How to Enhance Safety for the Long Escalator
Requirements on Design Code for Long Escalator
Public Service Escalator

Requirements for Public Service Escalator:

1. Based on passenger weight, the maximum calculated or measured deflection shall not exceed 1/1000 of the horizontal measurement distance between supporting of upper landing and lower landing of the escalator. (1.3.2)

2. The handrail of public service public escalator shall be certified by its manufacturer for a breaking strength of at least 25KN (3.8)

3. Public service escalator at rated speeds above 0.65m/s
Public Service Escalator

Requirements for Public Service Escalator:

1. The public service escalator shall be equipped with auxiliary brake. (8.6.1)

2. At the landings, the steps of the escalator shall be guided in such a way that the front edges of the steps leaving the comb and the rear edges of the steps entering the comb are moving horizontally for a length of at least 1.60m, measured from the point of the root of the comb teeth. (6.1.2)

3. The Minimum radius of curvature in the upper transition from incline to horizontal shall be 2.60m and in the lower transition from incline to horizontal of the escalator shall be 2.00m. (6.1.3)
Revisions on the Design Code - Long Escalator

1. Monitoring of hand rail speed deviation of more than $-15\%$ to the actual speed for more than 15 s

2. Check on the tensioning device moves in excess of $\pm 20\ mm$

3. Check on missing step or pallet
4. Check on non-lifting of the braking system after starting the escalator or passenger conveyor.

5. Shelter walls at both sides shall be installed with a height of at least 1800 mm from newel to newel to discourage people from climbing over the outer edge of the balustrate if there is a danger of people falling from:

a) the escalator and the height of escalator above 15 m; or
b) the escalator to the next lower floor.
Long Escalator Incident
Long Escalator Incident - Hong Kong Design Institute

- **Date:** 24 February 2011
- **Place:** Escalator No. E4 at Hong Kong Design Institute, Tiu Keng Leng, Tseng Kwan O
- **Incident:** Steps failure
- **Rated Speed:** 0.2 / 0.5 m/s
- **Rise:** 25.75 m
- **Length:** 51.5 m
- **Incl. Angle:** 30°
- **Step Width:** 1,000 mm
- **Direction of Movement:** Down
Photos Records taken on 24/2/2011
Photos Records taken on 24/2/2011

Step No. 24

Upper Landing Comb Plate
Step No. 24

Hollow axle was found missing on the step eye

Photos Records taken on 24/2/2011
Photos Records taken on 24/2/2011

Step No. 24

Driving Chain

Hollow axle was found missing on the step eye
Typical Escalator Step

- Hollow Axle
- Driving Chain Roller
- Step Eye
Step Roller with the Driving Chain

Hollow axle
Step with Chain Drawing

Hexagonal nut
Roller
Driving Chain
Hollow axle
Tab Washer
3 Limitations of Long Escalator
Limitations of Long Escalator

Requirements for Steps and Staircases:

1. Performance Objectives - Steps and staircases shall be intended as an alternative to lift access in buildings and shall be of adequate design to allow all persons, with or without a disability, to travel safely and independently.

2. Dimension and Orientation - The required staircases and the main circulation staircase in common areas of a building shall:

   a) be constructed with treads not less than 225 mm in width (measured at the centre of the flight) from the face of one riser to the face of the next riser and with risers not more than 175 mm in height;
Limitations of Long Escalator

Requirements for Steps and Staircases:

b) have risers built with vertical or receding face not more than 15 mm from the vertical, without a projecting nosing;

c) have not more than 16 steps in any flight without the introduction of a landing;

d) be provided on both sides with properly fitted handrails;

e) be provided with non-slip nosing in contrasting colour; and

f) have risers reduced to not more than 160 mm high and treads increased to not less than 280 mm wide for greater ease of use for external steps and stairs.
Limitations of Long Escalator

Passenger Weight
Step and Chain Weight
Friction and Tension
Limitations of Long Escalator

- Passenger Weight
- Total Forces on Step Chain
- Friction and Tension
Limitations of Long Escalator

Total Forces on Step Chain
Limitations of Long Escalator

Step Chain Broken Switch
## Limitations of Long Escalator

<table>
<thead>
<tr>
<th>Escalator Height</th>
<th>Possible Movement</th>
<th>tensioning device Y-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical Z-axis</td>
<td>Longitudinal Y-axis</td>
</tr>
<tr>
<td>6 m</td>
<td>12 mm</td>
<td>28 mm</td>
</tr>
<tr>
<td>10 m</td>
<td>20 mm</td>
<td>46 mm</td>
</tr>
<tr>
<td>15 m</td>
<td>30 mm</td>
<td>69 mm</td>
</tr>
<tr>
<td>25 m</td>
<td>50 mm</td>
<td>116 mm</td>
</tr>
</tbody>
</table>

- The tensioning device is activated in excess of ± 20 mm
Recommended Dimensions and Protective Measures for Long Escalator
4.1 Recommended Dimensions for Long Escalator

- The reasonable height of long escalator should be limited to 10 m.
- Escalator height above 10 m and below 15 m, the frequency of regular maintenance and overhaul must be doubled as compared with one-level travel of escalator.
- For long escalator the width shall be not less than exceed 1.10 m and consider up to 1.6m.
When entering escalators:

- Watch the direction of the moving step and step on and off with extra care.
- Take care if you are wearing bifocals or similar eyewear.
- Hold children firmly with one arm or hold child's free hand.
- Hold small packages firmly in one hand, but always leave one hand available to hold the handrail.
- Grasp the handle as you step onto the moving step.
- Do not step onto an escalator going in the opposite direction.
- Do not take wheelchairs, electric scooters, strollers, hand carts, luggage carts or similar items on the escalator.
4.2 Protective Measures for Long Escalator

When riding escalators:

- Keep loose clothing clear of steps and sides
- Wear closed-toed and hard-soled shoes, and avoid wearing footwear made of soft-resin or other rubbery materials
- Stand clear of the sides of the escalator
- Face forward and keep firm grip on the handrail
- Reposition your hand slowly if the handrail moves ahead or behind the steps
- Don't climb onto or ride the handrail
- Do not let children sit on steps or stand too close to sides
When exiting escalators:

- Don't hesitate and step off promptly
- Make sure to step over the comb fingers; don't let your feet slide off the end of the escalator
- Immediately move clear of the escalator exit area; don't stop to talk or look around since other passengers may be behind you
- Stand facing the direction of travel; keep feet away from sides
- Hold the handrail
THANK YOU