as construction proposal, safety regulations, etc.

1.3.2 Verification of civil engineering

Know about technical parameters such as installed width, lifting height, inclined angle of escalator, etc. Measure deminsions of civil engineering according to the confirmed construction layout drawing of escalator, including the length, width, depth and hoisting height of the foundation pit, distance between the upper and lower horizontal supporting points. After the repetition measurement of civil engineering, if error is found, notice users and relative units timely and correct the error. The repetition measurement of dimensions of civil engineering of escalator should be completed before installation and positioning. The repetition measurement for requirement and dimensions of civil engineering must be strictly according to requirements of the layout drawing (confirmed by company's stamp) of civil engineering of escalator.

a. Repetition measurement should be conducted for level supporting point of the upside and downside of escalator. Re-check whether the correct leveling supporting distance required by inclined angle of escalator accords with requirement of design. Step size, embedded parts, and the level of two horizontal anchor meets the installation requirements. If it does not meet, relative unit should tame measure timely. See details in the Figure 2 below

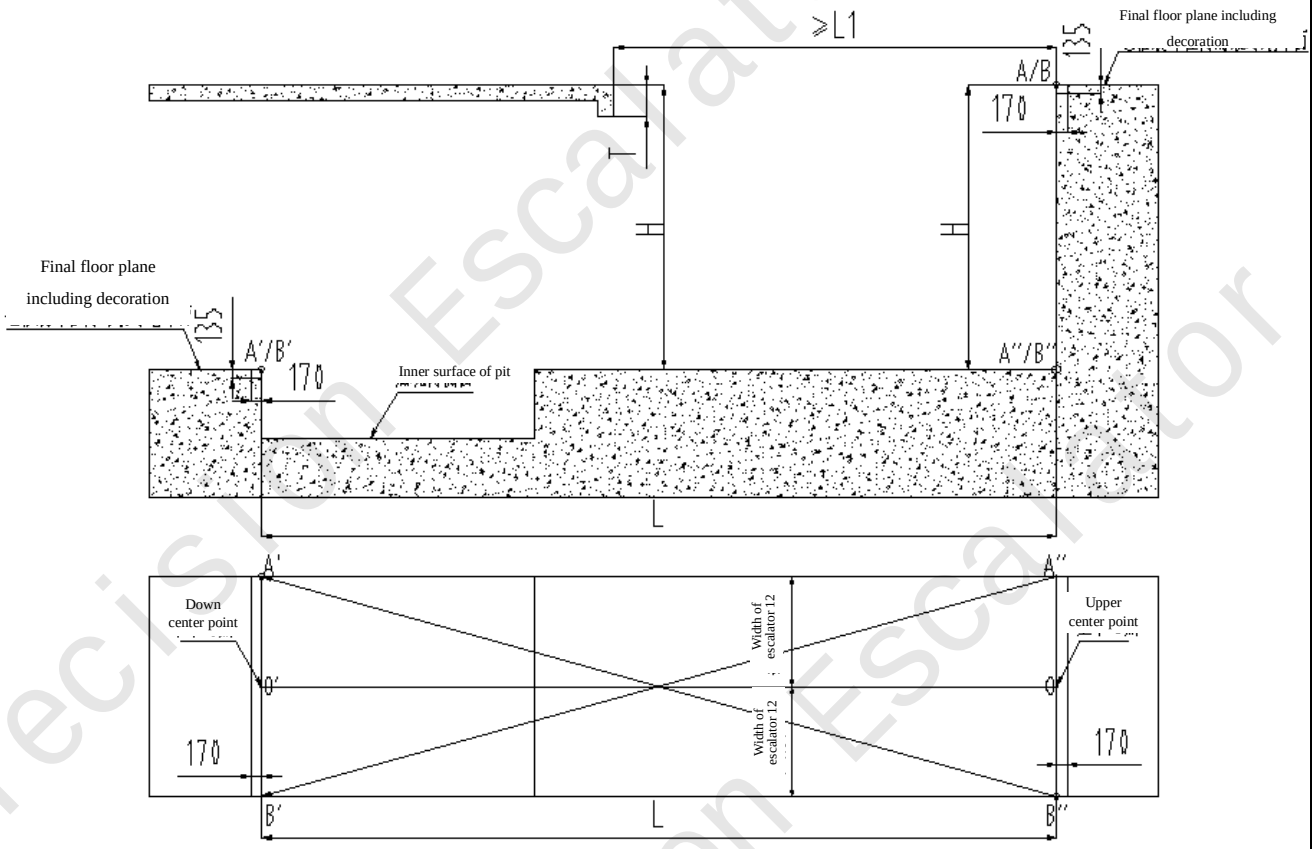


Figure 2 Repitition Measurement of Escalator's Civil Engineering

b. Place vertical aligner respectively at A and B. Then project to A'' and B'', and then measure the length of diagonal A'B'' and B'A''. |LA'B"-LB'A"|≤10mm.

c. according to specifications of national standard, the vertical clear height upon the steps of escalator should not less than 2.3m. Value of L1 can be obtained:

Type of escalator	L1 (mm)	Type of escalator	L1 (mm)
35° 2 Horizontal steps (indoor)	≥6500+1.428*T	35° 3 Horizontal steps (indoor)	≥7000+1.428*T
30° 2 Horizontal steps (indoor)	≥7000+1.732*T	30° 3 Horizontal steps (indoor)	≥7500+1.732*T

d. Measurement of hoisting height. That is to say, the vertical dimension between the finished surfaces of decoration of the two floors of the escalator's entrance. Measurement method: hang plumb line from the upper floor, find out the measuring point of the vertical dimension of the lower floor and measure the actual floor height H, the dimension is HH±5/0mm;

e. Measurement of leveling span That is to say the projection distance of two supports of transported two floors Measuring method: hang a line from upper supporting point to the ground for positioning. Then measure the level distance L from the positioning point to the edge of lower bearing beam. The dimension is L+10/0mm.

Two measuring points for single set, three measuring points for paralleling set. Ensure accuracy.

f. Find out the installation central point 0,0' of the whole escalator in the separation distance of the upper and lower beams. Mark the installation center well; and mark at A. B. A'.B' well on the center of the upper and lower beams (width of the escalator/2). The measured width 170mm+10/0mm of steps of the upper and lower beams should accord with the requirements of the dimensions of the construction layout drawing (see Figure 2) to ensure that there is no difference on the horizontal distance of the width when the escalator is installed. The allowed error of the civil engineering should be less that the requirements of the dimensions of the civil engineering;

g. The surface of the inner side of the upper and lower beams (near the escalator) must be vertical straight in the height scope of 1200mm. Embossment on the wall surface is not allowed (see Figure 2);

h. The civil engineering of the escalator that has pit should accord with the requirements of b, c, d, and e, Symmetrical centerline of the pit should be same with the symmetrical centerline of the upper supporting beam. Pit length, width, depth shall comply with the requirements of civil confirm FIG.

i. When conducting repetition measurement, check whether the steel plate embedding of the step surfaces of the upper and lower beams accords with the construction layout drawing. The distance between the upper surface of the embedded steel plate and the finial-decorating floor is 135±5mm. the embedding of steel plate should be horizontal. The edge should be straight with the pit and supporting beam. It can not exceed the outside of the supporting beam and be oblique;

1.3.3. Material storage

Confirm whether the storage area for the material is safe and whether the size is suitable.

1.3.4. Confirm installation plan

After the completion of preparation work, confirm the installation plan with costumers.

1.3.5. Confirmation of lifting staff

Overview: the lifting and positioning of escalator must be completed by professional group.

1.3.6. Tool preparation for construction site

No.	Name	Size	Design
1	Torque wrench	1,000N.m	

2	Monkey wrench	8” 10” 12”	

No.	Name	Size	Design
3	Hammer	1.5lb 2lb	
4	Rubber hammer	2lb	
5	Hacksaw		
6	Vice	2”	
7	File	8” 10”	
8	Flat file		

9	Ring chuck	6”	

No.	Name	Size	Design
10	Hexagonal wrench		
11	Flat chisel	8mm 10mm 12mm	
12	Grease injector		
13	Oil injector		
14	Support for thread chaser	M3-M16	

15	Thread chaser	M3-M16	

No.	Name	Size	Design
16	Burnisher r	¢120	
17	Electric drill	¢3-¢13	
18	Flashlight		
19	Hand light	~36V	
20	Flattop screwdriver	4” 6” 8” 10”	

21	Cross screwdriver		

No.	Name	Size	Design
22	Electrician’s knife		
23	Long nose plier		
24	Diagonal plier		
25	Stripping plier		
26	Test pen		

27	Gradienter		

No.	Name	Size	Design
28	Protractor		
29	Depth vernier caliper		
30	Vernier caliper		
31	Progress indicator		
32	Ruler		

33	Steel belt		

No.	Name	Size	Design
34	Decibelmeter		
35	Stopwatch		
36	Pincerlike electric instrument		
37	Tramegger		
38	Tachometer		

39	Multimeter		

Chapter II Description of the process for installation of escalator

2.1 Unpacking material check

Overview: Confirm delivered equipment or parts accord with site needs, and ensure normal carrying out for following installation.

Protective equipment


Tool

Details: crowbar, hammer, screwdriver, etc.

Procedures	Operation	Remark
1	Confirm material disposal site and passage are smooth	
2	Check the box whether it looks good	
3	Check cargo according to the packing list	
4	The placing of material is in neat, in order and specific. Do necessary protection well to avoid damage caused by improper stacking or improper protection	

5	Clear up residue sundries in unpacking site	
6	Unpacking person on site sign and confirm	

2.2 Lifting, installation and positioning of escalator

Overview: the lifting and positioning of escalator must be completed by professional group.

2.2.1 Overall lifting, installation and positioning of escalator in open area (apply for escalator without support)

The ordinary transporting mode is overall transportation. When being delivered, the escalator is equipped with tightwire lifting appliance specially used for lifting of the upside and downside. They are at the four corners of the truss. When lifting, lift at these locations. Do not change the lifting locations at will.

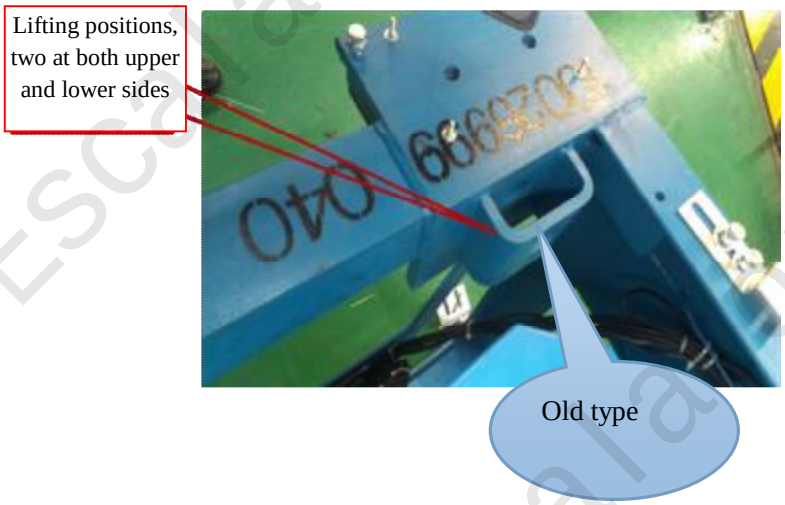
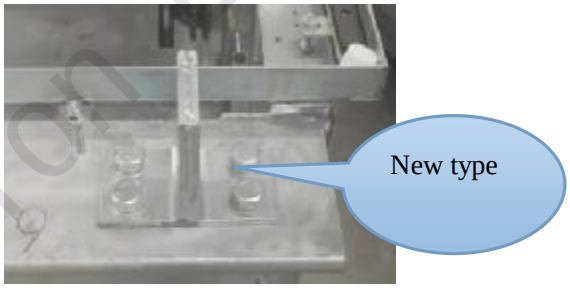
Protective equipment

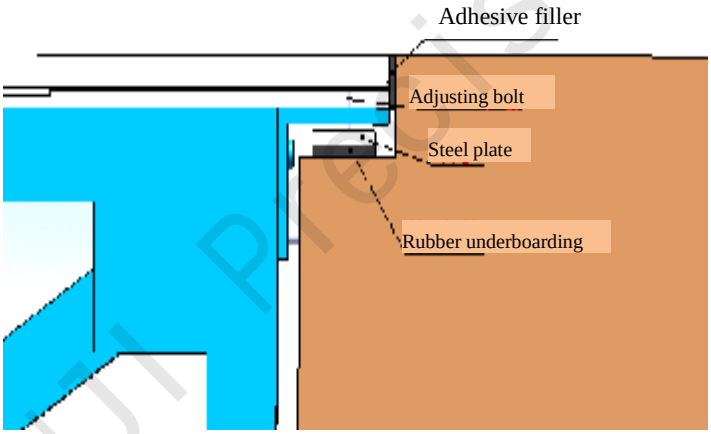
Tool

Details: tape measure, spirit level, ruler, wrench

Procedures	Operation	Remark
1	Confirm escalator's lifting area	Make relative warning mark and on-site supervision station well. Irrelevant personnel can not enter escalator's lifting area

Procedures	Operation	Remark

2	Confirmation of escalator's lifting position (apply for escalator without support)	1. Hoisting position   2. When being delivered, the escalator is equipped with tightwire lifting appliance specially used for lifting of the upside and downside. They are at the four corners of the truss. When lifting, lift at these locations. Do not change the lifting locations at will. 

Procedures	Operation	Remark
3	Escalators lifting height and place preparation	1. When lifting is in place, the escalator must higher than upper and lower bearing beam. The upper and lower part of escalator is in level state and put down slowly to make the escalator in place on the upper and lower bearing beam. The center of escalator should be basically same with centerline of civil engineering. Note: As to make sure the upper and lower parts being put down at the same time, on site, you can use chain block as center connection before the lifting of the upper part to make it easy for adjusting. Or under conditions permit, use two set of cranes 2. The distances of several paralleling escalators should be distributed uniformly according to dimensions of construction drawings. The horizontal gaps between the upper and lower parts and the upper and lower beams should be same 3. When the escalator is in place, put installation underboarding for it and install adjusting bolts. Rubber underboarding should put under the steel plate.
4	The upper and lower parts of escalator are in place	The upper and lower parts of escalator are supported on the building of upper and lower floors. As to avoid direct contact of escalator and building, put vibration reducing hard rubber underboarding under the large steel angle of the truss to separate escalator and building and reduce transmission of vibration. Fulfill the gap between escalator and building by adhesive filter. At least one end of the escalator should adopt this kind of moving support 

