



Category 1 Standard

S1057 Civil Engineering - Miscellaneous Assets

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1 Purpose

1.1 The purpose of this Standard is to define the whole life cycle civil engineering requirements for Miscellaneous Assets. These assets comprise:

- a) Roads, Paving and car parks
- b) Lighting towers and high mast columns
- c) Lighting standards
- d) Chimneys – concrete, masonry and metal
- e) Water towers
- f) Dry Stone Walls (free standing wall)
- g) Boundary walls (free standing wall)
- h) Non-boundary walls (free standing wall)
- i) Cable posts
- j) Cable Stiles
- k) Load gauges
- l)

1.2 In defining requirements specifically applicable to Miscellaneous Assets, this Standard complements LU cat 1 Standard S1050 that defines mandatory requirements generally applicable to all Civil Engineering assets including the Miscellaneous Assets.

1.3 A supporting Manual of Good Practice G0057 gives guidance and explanation on Miscellaneous Assets.

2 Scope

2.1 This Standard applies to civil engineering Miscellaneous Assets owned by LU.

2.2 This Standard defines the requirements for Miscellaneous Assets through the following lifecycle stages:

- m) Inception and design
- n) Construction, installation, testing and commissioning
- o) Inspection
- p) Analytical Assessment
- q) Condition Assessment
- r) Maintenance and remedial work
- s) Strengthening and Renewal
- t) Decommissioning
- u) Evidence of compliance
- v)

3 Requirements

3.1 Inception and design

3.1.1 General

3.1.1.1 The inception and design of new works, including works of Strengthening and Renewal, shall ensure that Miscellaneous Assets will satisfy their Required Duty.

Note: The Required Duty for Miscellaneous Assets as defined in the Foundation Document (Bridges and Structures) is as follows:

- | | |
|---|---|
| 1 | Meet railway operating requirements (within the performance specification at system installation or at the most recent system upgrade). |
|---|---|



1.1	Maintain inherent structural integrity (support itself so as not to suffer complete or partial collapse).
1.2	Maintain the ability to carry without restriction any permitted applied static and dynamic design loads.
1.3	Maintain the planned design envelope and adequate clearance to permit the safe passage of rail vehicles.
1.4	Provide appropriate access and egress for all planned uses (including Maintenance), and for reasonably anticipated emergency uses.
1.5	Sustain a condition and state so as not to cause unplanned interruption to, or restriction of, any aspect of the operating railway; this includes externally sourced wear or damage which is greater than that currently accepted for the asset.
1.6	Sustain a Condition and state so as to maintain all interfacing non-railway services and facilities at full design capability.
2	Ensure support at asset interfaces without undue wear and tear.
2.1	Minimise the degradation of all interfacing assets (e.g. as evidenced through Maintenance cycles). This includes interfaces with the railway and adjacent infrastructure (e.g. track, structures, stations and premises).
2.2	Minimise the degradation of all interfacing assets which support non-railway services or facilities (e.g. as evidenced through Maintenance cycles). This includes interfaces with dynamic & static assets (e.g. roads, buildings, walkways, etc).
3	Match LU policy in respect of realistic user perceptions. Ensure the asset does not cause undue degradation of interfacing assets, disruption to railway operations or unacceptable environmental nuisance.
4	Provide resistance against external interference and events.
4.1	Asset minimises the likelihood and consequence of asset abuse. Asset abuse encompasses, vandalism, planned/unplanned work, damage due to external event, etc.
4.2	Asset minimises the likelihood of occurrence and enhances the ability to respond to personal attack on passengers or staff.
5	Present acceptable environmental impact. Present an acceptable societal environmental impact (noise, vibrations, vegetation cover, adverse weather management, etc).
6	Minimise environmental impact throughout lifecycle. Minimise environmental impact and demands at all stages in the lifecycle; this includes effects now and into the future, including successive refurbishment, final decommissioning, and disposal routes.
7	Function within the legal and standards framework. Ensure the asset functions within the framework defined by legislation (including environmental); regulatory guidance; LU, Infraco and applicable national and international standards; and LU and Infraco policies.
8	Ensure safe operation as defined by LU.
8.1	Ensure safe operation and Condition as specified by LU requirements; this includes passengers, employees and members of the general public.
8.2	Ensure safe ingress/egress by passengers, general public, employees, and emergency services in planned & reasonably anticipated emergency scenarios.



