

17.5.2. The keys specified in clause 17.5.1a) and e) above, shall be identical. The key type shall be LUL standard escalator key RKL271.

17.5.3. Guards, of the nylon brush type, shall be provided to protect the entry of the handrail into the balustrade. The design of the guard and switch assembly shall negate the possibility of nuisance tripping, due to accidental contact with the body of the guard. The guard shall be removable for ease of access for cleaning.

17.5.4. Unless stated otherwise in the site-specific documentation, a means shall be provided to detect the entering of a user, onto the escalator, for stand-by operation as described in BS EN 115-1 and Part 3, section 14 of this specification. Details shall be agreed with the *Employer*.

17.5.5. Passenger emergency stop switches shall be fitted to the balustrade decking. See Part 3, sub-section 7.4 of this specification for further information, including quantity and location.

17.5.6. Refer to annexe.

18. Passenger signs & notices

18.1. Stand On The Right, No Smoking' notices (as appropriate) shall be mounted on the centre decking panels between adjacent escalators, spaced at a maximum pitch of 8m, provided that no such notice shall be positioned within 1m of an emergency stop 'half-diamond' switch. Where the decking at the side of an escalator exceeds 750mm in width, notices shall be fitted in a position corresponding to those on the centre decking. The notices shall be secured to the steelwork below the decking and not to the decking panels only. Refer to annexe.

18.2. Passenger warning notices shall be provided on the wall adjacent to the escalators, one per landing in a location as instructed by the *Employer*. Refer to annexe.

19. Floor plates

19.1. Hinged floor plates shall be provided at each landing, to cover the area between the back of the comb plate and the end of the escalator truss.

19.2. Floor plates with infill shall be provided for the areas between two adjacent escalators and for the areas between the escalator and surrounding finished floor, at the upper and lower landings. A suitable means of fixing the floor plates shall be provided and agreed with the *Employer*.

19.3. Floor plates shall have a renewable non-slip tread surface, which shall be in the form of stainless steel or extruded aluminium sections with an anti-slip pattern profile. The remaining plates shall be either infilled with the same material, or shall have a finish to match the surrounding floor.

19.4. Each floor plate shall be capable of supporting the greater of:

- a) A total imposed load of 7.5kN uniformly distributed over the whole plan area of the plate;
- b) A uniformly distributed load of 5kN/m² over the whole plan area of the plate.

19.5. The loads stated in clause 19.4 above, shall not cause:

- a) Deflection by more than 3mm;
- b) Deflection by an amount such that the clearance between the underside of the plate and the top of the escalator steps is reduced to less than 5mm;
- c) Permanent deformation.

19.6. The design of the floor plates and supports shall be fatigue resistant. The design shall take into account the loading parameters applied by the maximum passenger throughput on the escalator, according to the duty cycle quoted in Part 1, sub-section 10.6 of this specification.

19.7. The *Contractor* shall advise the *Employer* of the maximum weight, at the design stage. Each floor plate shall be clearly marked with its weight.

19.8. The plan area of each floor plate shall be as large as possible whilst taking due consideration for manual handling requirements.

19.9. Each floor plate shall have a fire resistance of thirty minutes.

19.10. The slip resistance of unprofiled flooring shall achieve a minimum Slip Resistance Value (SRV) of 36, when tested under dry and wet conditions using a TRL Pendulum Tester with 4S(96) rubber.

19.11. The slip resistance of profiled flooring shall achieve a minimum coefficient of friction value of 0.40 when tested in the wet according to SATRA test method TM144.

19.12. A suitable means of sealing the joints between floor plates, adjacent flooring and surrounding station fabric against water seepage shall be provided. No gaps shall be present between the floor plates and trays when finally installed.

19.13. Floor plate fixing screws shall be flush with the finished surface within $\pm 0/-1$ mm and shall be of a corrosion resistant material e.g. stainless steel. An escutcheon shall be provided to retain the infill material around the screw head.

19.14. Floor plates shall be accurately levelled to within 2mm of each other and adjacent flooring. Levelling shall be achieved by means of metal packers, which shall be bolted or screwed to the supporting steelwork.