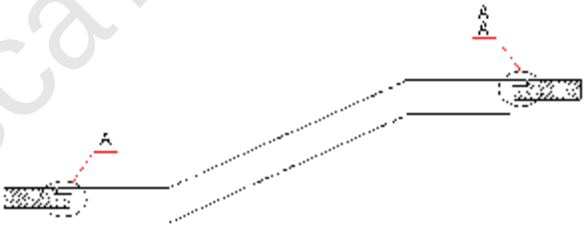
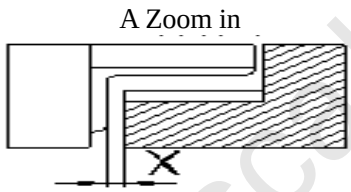
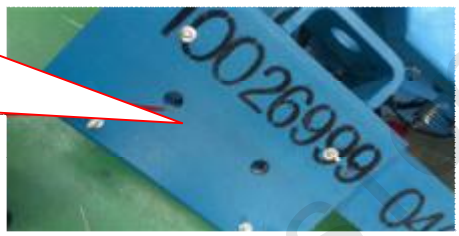
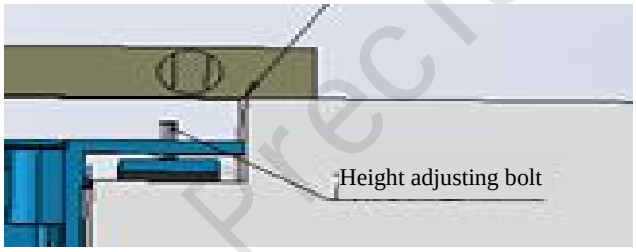
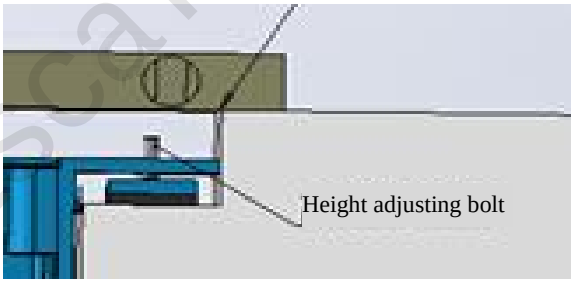
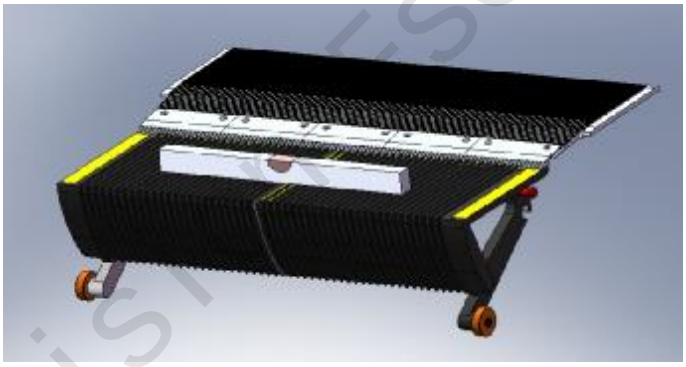
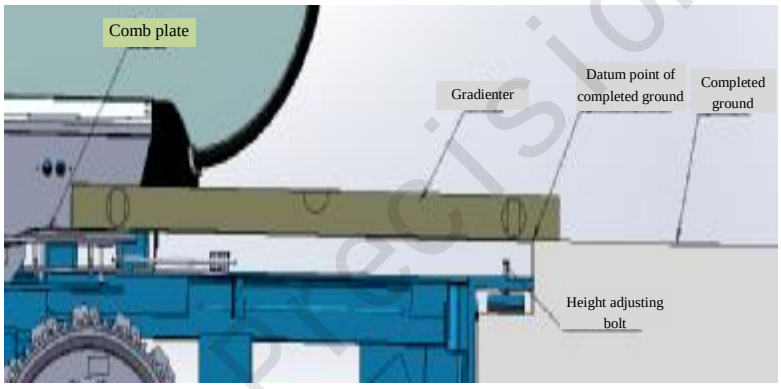
Procedures	Operation	Remark
5	Shelving requirement of the upper and lower parts of the escalator	  Note: Conditions of satisfaction: 10mm≤X≤20mm; when X>20mm, strethening measures must be taken and it should meet the technical requirements of the designed stength. And the strengthening proposal should be agreed by the technical department of the factory;
6	Height adjustment for the upper and lower parts of the escalator	When installing, the plane of front board of the upper and lower parts of escalator should little higher than the final floor of the upper and lower floors. You can use adjusting bolt of the upper and lower parts to adjust The upper and lower ends are placed upon the shock pad. 4 shock pads on each ends, 8 bolt positions in   Note: if the reserved mouth for civil engineering is too deep, solutions have been mentioned in repetition measurement in Chapter II of this specification. Use with embedded steel

		plate welded solid

Procedures	Operation	Remark

7	Escalator's levelness adjustment	1. Different four height adjusting bolts on the upper and lower parts of the truss also should be used for levelness adjustment  2. Levelness measurement (Allowed tolerance can not be more than 0.5 mm/m) Levelness of horizontal plane: steps in level section of upper and lower parts and steps of central supporting part;  Levelness of longitudinal plane: on the main beam at two sides of the upper and lower parts of the truss (at this moment, the front plate of the upper and lower parts are not installed) or the levelness of the longitudinal plane of steps of the upper and lower parts 

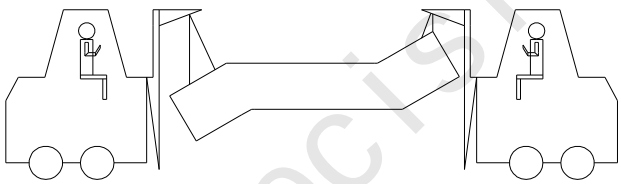
2.2.2 Overall lifting, installation and positioning of escalator in limited area (apply for escalator without support)

Overview: it does not apply for overall lifting for big crane. Involved equipment needs space for moving.

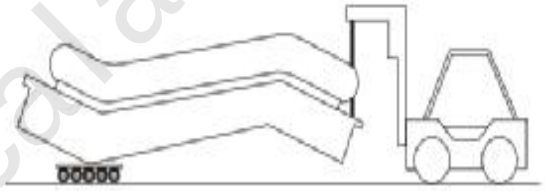
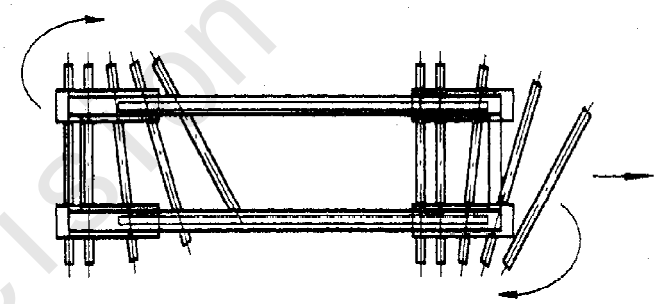
Protective equipment

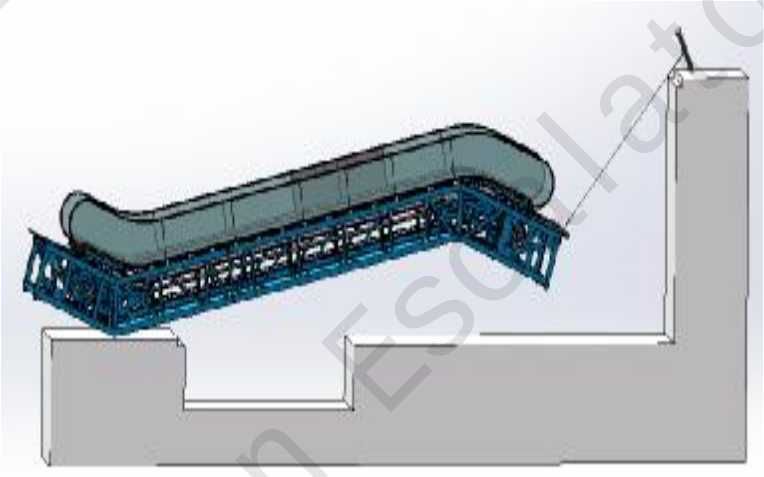
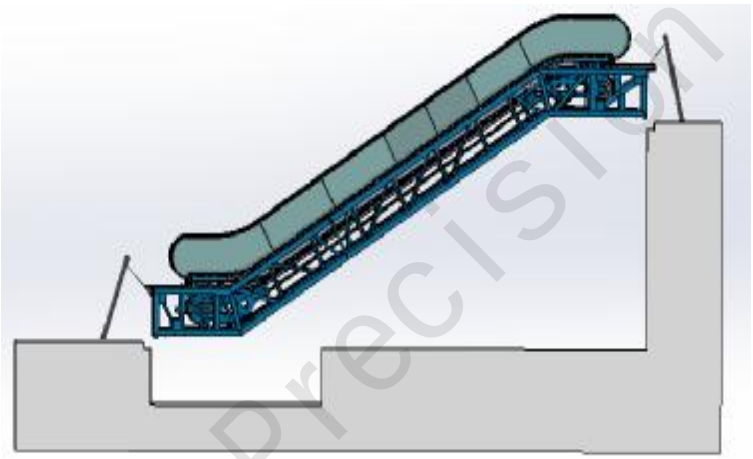
Tool

Details: crowbar, hammer, screwdriver, etc.

Procedures	Operation	Remark
1	Preparation for displacement of equipment	Corridor clearance and check of tools
2	Unloaded good from the crane should be put on displacement tool	Displacement way is shown below: 1. Two sets of forklift 

Procedures	Operation	Remark

2	Unloaded good from the crane should be put on displacement tool	2. One forklift and tank  3. Two tanks  4. Steel pipe 

Procedures	Operation	Remark
3	Lifting of escalator	1. Before the whole escalator is lifted to the bearing beam, the upper part should be lifted firstly, safety cables should be prepare well for the lower part before lifting. During the gradual lifting period for the upper part, the safety cable should be loosened slowly to make the upper part go upside slowly and the lower part move forward slowly  2. When the lifting is in place, the escalator must be higher than the upper and lower supporting beams. The upper and lower parts of escalator should be in level status and be put down slowly to make the escalator in place on the upper and lower supporting beam  Note: The only way a non-illustrated lifting mode, field conditions permit may also be multiple ways chain hoists

Note: positioning and relative adjustment of escalator are same as the above mention requirement in 2.2.1

2.2.3 Overall lifting, installation and positioning of escalator in limited area (apply for escalator without support)

1. Overview: as limited by transportation or other conditions, the truss adopts separate type. The whole lifting will be in place after the assembly on site.

2. Break wire rope breaking force of not less than 156KN.

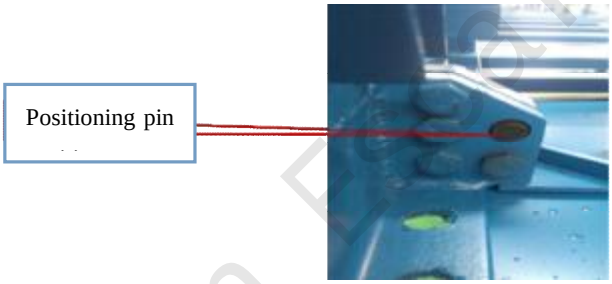
Safety device

Tool

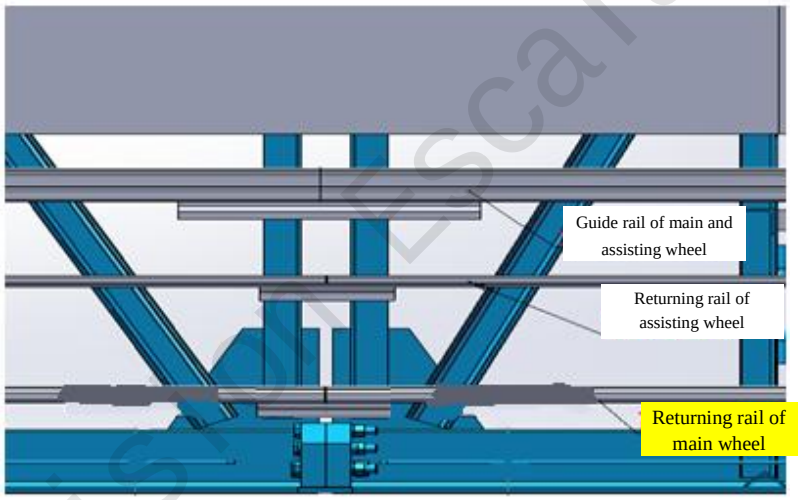
Details: Tape measure, spirit level, ruler, wrench, shifting tool (tanks, sleepers, steel pipe, forklifts), etc.

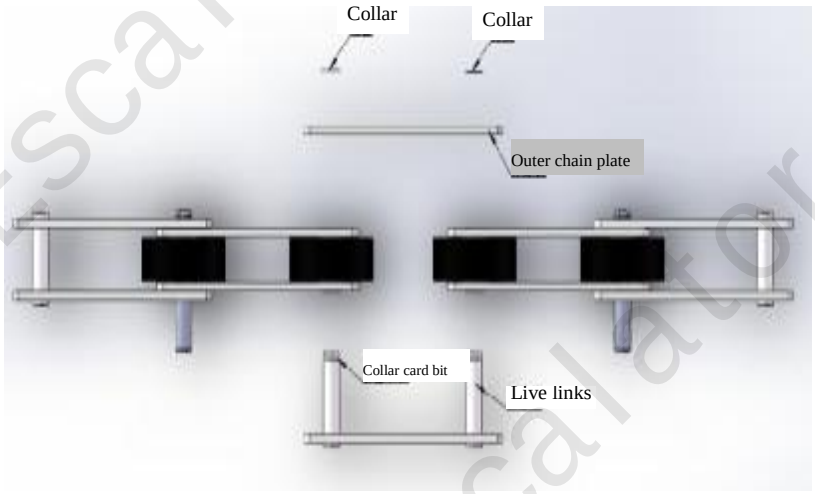
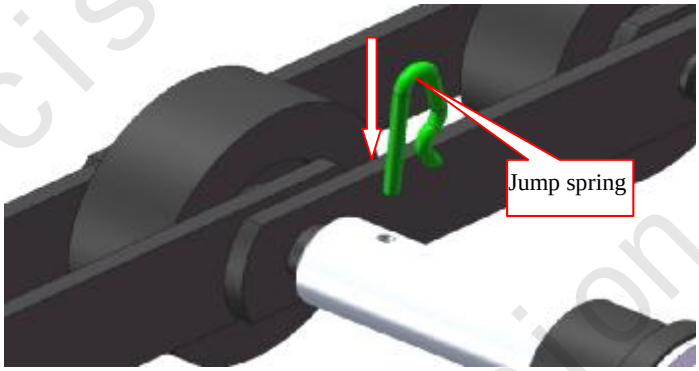
Procedures	Operation	Remark
1	Confirm escalator's lifting area	Make relative warning mark and on-site supervision station well. Irrelevant personnel can not enter escalator's lifting area
2	Lifting of separate escalator	One end for lifting stays at original place, the other end is at connection place. You should ensure this place has reliably connection to fix the lifting. And it can not cause transformation of truss 1. The lower lifting image, 2. The upper lifting image  Note: If the scene involves a shift of reference 2.2.2 Executive

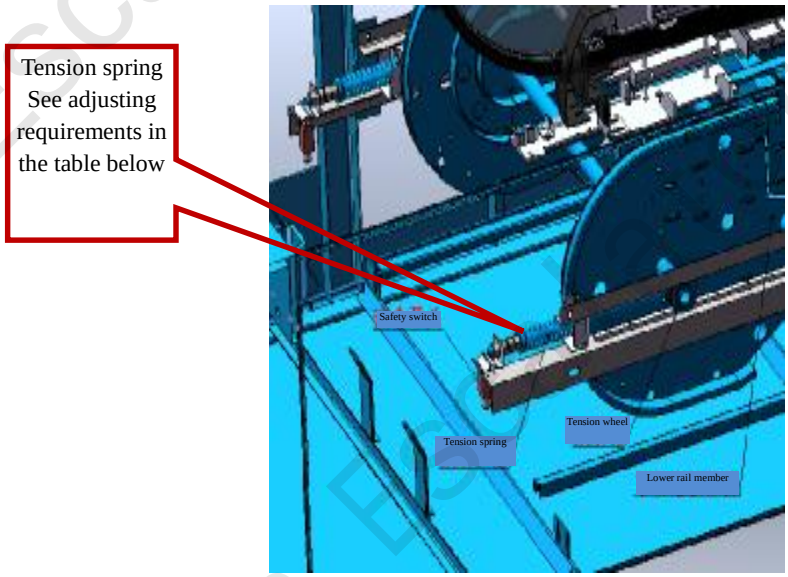
<table>
<tr><th>Procedures</th><th>Operation</th><th>Remark</th></tr>
<tr><td>3</td><td>Assembly on site</td><td>
1. End positioning column when assembled combination should be positioned close to the other end of the hole, then slowly push pin inserted into the positioning holes;

2. Then adopt random equipped high strength bolt for connection and installation.


3. All random equipped high strength bolts should use special torque spanner to fasten according to specified tightening torque. Then fasten them according to specified testing torque and they can be used only once.
4. This case should also be noted rung joint portion of the track and cannot collide, so as not to bend the rail joint portion, and then the binding site of bolt connections are tight. (Fastening force requirements)
<table>
<tr><th>Bolt Specifications</th><th>Rated torque</th><th>Testing torque</th></tr>
<tr><td>M16</td><td>340Nm</td><td>360Nm</td></tr>
<tr><td>M20</td><td>550Nm</td><td>590Nm</td></tr>
</table>
NOTE: truss segment joints connected, with Torque wrenches tested for compliance with the requirements of the preload; If the indicator measuring the force on the handle has reached the moment of testing, but has no further rotation of the nut, it can be considered already preloaded
</td></tr>
</table>

Procedures	Operation	Remark
4	Inspection and adjustment for truss splice	The vertical and level precision at connection place of truss can be adjusted by adjusting gasket when necessary
5	Inspection and adjustment of guide rail at connection place of truss	1. The joint of guide rails of steps at the juncture should be strict. The partial gap at the joint should be less than or equal with 0.05mm. The joint step should be less than or equal with 0.05mm. 

6	Inspection and adjustment of tracking chain of steps at connection place of truss	Note: installation side of jump ring is at the external side to make sure the jump ring is in effect 
7	Installation inspection of jump ring of step chain	1. Install jump ring at every pin roll of step 2. After the completion of installation and debugging of escalator and before the operation, check whether all chains get enough lubrication. 

<table>
<tr><th>Procedures</th><th>Operation</th><th colspan="2">Remark</th></tr>
<tr><td rowspan="6">8</td><td rowspan="6">Tensioning force adjustment for tracing chain of steps</td><td colspan="2">Refer to actual operating conditions and the figure below to adjust the tension of the spring compression length
 
</td></tr>
<tr><td colspan="2">Adjustment standard of tensioning spring of step chain</td></tr>
<tr><td>Spring free length</td><td>170mm</td></tr>
<tr><td>Working load</td><td>300kg</td></tr>
<tr><td>Working length</td><td>150±2mm</td></tr>
<tr><td>The amount of compression</td><td>20±2mm</td></tr>
<tr><td colspan="4">Note: Positioning and relative adjustment are same as the above mentioned contents in 2.2.1 and 2.2.2</td></tr>
</table>

2.2.4 Separate lifting, installation and positioning of separate truss escalator (with support)

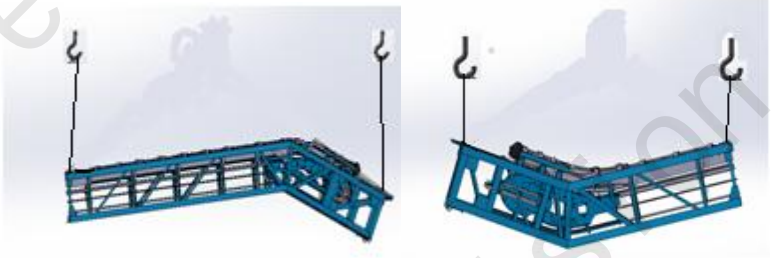
Overview: 1. As limited by transportation or other conditions, truss adopts separate mode. Separate lifting and positioning are conducted on site

2. Break wire rope breaking force of not less than 156KN.

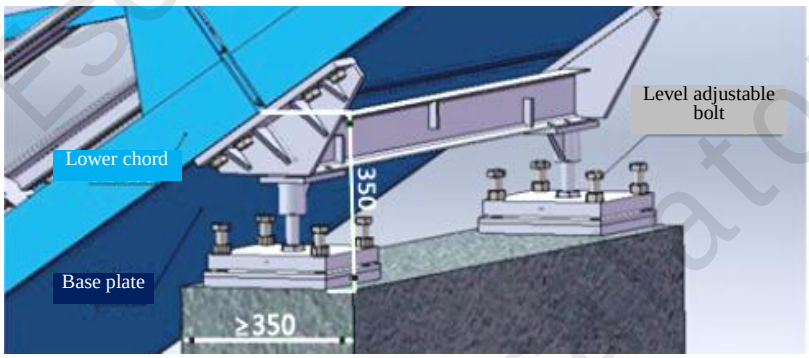
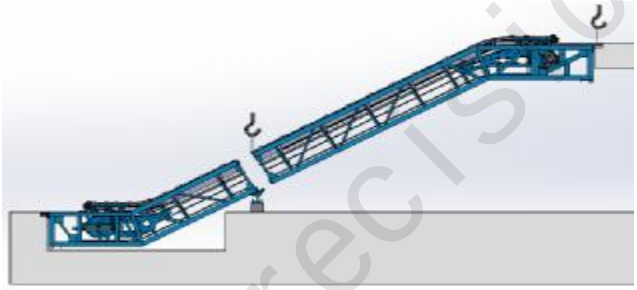
防护用具 Safety device

工具 Tool

Details: Tape measure, spirit level, ruler, wrench, shifting tool (tanks, sleepers, steel pipe, forklifts), etc.

Procedures	Operation	Remark
1	Confirm escalator's lifting area	Make relative warning mark and on-site supervision station well. Irrelevant personnel can not enter escalator's lifting area
2	Lifting of separate escalator	One end for lifting stays at original place, the other end is at connection place. You should ensure this place has reliably connection to fix the lifting. And it can not cause transformation of truss 1. The lower lifting image, 2. The upper lifting image  Note: If the scene involves a shift of reference 2.2.2 Executive

Procedures	Operation	Remark

3	Lifting of separate escalator	1. When the lifting height is larger, its deflection and span should also be increased. Center support should be set up between the two supports (see picture below). Adjusting bolt is installed in the center support, which performs supporting function for the truss. Necessary adjustment must be conducted when installing.  2. Put the lower part of the escalator on the lower pit and central support. Lift it down slowly after adjusting the position well, and put it at the position of lower support and central support.  Note: requirement of lower part refer t o relative requirement in 2.2.1 3. Place the upper escalator at the position in the picture below. Move the upside of escalator slowly to jointing place of separate truss. Adjust the position of the upside of escalator to make it match the flange of the downside of escalator.  NOTE: Stitching Requirements refer to the corresponding requirements in 2.2.3. Other shelving requirement refer to relative requirement in 2.2.1. As these three sections of a support, lifting the order from bottom to top stitching lifting adjustment.

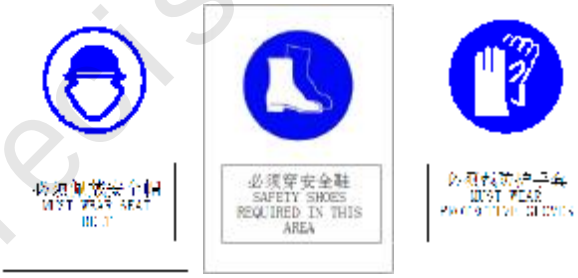
Note: The escalators in place and adjusts the corresponding requirements consistent supra 2.2.1, 2.2.2, 2.2.3.

2.3 System Installation for Handrail

Overview: Wall handrail system is mainly composed of glass, rails and handrails handrail three parts. Special attention is Wall toughened glass; the installation should pay special attention to bump to prevent damage to the glass.

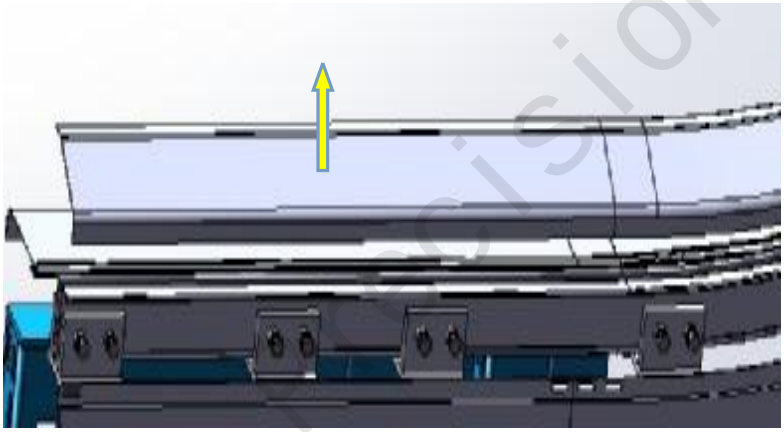
2.3.1 Installation of Components of Cover Plate and Guide Rail of Handrail

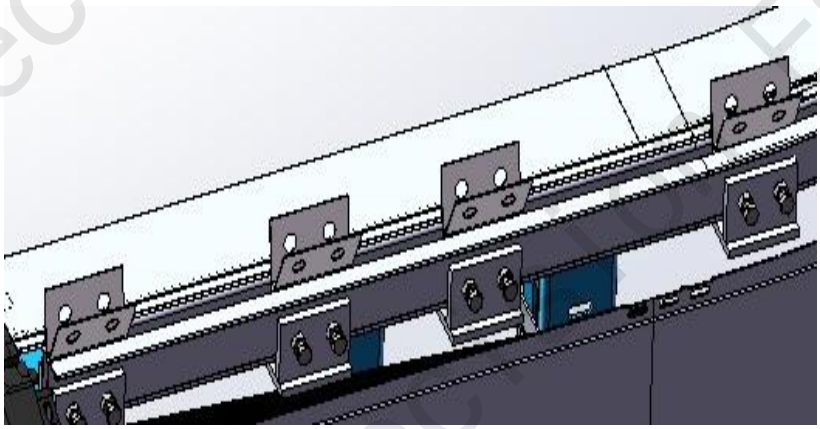
Protective equipment

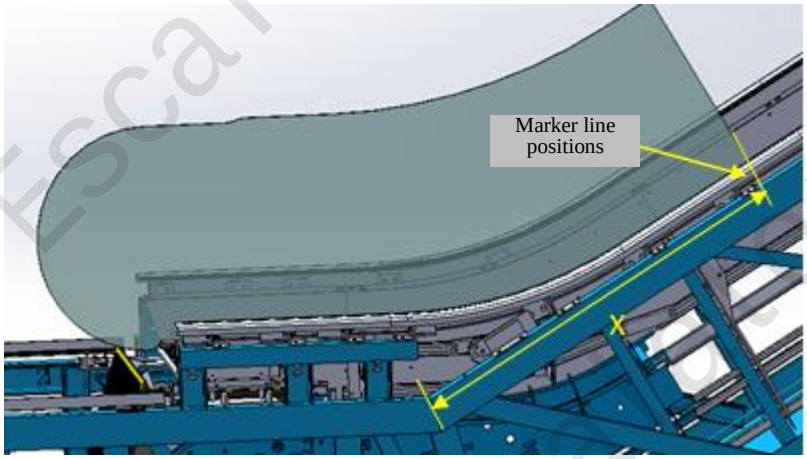


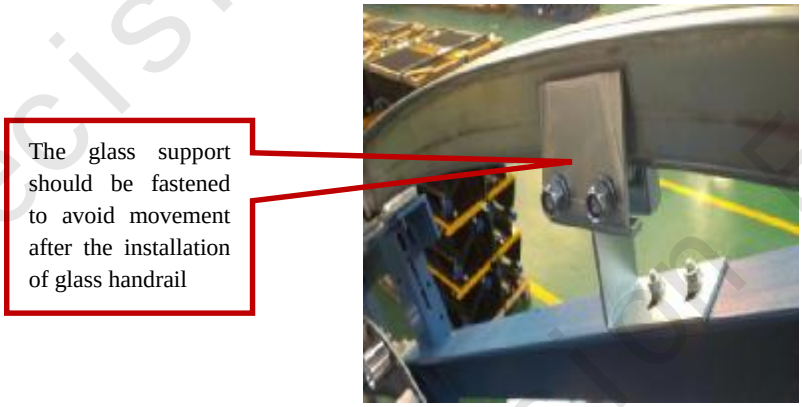
Tool

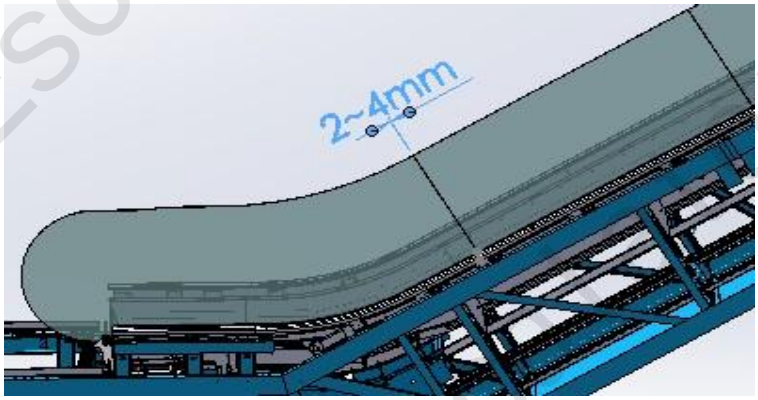
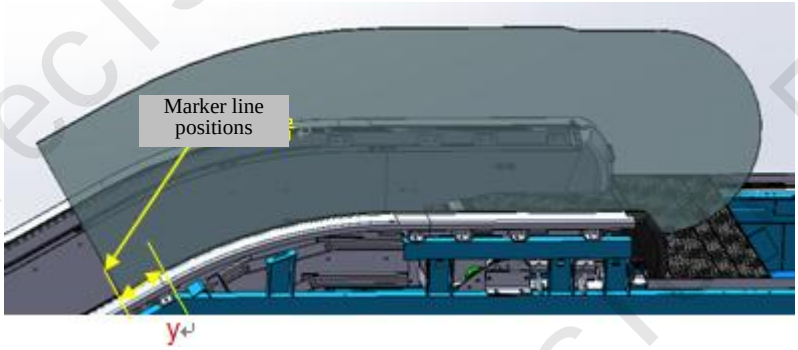
Details: sucker, small brush, open-end wrench

Procedures	Operation	Remark
1	Inner cover from the S line in first out	Before installing the inner cover to dismantle, easy to install and fixed glass 

Procedures	Operation	Remark
2	Glass clamp cleanup	Clean clampers of glasses before installing the handrail glass 
3	Placed in a glass liner clamping member	Pad placed glass tray and place the glass clamp segments and profiles at 

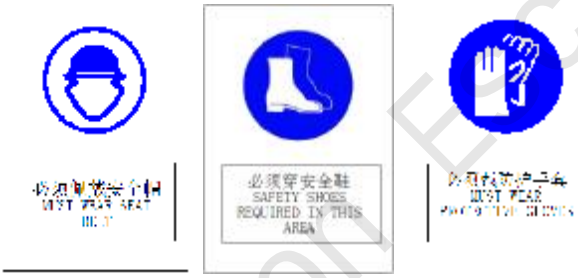
<table>
<tr><th>Procedures</th><th>Operation</th><th>Remark</th></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Install the lower R glass Wall</td><td>1. good control of the lower R cover tag line, in accordance with the position of the indicator line of the glass installation.
 