19.15. The supporting steelwork shall be drilled and tapped to receive the floor plate fixing screws. There shall be no loose items e.g. clamping devices, which could fall free into the machinery space below on removal of the fixing screws.

19.16. Screw threads shall be provided in the floor plates, to enable the insertion of lifting eyes or jacking screws and to permit lifting and handling by mechanical means. The sockets for the lifting eyes shall be concealed when the fixing screws are in place.

20. Guarding

20.1. General

20.1.1. Guarding shall meet the requirements of the Supply of Machinery (Safety Amendment) Regulations 2008, and PD 5304.

20.1.2. The removal or fitting of individual guards shall not require the dismantling of other guards or escalator components.

20.1.3. The guards shall be fitted following the installation of fire protection systems and all other auxiliary works.

20.1.4. Electrical interlocking of the guarding with the operation of the escalator is not required.

20.1.5. Refer to annexe.

20.1.6. Refer to annexe.

20.2. Passenger side guarding

20.2.1. For maintenance purposes, the following barriers shall be provided to prevent access by unauthorised personnel and the *Contractor* shall implement safe systems of work, which shall be submitted to the *Employer* for acceptance.

- a) Where floor plates are not raised, lockable Maintenance Engineers' barriers shall be provided across the newel ends. One barrier shall be provided for each of the upper and lower landings, per flight of escalators. Refer to annexe.

- b) Where floor plates are to be raised on the passenger side, a lockable barrier shall surround the escalator working area. The barrier shall give 300mm minimum working space either side of the floor plate opening, 600mm minimum working space behind the opening and a minimum height of 1100mm. The design of the guard shall meet all of the *Employer's* operational and safety requirements. The design of the barrier shall be agreed with the *Employer*.

One barrier shall be provided for each of the upper and lower landings, per flight of escalators.

20.2.2. Refer to annexe.

20.2.3. Where floor plates are to be raised on the passenger side for maintenance purposes, the *Contractor* shall implement a safe system of work, to prevent unauthorised access. The details of safe system of work shall be submitted to the *Employer* for acceptance.

20.3. Machine room guarding

20.3.1. In the upper machine chamber and lower machine chamber, guarding shall be fitted to both sides, the ends and the bottom of the escalator truss. The guards shall extend upwards to a minimum height of 2.5m above floor level, and for a distance of nominally 1m beyond the incline access gates.

20.3.2. The guards shall allow easy access to the dust collection areas under the truss.

20.3.3. The design of guarding shall enable access to items requiring frequent attention, without having to remove complete guard panels. To meet this requirement, small access doors shall be provided within the guarding panel where appropriate. The doors shall be of the same material as the guarding, hinged from the top and fitted with a lock. The access aperture shall be fitted with stops at the bottom left and right hand corners. Locations of any such doors shall be agreed with the *Employer* prior to manufacture.

20.3.4. Refer to annexe.

20.3.5. The clearance between the guards and machinery shall be in accordance with The Safety of Machinery Directive 2006/42/EC, as interpreted by BS EN 115-1 and the HSE/ORR.

20.3.6. The clearance between the guards of adjacent escalators shall be adequate to maintain a personnel access route between the escalators (600mm minimum). Where this requirement cannot be met, and where alternative walking routes exist, the guarding shall be arranged to restrict personnel access into that area.

20.3.7. Refer to annexe.

20.3.8. Refer to annexe.

20.3.9. Guards shall be of wire mesh or sheet steel construction, which shall be welded into a rigid tubular or angular steel sub frame. The mesh size shall conform to PD 5304 Appendix A with the wire gauge being adequate to withstand distortion or breakage of fittings from a person suffering an accidental fall onto the guarding. The use of sheet steel shall be kept to a minimum to reduce dust traps, to ensure maximum visibility of machinery, structures or other persons, and to reduce weight.

20.3.10. No single panel shall weigh more than 10kg and shall not be larger than 1.5m x 1m in either width or height. A maximum height and width of 1m applies for guards that are fixed in confined spaces or that require the use of a ladder for their removal.