标记线位置 Marker line positions
<table><tr><td>Escalator Model</td><td>X（mm）L1 (mm)</td></tr><tr><td>35°</td><td>1249</td></tr><tr><td>30°</td><td>1173</td></tr></table></td></tr>
<tr><td>2. Glass holder screw fastening, to prevent the glass shift
 
</td></tr>
</table>

<table>
<tr><th>Procedures</th><th>Operation</th><th>Remark</th></tr>
<tr><td>5</td><td>Paragraph lower straight piece of glass installation</td><td>You should fill in between the glass liner, two adjacent glass installation gap is not less than 2mm, the maximum gap of no more than 4mm
 
Note: Wall glass installation steps: (from bottom to top)
Lower R dado glass→dado glass of straight section→non standard dado glass→upper R dado glass</td></tr>
<tr><td>6</td><td>Install the lower R glass Wall</td><td>The control marker on glass cover R Wall, Glass Wall mounting R
 
2. See Y values for different step types in the following table:
<table>
<tr><td>Escalator Model</td><td>Y（mm）L1 (mm)</td></tr>
<tr><td>35°</td><td>220</td></tr>
<tr><td>30°</td><td>105</td></tr>
</table></td></tr>
<tr><td colspan="3">Note: If not gap label Wall of glass and glass on Wall R is too large, you can adjust the gap between the rest of the glass is controlled Wall</td></tr>
</table>

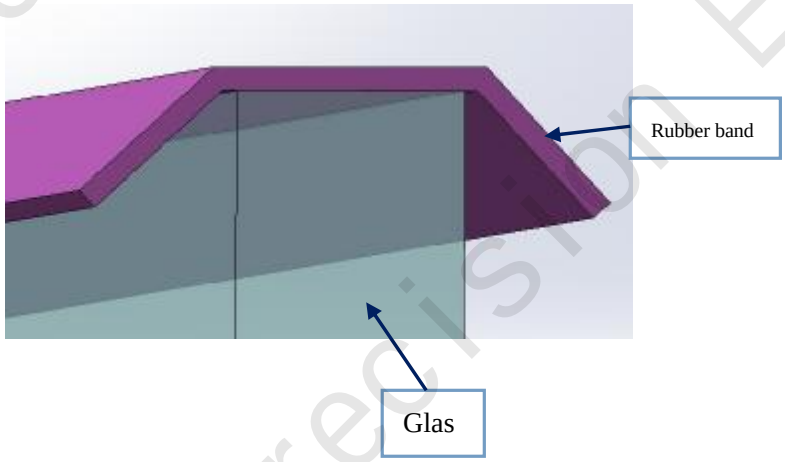
2.3.2 Installation of Guide Rail of Handrail

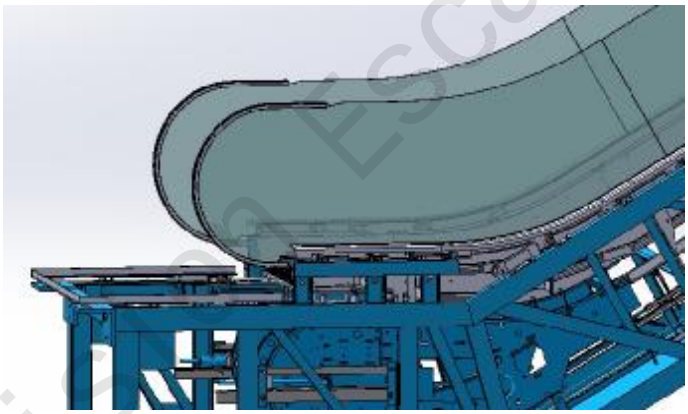
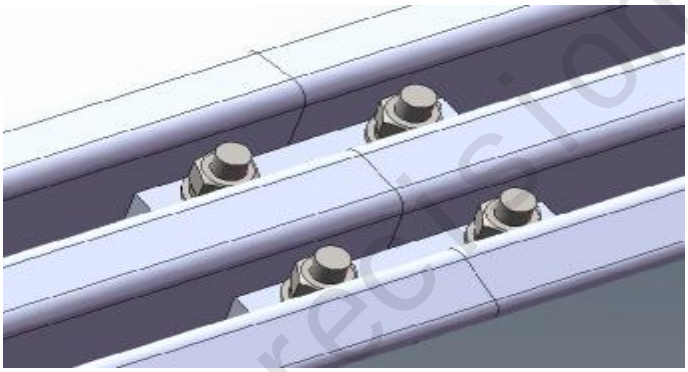
Protective equipment



Tool

Details: Wrench

Procedures	Operation	Remark
1	Glass end face wrapped in rubber bands	1. the upper end of the glass wrapping rubber strip, covering the whole 

Procedures	Operation	Remark
2	Install handle support	1. Sequence: support of handrail of lower head→lower R support of handrail→support of handrail of straight section→support of handrail of non-standard section→upper R support of handrail→support of handrail of upper head 2. The lower part of the armrest mounting bracket 3. Under the horizontal section of the head with glass handrail bracket should be parallel and close to the glass  4. Followed by installation of line segments armrest support, armrest support below shows the docking comp image between the bracket connecting plates 

Procedures	Operation	Remark
3	Check armrest support amendments	1. The armrest bracket installed, should be visually inspected, all joints should be smooth, if there are glitches, application rasp amended to avoid scratching the handrail. 2. andrail bracket butt joints should be smooth, the gap ≤1 mm, stepped ≤0.5 mm

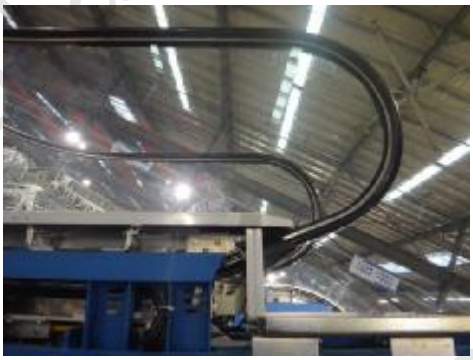
2.3.3 Installation and Adjustment for Hand Strap

Protective equipment

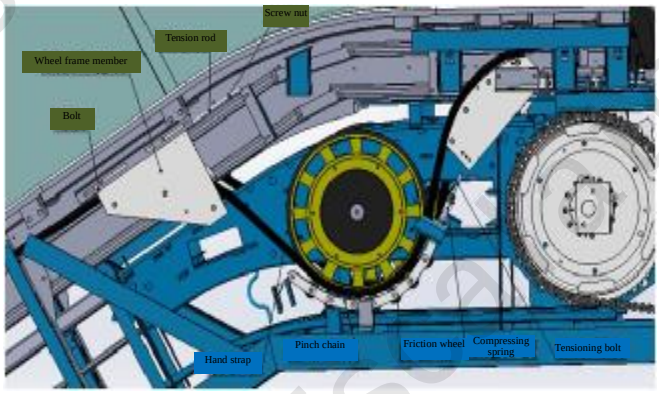
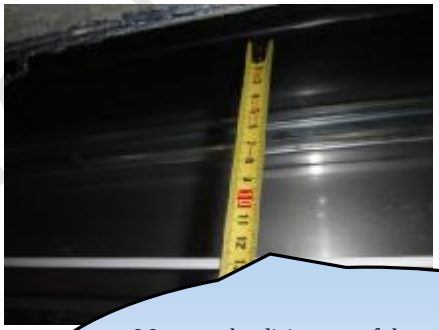

Tool
Details: retractors, wrenches

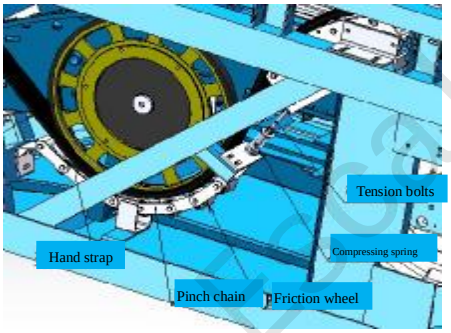
Procedures	Operation	Remark
1	Check the handrail assembly operation	Ensure that the roller, the roller flexible movement

Procedures	Operation	Remark

2	Install handrails on head	Use special tools to install handrails on the head on the armrest support to ensure that the handrail does not slip  
3	Place hand strap	According to the handrail installed position, the handrail stroke along the edge of the rung on the ladder
4	Install hand strap at the lower head	Ditto the upper head in the same way

Procedures	Operation	Remark
5	Install hand strap of center part	The handrail is mounted on the rest of the armrest bracket

6	Adjust hand strap	1. Adjust tightness of hand strap Need to loosen the nuts and bolts of the tension rod and the roller frame components joined by left and right (up and down) to move the roller frame parts to achieve the handrail tension adjusting fixed after completion of all fasteners.  Method for determining elastic of hand strap1：  Under the hand strap，A reference line is drawn between the two roller wheels   Measure the disitances of the reference line and hand strap at the end of the line and the central of the line separately，if the difference of disitances less than 8mm，then it ‘s appropriate  Method 2：Single hand pull down hand strap in inclined section(about 10~15Kg), and handrail deformation 60~80mm, The elastic of the arm is suitable.

<table>
<tr><th>Procedures</th><th>Operation</th><th>Remark</th></tr>
<tr><td>6</td><td>Adjust hand strap</td><td>2. the handrail drive tension adjustment
By adjusting the extent of pressing pressure belt chain handrail adjusted. Chain belt tensioning pressure is maintained by springs. Adjusting the position of the pinch roller tensioning nut on the screw, you can adjust the length of the spring, in order to achieve the handrail tension adjustment. If handrail tensioning is appropriate, the friction wheel will drive the handrail and running.
 

<table>
<tr><th colspan="2">Handrail pinch chain tensioner spring adjustment standard</th></tr>
<tr><td>Spring free length</td><td>75mm</td></tr>
<tr><td>Working load</td><td>85KG</td></tr>
<tr><td>Working length</td><td>58±3mm</td></tr>
<tr><td>The amount of compression</td><td>17±3mm</td></tr>
</table></td></tr>
</table>

7	Check and adjust the lower portion of the handrail belt entrances protection switch (9300 entrance)	Entrance equipped with anti-foreign body or a child's finger into the handrail at the entrance of the protection switch, touch-protect switch so the escalator stops running. When troubleshooting, handrail under spring action, to restore the original position. 

Procedures	**Operation**	**Remark**
	Check and adjust the lower portion of the handrail belt entrances protection switch (straight entrance)	

8	Check and adjust the handrail run	1. The handrail driving device adjustment Control the escalator up, observe the handrail is running in the middle of the driving wheel, if the handrail to the side of the side, near the upper part of the main regulator of the roller wheels and guide block, or near the lower part of the adjustable roller group and the guide block so handrail from directly above the roller wheel by means of a support plate if the driver is not adjusted, can be adjusted (generally support plate has been adjusted in the factory), until runtime handrail drive wheel through the middle; and thereafter run in the opposite direction, if the handrail to the side of the side, near the lower part of the main regulator of the roller wheels and guide block. So again run the debugger, run up and down until the handrail drive wheel through the middle from the armrest up. After adjustment, put the fixing bolts tightened. 2. Handrail tensioning device adjustment: Control the escalator up, observe whether the handrail and tensioner side rubbing or gap between them is too small, if it is, by adjusting the adjusting bolt tensioning device, so that the gap on both sides of the handrail and tensioner side agreement; control the escalator down, in order to adjust the same way, so that the gap on both sides of the handrail and the tensioning wheel side of the same. Down repeatedly run the debugger, run up and down until the consistent gap between the handrail and the side of the tensioner on both sides. Note: The handrail run is driven by friction, the rotating member, the guide more; in the front armrest with normal operation must be carefully examined every aspect, so that two handrail running in a normal state and in sync.

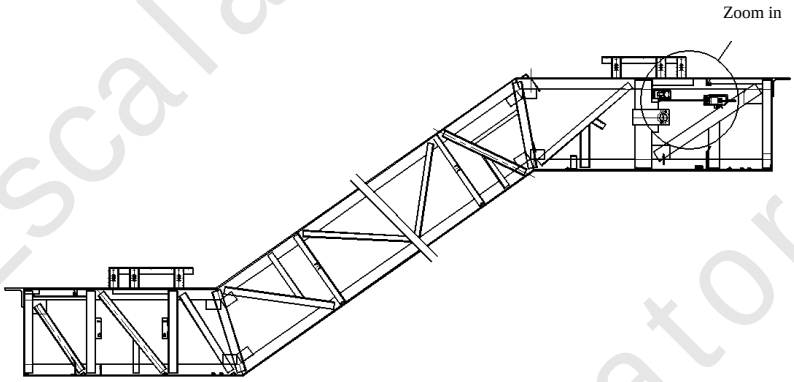
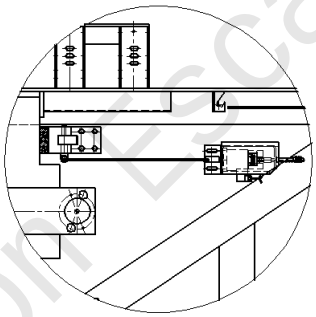
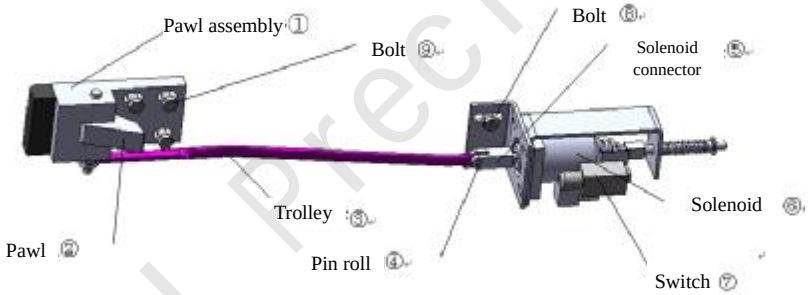
2.4 Additional installation and adjustment of the brake

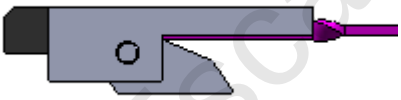
Protective equipment

Tool

Details: screwdriver, hex wrench, wrench

Procedures	Operation	Remark

1	Install additional brake	1. Additional brake mounted on the upper truss, truss and fixed by a bolt, the specific location as follows:  Figure 1 additional brake Installation location map  Enlarged view 2. Remove the pin ④, so that pawl assembly ⑥ and solenoid assembly ① separation; moving back and forth up and down the ratchet pawl seat fully open and hit the impact surface completely block contact adjustment is completed tighten the fixing bolts ⑨, back and forth manually push-pull rod ③, observe the pawl ② is rotating normally, if there catching phenomenon, replace the pawl assembly after the above adjustments; 

2	Additional brake adjustment	1. Replace or adjust the solenoid assembly, with its initial fixing bolt ⑧ fixed to the truss; access to power supply voltage 220V AC solenoid assembly when the solenoid is fully energized state, it is in a fully manual rotation of the pawl closed state (Figure 3), check whether the lever and the solenoid terminal holes correspond exactly, if not, adjust the solenoid assembly bracket (coarse) and solenoid connector (fine-tuning) position, so that the lever of the electromagnet the holes in the joints, and then insert the pin and cotter pin installed;  Pawl fully closed state 2. Installation of automatic reset switch ⑦ and adjust the switch plate, just to complete the switch operates in the solenoid is fully energized state;  Switch Location (fully closed) switch map (ratchet fully open) NOTE: pawl in the half-open state, the switch should be open. 3. Connect electromagnet and switch into related circuit in the control cabinet respectively. Start up the escalator for conducting debugging. Confirm whether the pawl pulls in. open and stop the escalator at least 3 times. Confirm whether the energizing actuation of the pawl and the outage opening is normal; 4. Pawl may occur in the course of the escalator stopped three states, respectively, as shown below. When the two pawl in a state or a state belonging to the normal operation without the need for other actions; when in the third state (only additional brake when braking occurs), the need to manually rotating the disk drive device so that the escalator up to the pawl to freedom state, the electromagnet can be running smoothly after the pull.

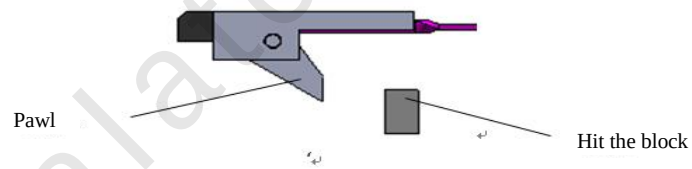
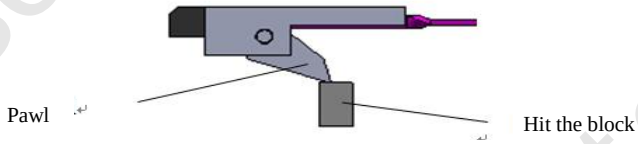
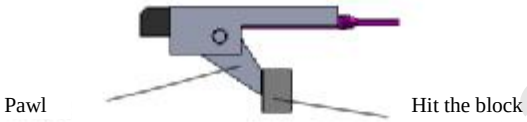


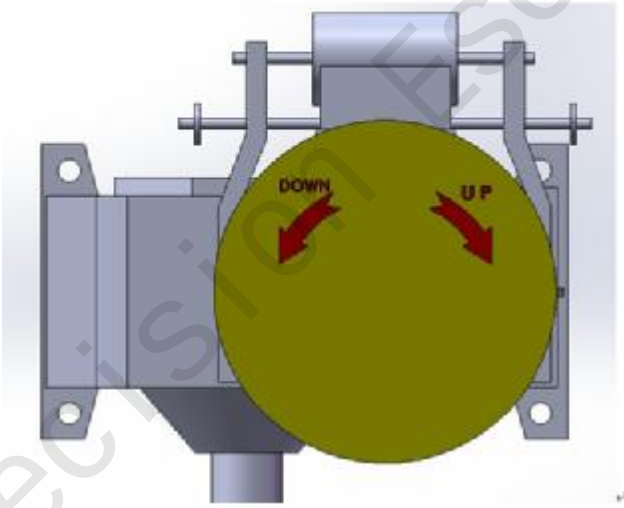
Figure 7 Status I: pawl half closed freely open position



Status II: pawl half open state



Status III: the pawl is completely blocked state

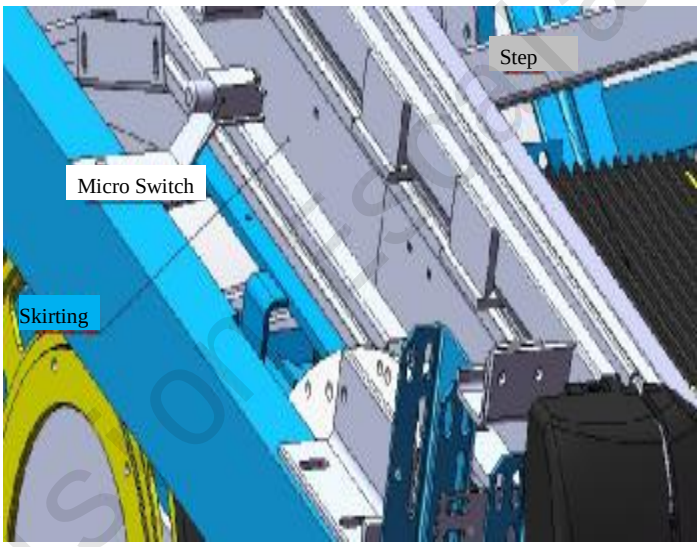


Additional brake bolt tightening torque table

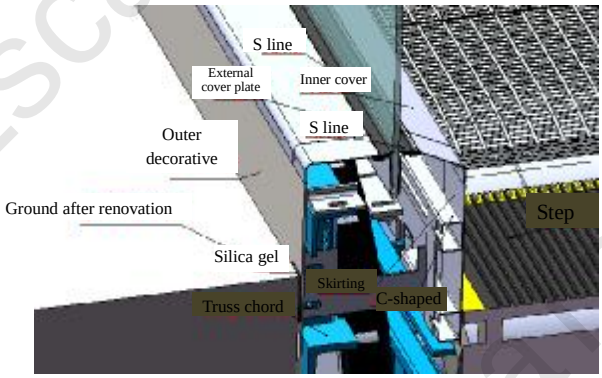
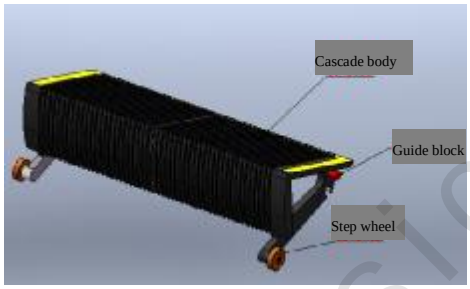
Lifting height H / mm	Number of additional brake	Number of bolt preload	Single bolt tightening torque / N * m
5000≤H＜6000	1	6	27
6000≤H＜7000	1	6	32

2.5 examine and adjust the mechanical parts
Protective equipment
  
Tool

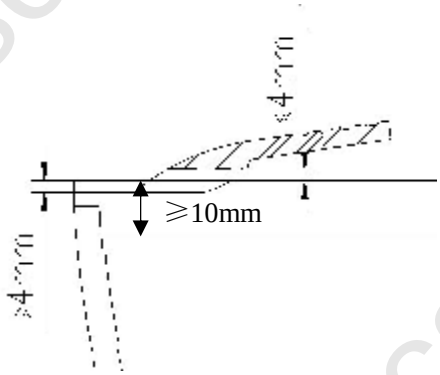
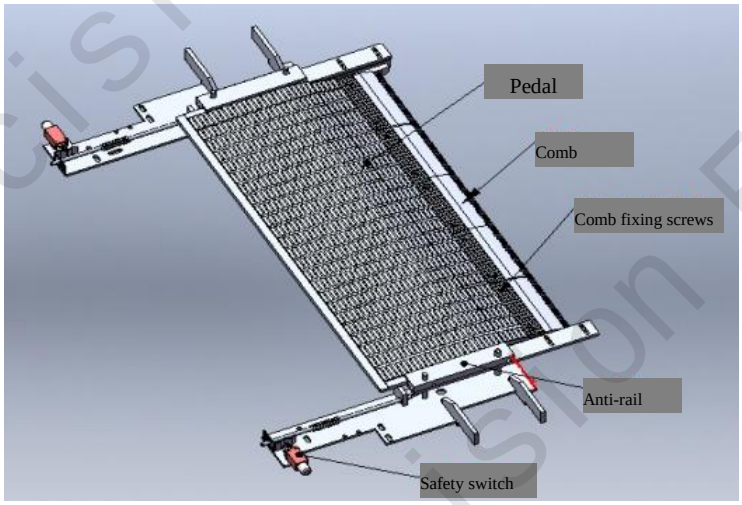
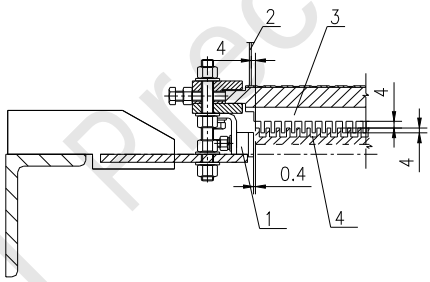
Details: screwdriver, hex wrench, wrench

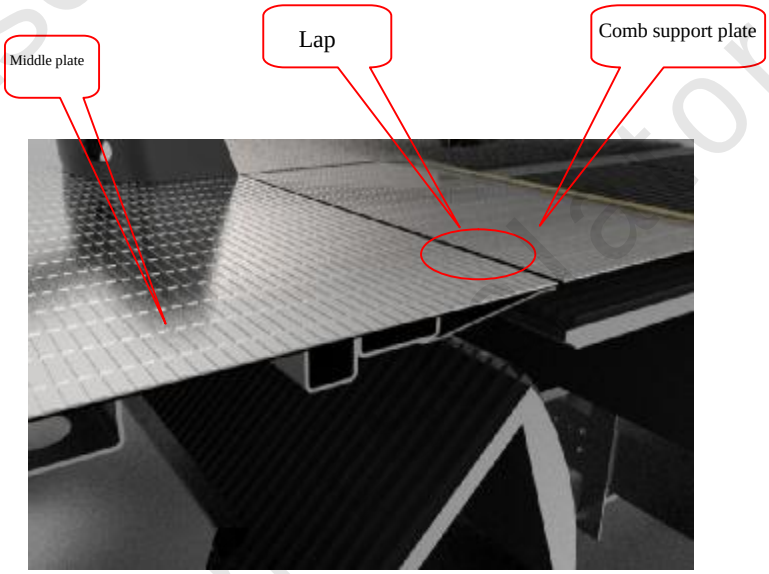
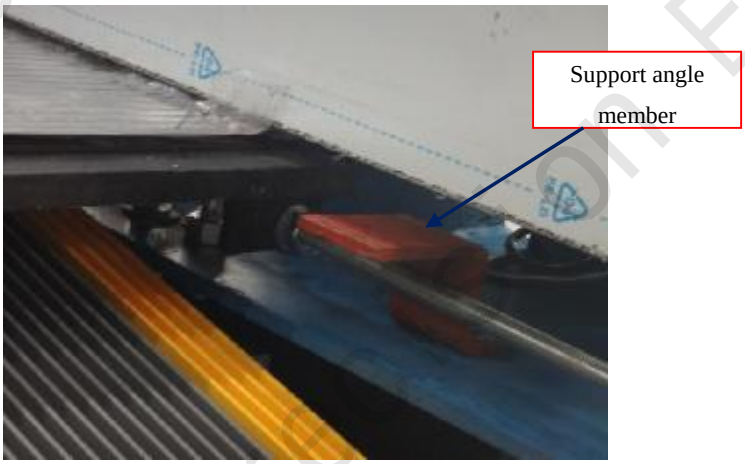
Procedures	Operation	Remark
1	Skirting gap adjustment	1. The gap between unilateral and Cascade skirt should not be greater than 4mm, the sum of the gap between symmetrical positions on both sides of the apron plate and Cascade should not exceed 7mm; 2. Skirting the abutment should be smooth, the gap ≤1 mm, stepped ≤0.5 mm 3. Skirt micro-switch adjustment 

Procedures	Operation	Remark

2	Inner cover installation	1. Handrail installation, the installation cover 2. Screw holes skirt snaps installed, the corresponding screw holes on the inner cover with the screw holes on the skirt buckle, tighten the screws  Note: The outer cover, inner cover butt joints should be smooth, the gap ≤1 mm, stepped ≤0.5 mm
3	Cascade and skirt clearance check (check under the engine room)	Unilateral gap skirting and Cascade guide block should not exceed 4mm, can be adjusted or corrected shifted skirting rung when necessary. 

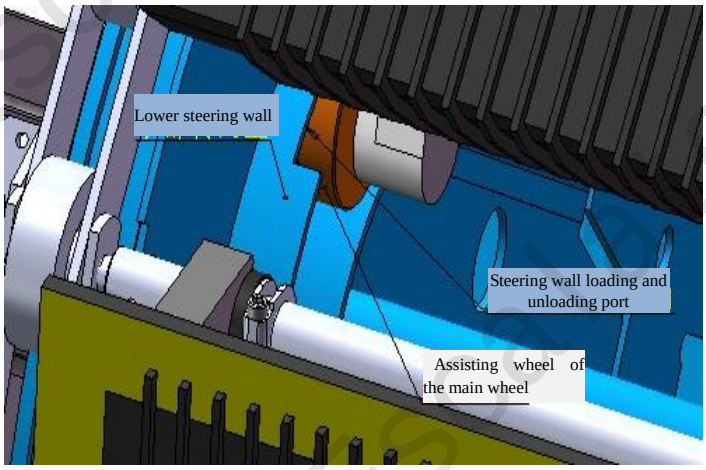
Procedures	**Operation**	**Remark**

4	Check and adjust the comb plate	1. Cascade and comb engagement check Requirements: The depth of engagement with the comb rung pedal surface be not less than 4mm, alveolar and Cascade comb plate comb engaged, rung pedal surface to the base of the comb plate comb vertical distance should be no more than 4mm.  2. The comb plate and Cascade points in the gullet. 3. both ends of the comb plate and strip with anti-bias case Requirements: Partial clearance and anti-strip should not exceed 0.4mm, should not hinder the comb plate when moving backward, just adjust the gap adjustment bolt to adjust the anti-side rail can also check whether there is sufficient guide groove lubrication   1. Anti-bias bar 2. Skirting 3. Comb plate 4. step

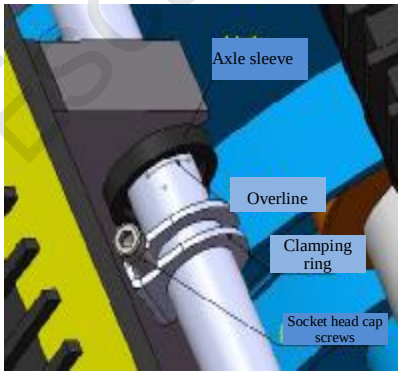
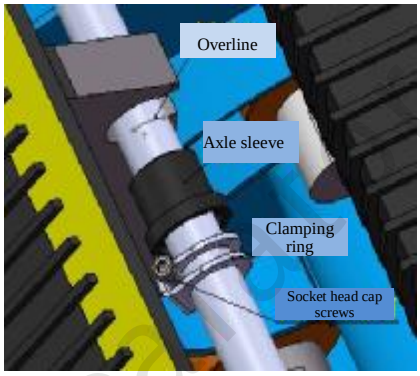
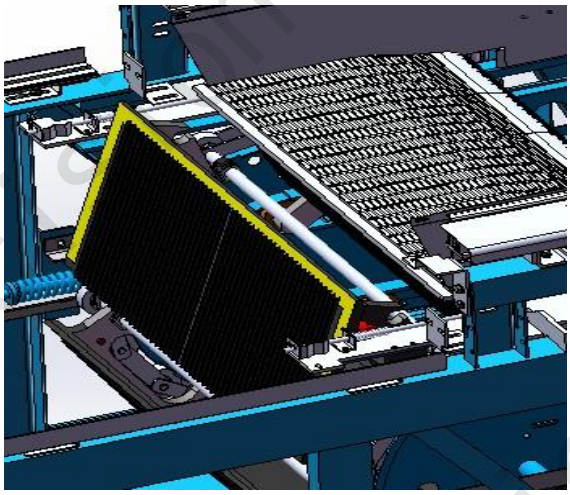
Procedures	Operation	Remark
5	Frontier inspection panel installation	1. The front plate for an overlap in comb support plate and the support plate and lap comb plate leaving a gap between the need 6 ~ 8mm avoid dieback comb support plate.  2. In addition to using cutting-edge plate with a frame around the outside support, as well as the support plate beneath the front corner piece against plate displacement, flip, causing the passengers fall into the room hurt. 