20.3.11. The guards shall not give rise to any handling risk, i.e. all panel mesh strands shall be spot welded, cut-outs and edges shall be smoothed and rounded, and any protruding metals shall be cut flush with the sub frame or truss.

20.3.12. Personnel access gates shall be fitted at the top and bottom of the incline maintenance stairways between adjacent escalators, and between the escalators and tunnel walls, where appropriate. Where it is impractical to fix an access gate between the escalator and tunnel wall due to restricted space, a fixed mesh guard is to be fitted. This guard shall be secured with a design of fixing that will allow egress from the incline in the case of an emergency.

20.3.13. The access gates shall provide the maximum clear width and height possible. They shall be hinged and fitted with a lock. The gates, frames and any fixed panels shall be removable, as required for major maintenance or repair activities.

20.3.14. Refer to annexe.

20.3.15. All guards shall be secured by captive fixings that cannot be removed without the use of tools. In order to prevent a guard panel falling when the captive fixings are released, each panel shall be fitted with a fall arrest mechanism bracket welded to the bottom left and right hand corners pointing inwards, and seating onto a fixed member.

20.3.16. Screwed fastenings shall be of grade 8.8 and shall make use of tapped holes or captive nuts. Self-tapping screws shall not be used.

20.3.17. No drilling or welding of the truss members shall be carried out without prior confirmation by the *Contractor* through the provision of calculations, that the integrity of the truss is not compromised.

20.3.18. Each guard shall be painted in accordance with Part 1, sub-section 10.13 of this specification.

20.3.19. Each guard shall be identified by a code letter/number stamped onto a small plate fixed to one corner of the guard. The code identification shall correspond to that shown on the location diagram.

20.3.20. Refer to annexe.

21. Access stair handrail

21.1. Refer to annexe.

22. Oil and dust trays

22.1. Drip trays shall be fitted under sprockets, auxiliary drive chains and step chains, to prevent oil drips falling onto the floor or onto equipment (particularly the brakes). These shall be integral with the guards where appropriate. Means shall be provided for collecting and removing the waste oil from the lowest point of the system. The facility for waste oil removal shall be easily accessible. (See clause 14.13).

22.2. A dust tray system shall be provided at the upper and lower reversing stations, to catch dust and other debris thrown from the steps. Deflector plates shall be fitted as required to direct debris into the tray.

22.3. Due consideration shall be given to access for cleaning the whole oil and dirt collection system. The design of the above items shall take account of site conditions, and shall be agreed with the *Employer* prior to manufacture.

23. Insulating mats

23.1. Insulating mats shall be provided in front of all the access door(s) of electrical equipment.

Document history

Revision	Date	Notes
01	October 2010	First issue.
02	April 2011	For document change detail see separate document.
03	May 2011	Approved for use in Pan-TfL escalator PQQ. For document change detail see separate document.
04	August 2011	For document change detail see separate document.
05	September 2011	For document change detail see separate document.
06D	February 2012	DRAFT for use – Pan-TfL. For document change detail see separate document.
06	April 2012	APPROVED for use – Pan-TfL. Changes since DRAFT rev.06 = clauses 20.2.1 and LUL 20.2.2 revised. No other changes.
07	July 2012	APPROVED for use – Pan-TfL. No changes.

Appendix 2.1 – Sample template for escalator truss CDS

Vendor Limited,
XXXXXXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX

Conceptual Design Statement For

Escalator Truss Design
For

Heavy Duty Metro Escalator Nos. XX - XX

At

XXXXXXXXXX Station

Document Ref. No.: VENDOR-XXXXXXXX-CDS-XXX

Rev.	Date	By	Checked	Approved

Contents

1. Design Organisation

Vendor Engineering Somewhere

Add in address

2. Identification of structure

2.1 Location

XXXXXXX Station Add location

2.2 Description

New metro style escalator (type XXX), in accordance with specification XXX-XXX-XXXX-XXXXXXX Issue XX, and Vendor Tender documentation.
X@ X.Xm rise.

3. Brief Description of Existing Conditions

3.1 Associated Structural Assessments

The shafts into which the new escalators are to be installed are new, purpose built structures designed by others.