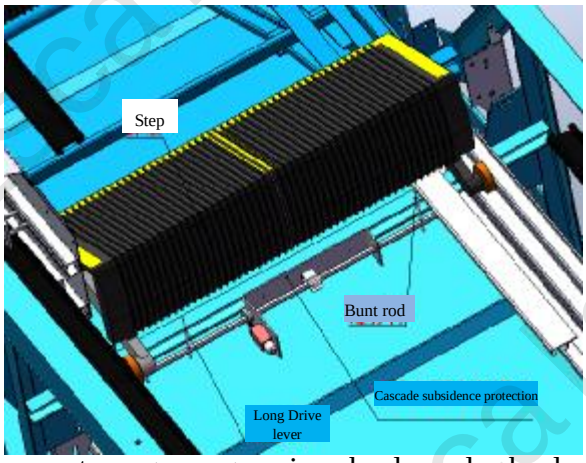
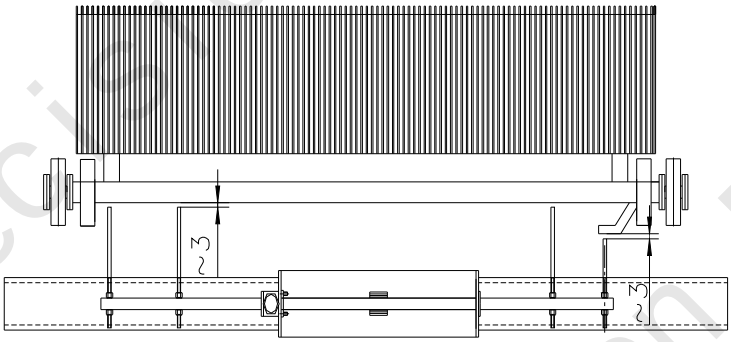
Procedures	Operation	Remark

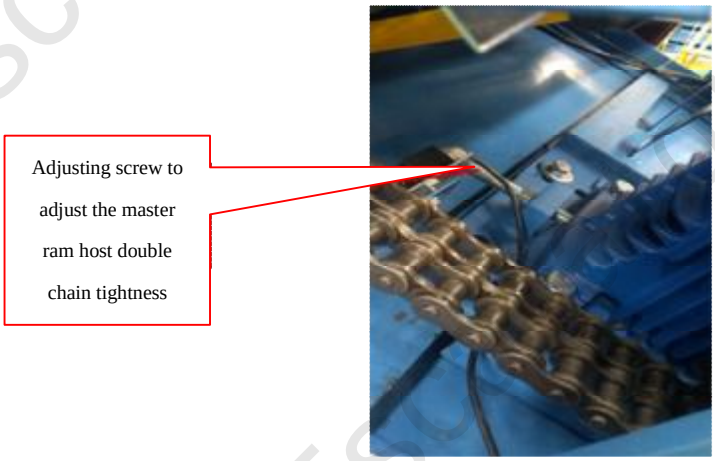
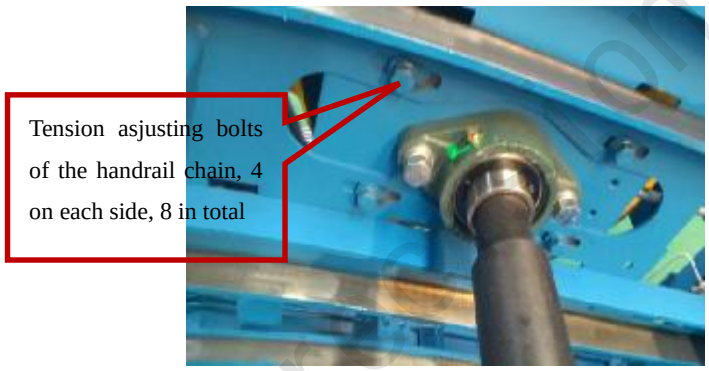
6	Comb action test	1. Before checking on the comb plate and the lower comb plate, the upper and lower portion of the leading edge plate should be pre-removed. Center comb plate 45 kg (spring compressed height of about 60 ~ 65mm) horizontal thrust when the comb foreign body protection should be able to switch operation, the escalator stops running. 2. in some cases, the installation site does not spring dynamometer measured comb to adjust the force of the following ways to check: a. Remove the two comb; b. Respectively, put a screwdriver into the gap cascade comb plate front left and right; c. Release the hand brake disk drive by turning the flywheel on the motor so that cascade operation; d. Combs should be able to move smoothly through the resistance, and to promote the safety switch operation; e. Hand cranking the rung moves backward, the comb should return to its normal position where the safety switch to be manually reset. Note: The upper and lower comb each fitted with two safety switches, switch should be adjusted in contact with the wave board, as long as a switch is activated, you cannot run the escalator.

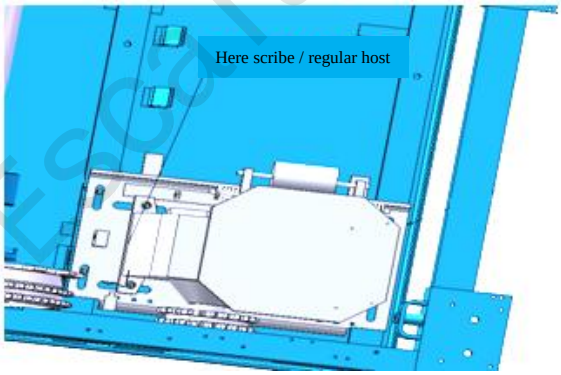
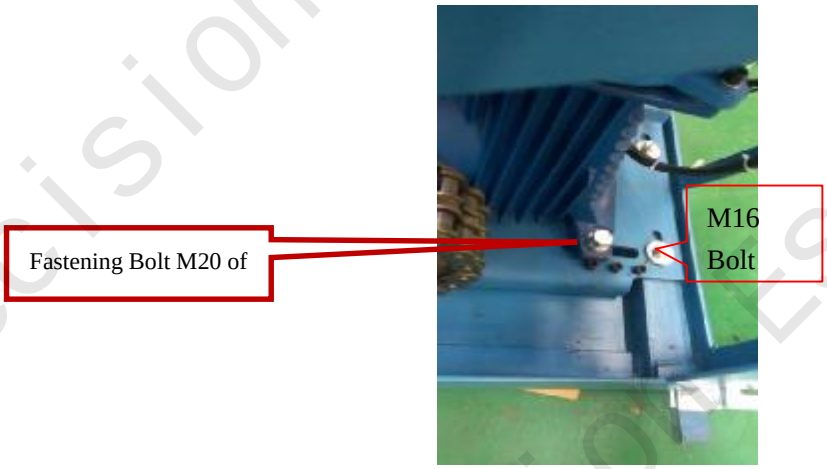
7	Removing rung inspection requirements	1. Removal and installation should be rung in the lower engine room, when removing the steering box with the overhaul will be disassembled and moved to dismantle rung mouth with flat position (that is to say, the lower steering wall loading and unloading port). 

Procedures	**Operation**	**Remark**

7	Removing rung inspection requirements	2. Loosen the soket head cap screw on the clamping ring. Mark on the side of the axle sleeve of the step by embossing stylus. Push the locating clip to the center of steps. Also push the axle sleeve of steps to the center of the steps.   3. Flip open the rung from the shaft, cascade along the main wheels to the steering wheel round notch on the wall, slightly tilted slowly pull  4. Reinstall reinstallation in reverse order after the removal of the rung. Before hex screw in to tighten the clamp ring should be aligned with the step chain axle mark, tighten the Allen screws. Cascade and check meshing comb after the installation is complete 5. Escalators before running inside to check whether the socket head cap screws are installed.

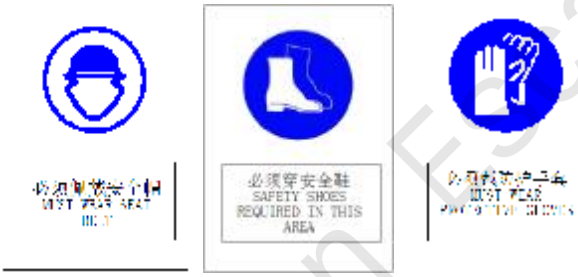
Procedures	Operation	Remark
8	Cascade subsidence switch adjustment check	Location: upper and lower escalator equipped rung sag protection device.  Role: event rung, rung main wheels and wheel subsidence due to deformation or fracture, touched off security protection switching power supply circuit, the escalator stops running. Requirements: vertical distance of 3±0.50mm 
9	Cascade chain tension adjustment	See 3.2.3 execution, not repeated here

Procedures	Operation	Remark
10	Host double check the chain adjustment	1. Foot bolts can loosen the hoisting machine; 2. Tension adjustment screw through the rack ends can adjust the tension double chain;  3. Droop adjusted to not more than double the chain of 15mm, while not too tight; And adjust the drive chain scission effective protection switch
11	Check and adjust the chain handrail	The Tension of driving chain of hand strap can adjust the adjusting bolts on the side board of the axle of the handrail. The droop of the chain is not more than 10mm. it can be adjusted at this time if you remove 3 steps and the driving chain of the hand strap. 

<table>
<tr><th>Procedures</th><th>Operation</th><th>Remark</th></tr>
<tr><td>12</td><td>Check the motor holding position</td><td>The host and the base plate is marked with roulette, check if there are displaced.
 
</td></tr>
<tr><td>13</td><td>Host fixing bolt inspection</td><td><table>
<tr><td>Bolt Specifications</td><td>Rated torque</td><td>Testing torque</td></tr>
<tr><td>M16</td><td>340Nm</td><td>360Nm</td></tr>
<tr><td>M20</td><td>550Nm</td><td>590Nm</td></tr>
</table>

</td></tr>
<tr><td>14</td><td>Floor openings schematic</td><td>Allow floor trusses schematic hole size range
 
</td></tr>
</table>

2.6 Debugging

Protective equipment



Tool

Details: multimeter, megger, screwdrivers, wrenches, decibel meter, stopwatch

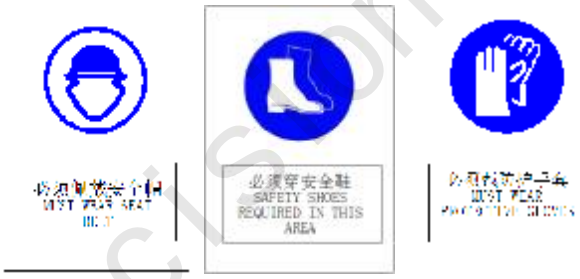
Procedures	Operation	Remark
1	Escalator installation is complete; you should clean up the site and escalators external and internal.When every safety protection facility is under normal-working status, running and rotating parts of the machine such as tractor, driving, transmission system, guide rail of steps, chain, etc, should have enough lubrication. So that the escalator could be in operation. While continuously running escalator response performance escalator, starting acceleration, deceleration, braking, smooth running of the extent of the necessary adjustments.	
2	All rungs should be able to pass the comb plate	
3	All rungs shall skirting friction phenomenon	

Procedures	Operation	Remark
4	The entire process of engagement between the two adjacent rungs without friction phenomenon.	
5	At rated frequency and voltage, the maximum permissible speed and the nominal speed cascade along the direction of no-load deviation ±5%.	

6	Handrail running speed, the relative speed rung tolerance of 0 to + 2%, at the same time measure the no-load speed of the handrail and rungs, respectively, in the vertical direction to run each test once.	
7	The stopping distance of the stopping escalator run from no-load and load items should be within the following ranges: Nominal speed the stopping distance 0.5m / s 0.2-1.00 m	
8	Each member of the escalator should run normally, with no grazing abnormal sound, no-load operation, at the forefront of the rung and side board measured at 1m operating noise should not exceed 65dB (A).	

2.7 Commissioning

Protective equipment



Tool:

Details:

Procedures	Operation	Remark
1	Mechanical and electrical commissioning test run is completed, before the trial run again for cleaning and lubrication, ensure clean escalators, each parts have adequate lubrication	
2	Check all the parts are in normal status. Conduct the trial run for the escalator. Move up and down 1 hour without load respectively. The escalator should run normally, stably and be without abnormal sound.	

2.8 Testing and inspection

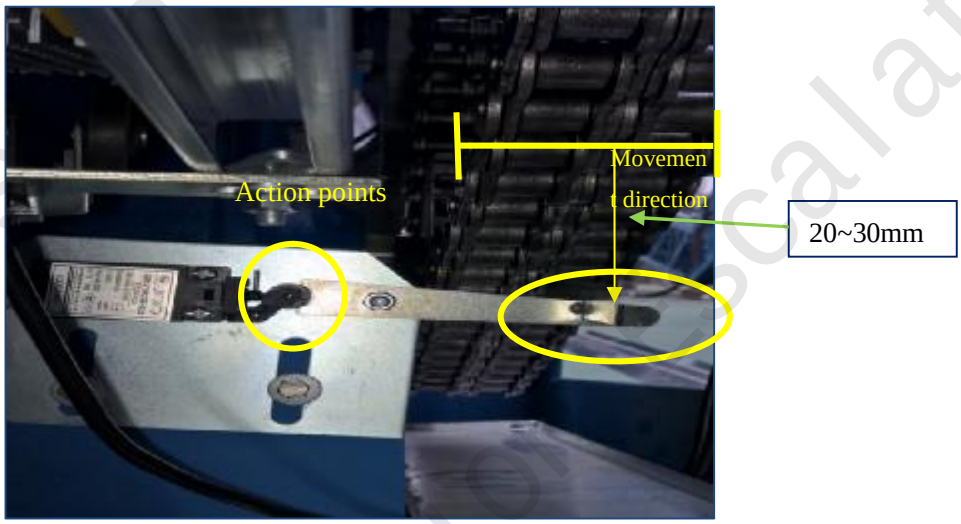
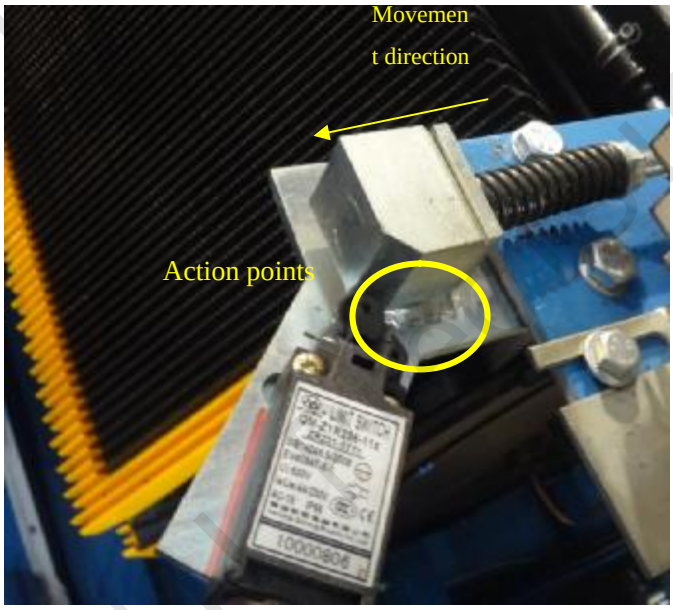
Protective equipment

Tool:

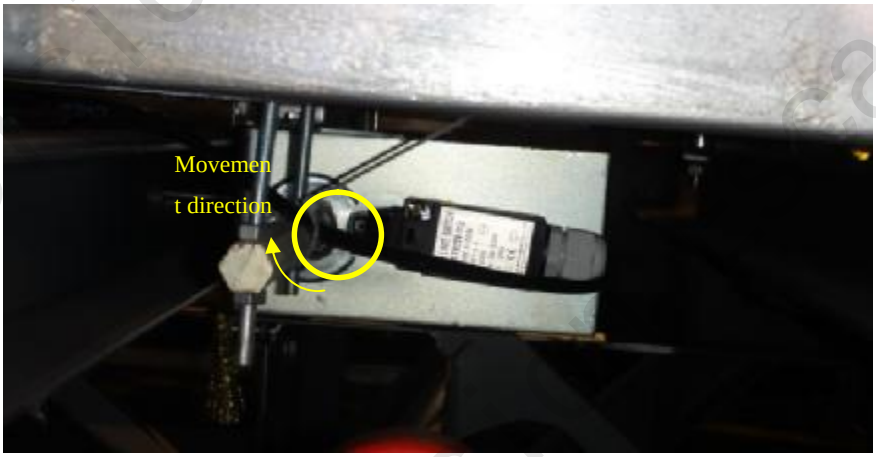
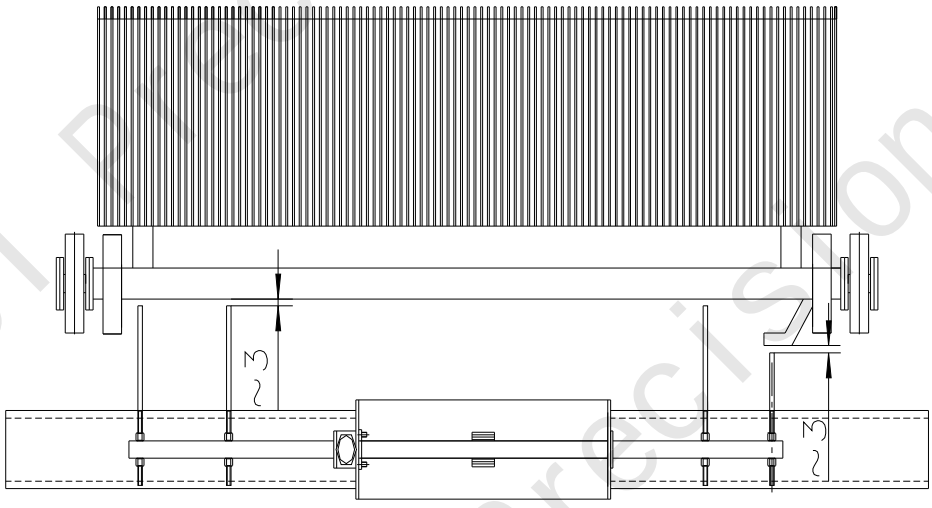
Details: tape measure, ruler, multimeter

Procedures	Operation	Remark
1	Self-Test	The whole installation, debugging, self-test or mutual inspection and by the relevant information requirements completed. Then the company declared final acceptance.
2	Quality Department final acceptance	1. The quality inspection personnel department proposed corrective terms; the installer should be completed within the stipulated time. 2. For inspection personnel-related issues rose by the installer has the responsibility to give answers, and urged the installer to complete the rectification, until it meets the requirements.
3	Government final acceptance	1. After the quality inspection departments to meet the requirements should be completed five days ahead and reported to government acceptance. 2. Install during acceptance shall be with full assistance for government inspectors propose corrective terms; the installation should be completed within the stipulated time.

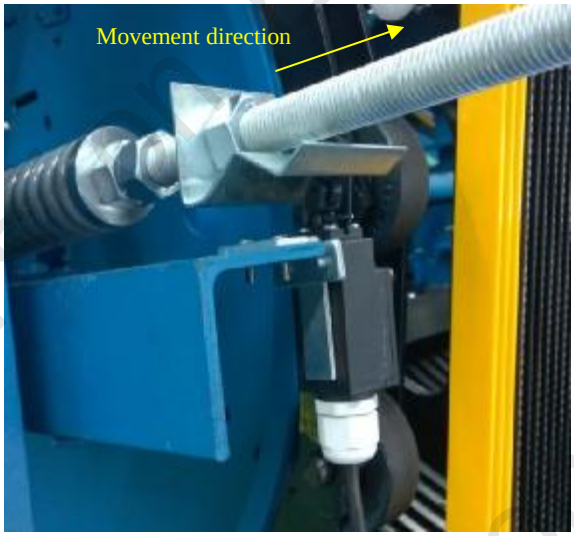
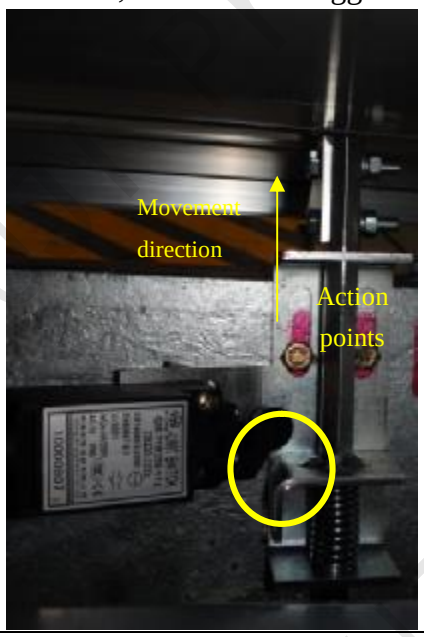
Chapter III Describes the instructions escalator safety switch

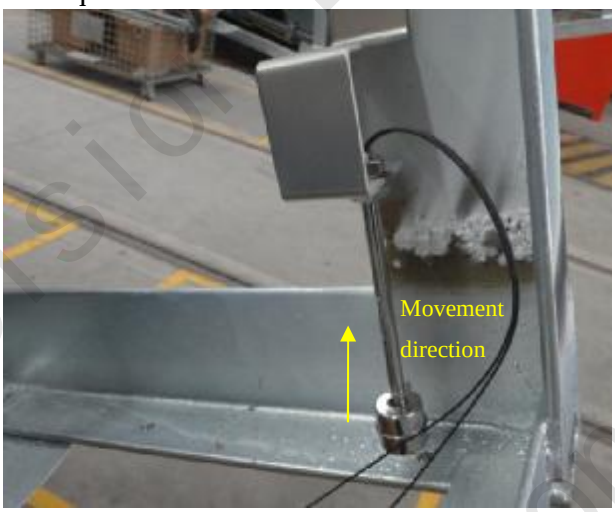
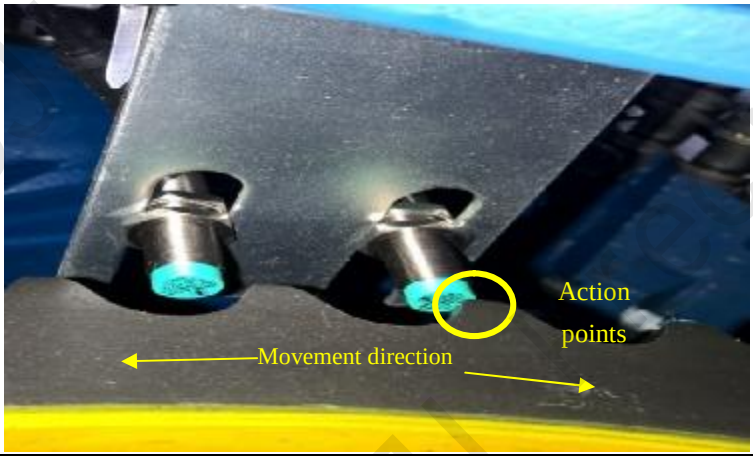
Electrical switch name	Example diagram illustrates
Host driver safety switches	1. Position: top of the escalator is equipped with a host drive chain protection. 2. Role: When the host drives chain scission or elongation, the drive strand breaks protective devices; touch protection switch moves to cut off the power supply safety circuit, the escalator stops running. 3. Requirements: The host drive chain protecting switch lever or wheel contact and hit the pit and projecting horizontally linked, playing rod drive chain just above the vertical spacing of about 20-30mm. 
Comb protection switch	1. Location: upper and lower escalator protection device is equipped with a comb. 2. Role: When Rung have entered the place of engagement with the comb plate when foreign matter sandwiched comb plate can not be engaged with the normal steps or pallets, collision, touched off security protection switching power supply circuit, the escalator stops running. 3. Requirements: comb protection switch or wheel contact with the contact spacing along the direction of movement of about 1mm. 

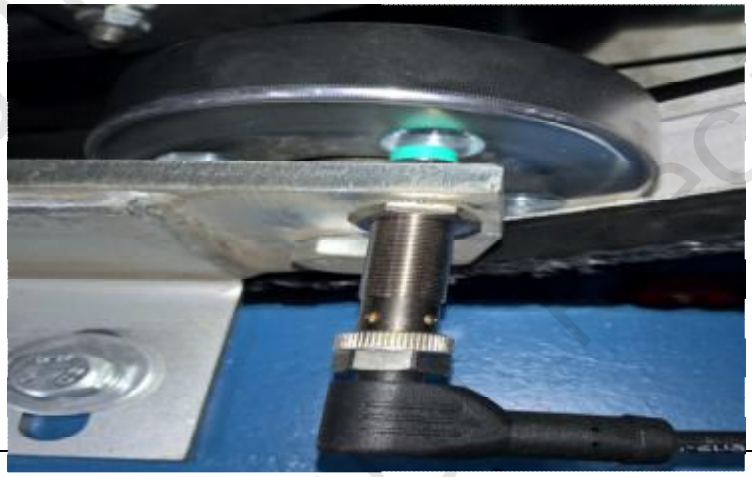
Electrical switch name	Example diagram illustrates
Handrail inlet protection switch	1. Location: upper and lower escalator handrail entrance equipped with an inlet protection device. 2. Role: When the handrail at the entrance to the steering end of a foreign body into the card, touch protection safety circuit switching off the power, the escalator stops running. 3. Requirements: handrail entrances protection switch or wheel contact with the stopper along the movement direction of the contact face, but cannot squeeze the shutter switch. 
Skirting protection switch（Selectable）	1. Location: upper and lower escalator equipped with skirting protection device. 2. Role: when skirting the edge gap and Cascade card into the foreign body, outward displacement skirt touched off security protection switching power supply circuit, the escalator stops running. 3. Requirements: skirting protection switch in contact with, but not squeeze skirt switch. 

Electrical switch name	Example diagram illustrates
Cascade subsidence protection switch	1. Location: upper and lower escalator equipped rung sag protection device. 2. Role: in the event of Cascade, Cascade main wheels and wheel subsidence due to deformation or fracture, touched off security protection switching power supply circuit, the escalator stops running. 3 Requirement: connect the contact terminal of the round wheel of sinking protection switch of steps with the trough of the hitting rod in effect. The vertical distance from the vertical hitting rod and steps' axle is about 3mm  

Electrical switch	Example diagram illustrates

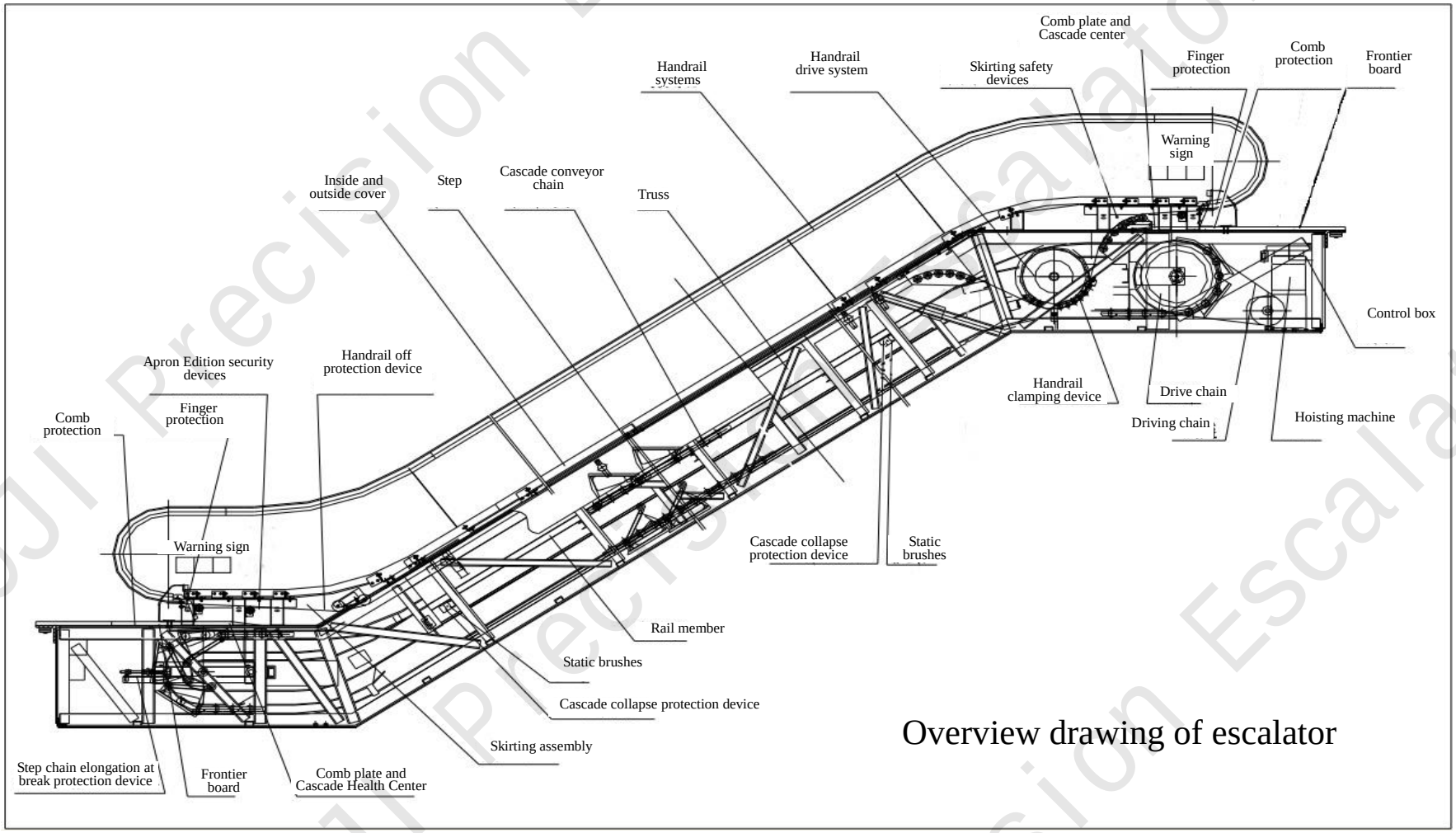
name	
Cascade chain scission extend protection switch	1. Position: lower escalator equipped with step chain protection device. 2 Function: before the steps chain is fractured during operation or the tension device moves more than ±20mm, the protection device of the steps acts to lead the protection switch to cut off the power of the safty loop and the escalator will stop running. 3. Requirements: Cascade chain protecting switch or wheel contact with the contact surface wave plate along the direction of motion of the pitch 1mm.  
Open the protective cover switch	1. Location: upper and lower escalator equipped with rear plate open the protective device. 2. Role: When opening the rear cover plate (theft), touch security protection switching off the power supply circuit, the escalator stops running. 3. Requirements: protection against the lever switch vertical rear cover plate, the spring is compressed, the protection switch circle round the bend in the contact plate side 1 ~ 2mm. The cover is opened, the spring recovery, protection switch or wheel contact plate is bent extruded, the switch is triggered. 

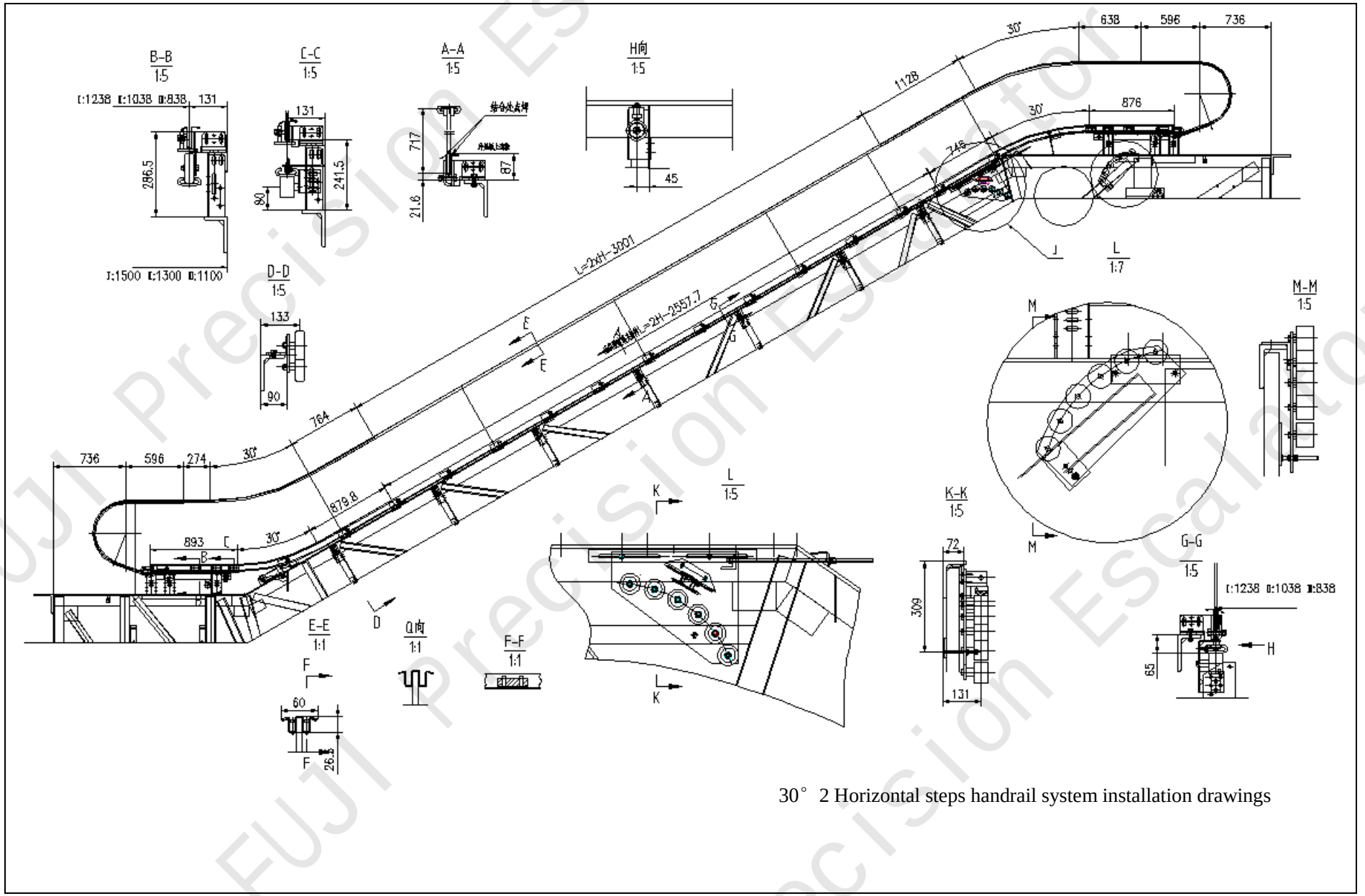
Electrical switch name	Example diagram illustrates
Water level detection protection switch	1. Position: lower outdoor escalator equipped with level detection protection device. 2. Role: When the lower portion of the cabin elevator pit water level exceeds the testing requirements. Water level detection switch will give the PLC board or a detection signal so that it is protected. Unable to run correctly. 3. Requirements: water detection switch and the bottom of the cabin space is 100mm. 
Cascade speed protection switch	1. Location: Upper Cascade gun equipped with an escalator protection device. 2. Role: speeding event rung 120% protection rate of 80% or less reversal of the safety circuit switching off the power, the escalator stops running. 3. Requirements: clearance speed switch with the drive gear in the 2 + 0.5mm. 4. Reversal Test Method: a: Stop state, the control cabinet tachometer signal A02 and A03 swap (damage defined retardation), will automatically stop running after starting ladder. b: By stopping state, the safety function board brake detection signal removed, manually open the brake. Manually cranking down the line. Safety function board tachometer signal operation reversal protection. 