4. Description of Proposed Works

4.1 Foundations and Concourse Floor Support Steelwork

Support of the concourse floor support steelwork will not be provided by the new escalator steelwork. Responsibility for providing alternative, permanent support of the concourse floor will be provided by others.

4.2 Truss Support Design

The design of the truss supports members connected to the truss will be by Vendor. The support structure below the steelwork will be designed by "others" and covered by a separate CDS.

5. Design Criteria

5.1 Loads

A full assessment of load incidents on the structure will be considered which will include the following:

Passenger Loading is taken as XXXXXX kN/m²

Case No	Load Type	Load Description	Magnitude
1	Dead Load	All loads/weights of materials associated with the permanent installation	Calculated from Structure Mass
2	Live Load	Loads incident on the structure from the use of the escalator by passenger traffic,	Passenger Load Applied to plan area of steps
3	Braking Load	Loads from Emergency Braking while in Passenger Service	Passenger Load PLUS The dynamic forces from the passenger load stopping within the minimum braking distance recommended in EN115.
4	Brake Test Load	Loads from the testing of the Escalator braking systems prior to passenger service	The load is applied over sufficient incline to give an equivalent brake test load. Load is applied in various locations to give the critical member and support stresses under testing.
5	Lock-Up loading	The lock-up condition will be used to determine the potential for load transfer to the concourse floor steelwork and to ensure that catastrophic collapse of the truss does not occur	Passenger Load PLUS The dynamic forces from the passenger load stopping within a distance of xxx mm

A combination of dead, live and special loads will be made, using appropriate load factors or the particular limit state under consideration.

The factors will be as follows:-

Serviceability Limit State (Deflection):

Live Loads **xxx**

Ultimate Limit State (Operating, Braking):

Dead Loads **xxx**

Live Loads **xxx**

Ultimate Limit State (Brake Test):Dead Loads **XXX**
Live Loads **XXX****Accidental Limit State (Lock-up):**Dead Loads **XXX**
Live Loads **XXX**

Special loads – these are loads incident on the structure which have their origin in the drive or braking forces, or any pretension applied to the step chain.

Other loads considered under this section include test loading, and where the specification or condition dictates a lock-up condition.

A stopping distance of **XXX** mm will be taken for the lock-up. The lock-up condition will be used to determine the potential for load transfer to the concourse floor steelwork and to ensure that catastrophic collapse of the truss does not occur.

5.2 Consideration of load cases

5.2.1 Fatigue is not critical for the truss therefore not been further addressed in the calculations.

5.2.2 i) For serviceability, deflection is limited to L/1500 or 3mm (under an imposed load of 5kN/m².

ii) For lock up load cases deflection is to be limited such that entrapment will not occur.

5.3 Assumptions of restraint provided by adjacent floor areas

The concourse floors will provide no restraint to the head and tension end steelwork of the escalator truss.

5.4 Concrete strength

The civil truss supports will be by others, the vendor to supply loading applied by truss.

5.5 Support Restraints

The supports to the truss at the head and tension ends will be bolted down to the concrete foundations to restrain against lateral movement.

The design of the support arrangement is to ensure adequate longitudinal and lateral rigidity to maintain overall structural deflection limits within specification.

The supports will be analysed as a pin joint to the concrete sub structure

6. Proposed method of structural analysis

The truss will be analysed as a fixed joint truss, continuous over the supports. The compression boom will be assumed to be laterally and torsionally restrained by U-frame action.

7. Proposals for an independent Category 2 or 3 design check

A category 2 design check is proposed.

Approval in Principle Certificate

Approval in Principle of the Conceptual Design Statement
 for the Structural Design of Escalator Trusses and Supports
 for new Escalators Nos. XXXXX at XXXXXX Station

Sign off sheet to be agreed by project team

Submitted by (signed)
 Name (printed) Date:

Recommended by (signed)
 Name (printed) Date:

Approved by (signed)
 Name (printed) Systems Engineer
 Date:

Appendix A - Reference Drawings

Drawing No	Description	Date
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List Main GAs only

Appendix B - Escalator Loading – Include diagram