Electrical switch name	Example diagram illustrates
Missing step protection switch	1. Location: upper and lower escalator equipped rung sag protection device. 2. Role: On the escalator, lower steering is detected at the time to have rung pedal missing, cut off the power supply safety circuit, the escalator stops running. 3. Requirements: Photoelectric missing rung and rung the contact surface of the effective distance of 5mm. 4. Test Method: Remove a cascade running escalator, escalator-rung notch running into the upper or lower rungs missing sensor position (from the position before the comb appears to stop). Security features blackboard missing step failure. Upper and lower positions should be tested. 
Handrail speed protection switch	1. Position: lower escalator handrail speed protection device is mounted. 2. Role: When rung handrail speed deviation actual speed is greater than 15% and duration longer than 15 s, the safety circuit cut off power supply, the escalator stops running. 3. Requirements: Photoelectric handrail speed should be aligned with the center of the wheel holes, and the roller gap is 2mm. 4 Test Method: remove the velocity measurement photoelectricity on the left or right hand trap (safety function panel JP1.5 or JP 1.6, do not remove them at the same time, remove them respectively). Run the escalator, after 5~10s the function safety board sounds out the protection fault of the velocity measurement photoelectricity of the hand strap. 

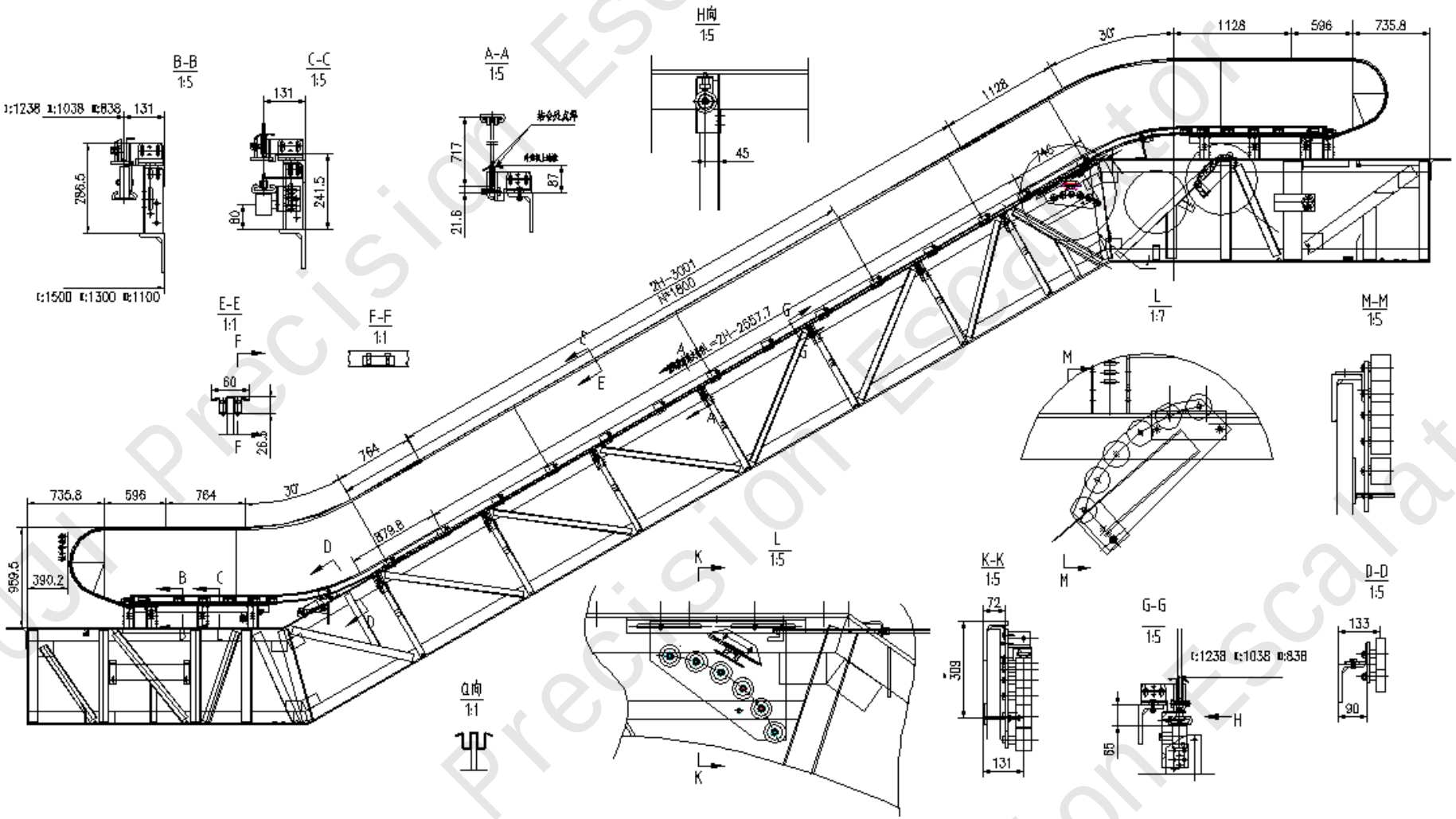
Electrical switch name	Example diagram illustrates
Brake protection switch	1. Location: Upper motor equipped with an escalator brake protection device. 2 Function: after the starting up of escalator, the brake system does not release and the escalator can not be started up; When monitoring the running of the escalator, if the direction of band-type brake is different with feedback logic of the band-type brake, cut off the working brake and the power of safety loop. Then the escalator will stop running. 3 Requirement: testing switch of band-type brake is the check point of normally closing signal, which can response action situations of arm of band-type brake in effect. 4 Testing method: Remove the testing switch of band-type brake (safety function board JP2.9 or JP 2.10), run the escalator. After 1.5s, the safety function board sounds out the protection fault of the band-type brake. 

Overview picture escalator handrail system and installation diagram

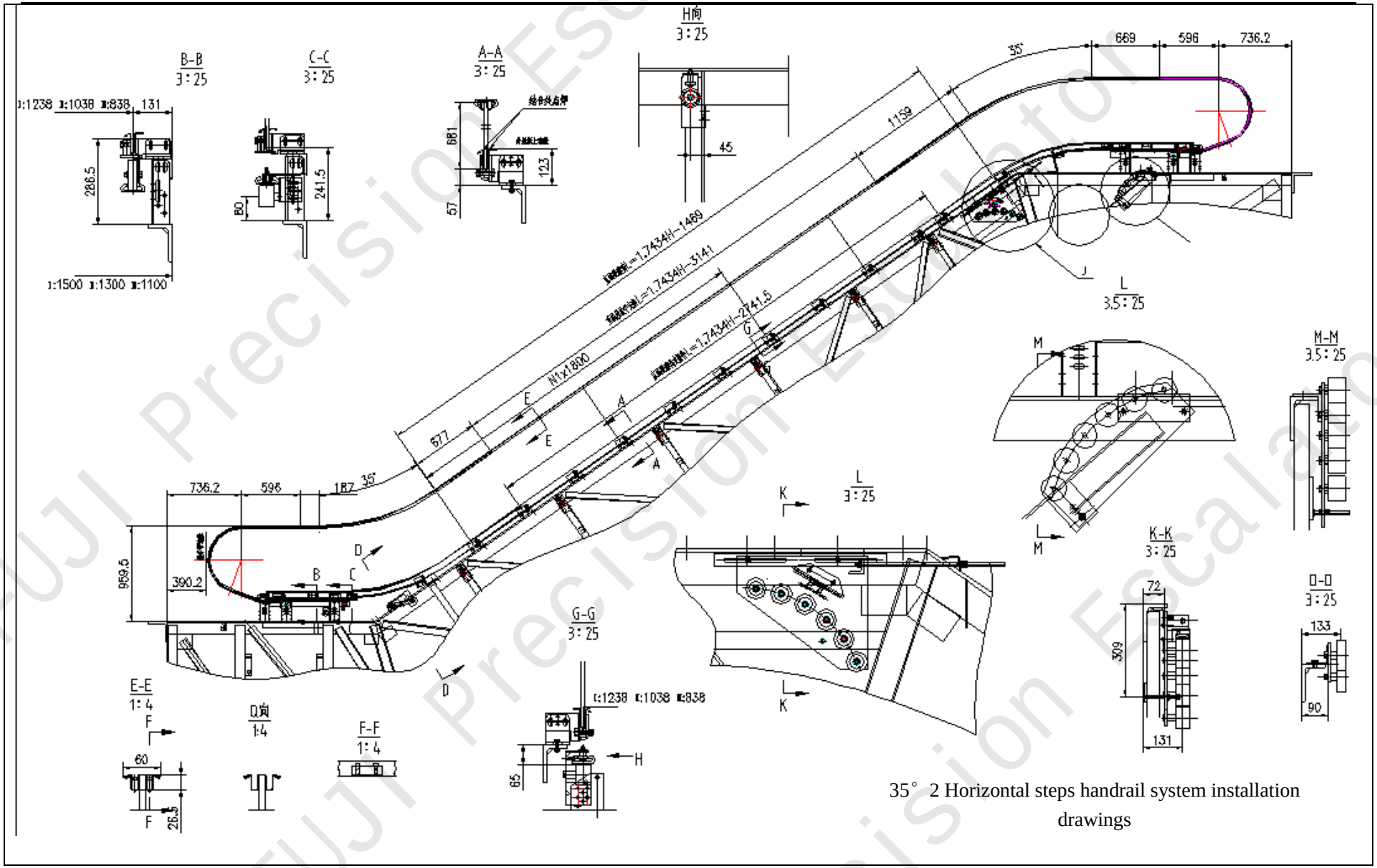




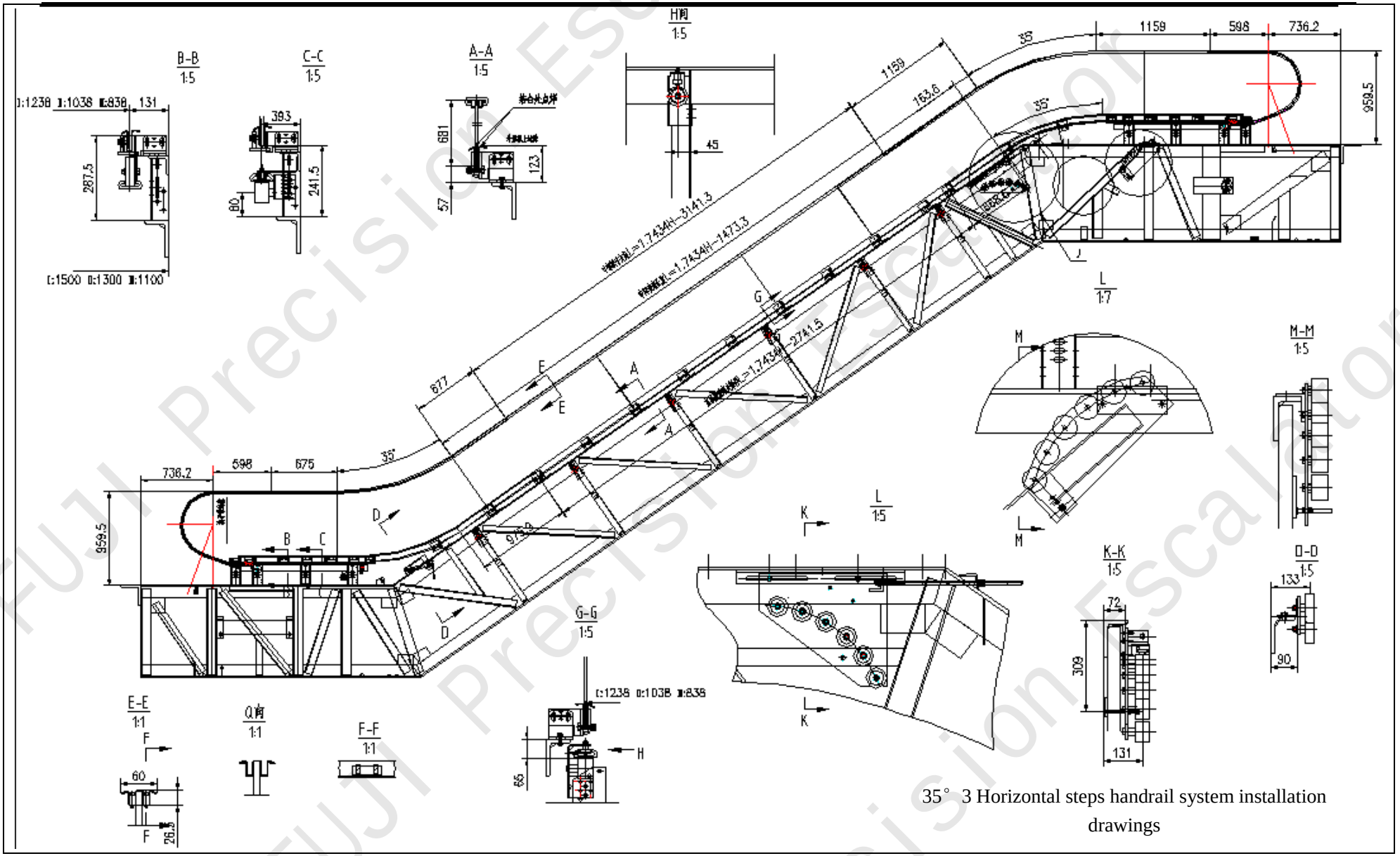
30° 2 Horizontal steps handrail system installation drawings



30° 3 Horizontal steps handrail system installation drawings



35° 2 Horizontal steps handrail system installation drawings



35° 3 Horizontal steps handrail system installation drawings