	This includes the means of transfer from the Miscellaneous Asset to the principal interfacing assets and transfer mediums (e.g. public footpaths).
8.3	Safeguard the health and safety of passengers, employees and members of the general public.
9	Provide above within reliability and availability targets. Provide all aspects of the Required Duty within the defined LU requirements.
10	Ensure Required Duty is performed without incurring excessive or prohibitive costs.

3.1.1.2 Miscellaneous Assets shall be designed to the principles of asset management planning.

3.1.2 Inception

All proposals for new or altered assets including Strengthening and Renewal made by Suppliers to LU shall be initiated and controlled in accordance with LU Standard S1538 and S1050.

3.1.3 Design process

The design shall proceed in a staged manner in accordance with LU Standard S1538.

3.1.4 Ground Investigation information

Ground Investigation and desk top studies for Ground Investigations shall be carried out in accordance with LU Standard S1050.

3.1.5 Design standards

Design, Strengthening and Renewal shall be carried out in accordance with the requirements stated in Attachment 7.

3.1.6 Design life

The Design Life shall be as defined in Attachment 7.

3.1.7 Structure gauge and clearances

Assets shall conform to LU Standard S1156, under any loading combination.

3.1.8 Service fixings and connections

3.1.8.1 The design shall comply with the requirements for service fixings and connections in accordance with LU Standard S1050.

3.1.8.2 The design shall accommodate provisions for services and the relocation of existing services where appropriate to the scope of work.

3.1.9 Fire resistance

Structural members shall be designed to provide the fire resistance given in the Fire Safety Strategy Document produced in accordance with LU Standard 1-080.

3.1.10 Groundwater

3.1.10.1 Where applicable to the scope of work, the design shall take account of the following:

- w) Changes in long-term Groundwater levels as defined by LU
- x) Seasonal variations in Groundwater levels.
- y)

3.1.11 Impact on operational railway and adjacent structures

The design shall comply with the requirements of LU Standard S1050.



3.1.12 Drainage

- 3.1.12.1 The structural design shall provide space for the drainage system.
- 3.1.12.2 The structural design shall be coordinated with the drainage system design, as given in LU Standard S1052.

3.1.13 Stray electrical currents

- 3.1.13.1 Where structures are to be placed within 3 metres of LU conductor rails, the likelihood of damage being caused due to stray electrical currents shall be assessed.
- 3.1.13.2 Where structures are to be placed in areas which contain 750V third-rail electrified railways or 25kV overhead line electrified railways, the likelihood of damage being caused by stray electrical currents shall be assessed.
- 3.1.13.3 All metal structures and steel reinforcement in concrete that are prone to corrosion due to stray electrical currents shall be earthed in accordance with LU Standard 1-106.

Note: Guidance on protection of structure against stray currents is given in Manual of Good Practice G0106.

3.1.14 Foundations

Note: Guidance on underpinning is given in Manual of Good Practice G0053.

- z) The design and proposed methods of construction shall minimise effects of construction-related ground movements on adjacent buildings, structures and utilities.
- aa)
- bb) Settlement and damage predictions shall be undertaken in accordance with LU Standard S1050.
- cc)
- dd) The design and proposed methods of construction shall control construction-related ground movements to ensure that damage to adjacent buildings, structures, and utilities does not exceed Category of Damage 2 (Slight) as defined by Burland et al (1977).
- ee)
- ff)

Note: Burland et al defined slight damage as "Cracks easily filled. Redecorating probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repainting may be required externally to ensure weather tightness. Doors and windows may stick slightly."

The approximate crack width (in masonry construction) was suggested as 5mm. The limiting Tensile Strain 0.075% to 0.15%.

- gg) The owners of adjacent buildings, structures and utilities shall be consulted on the assessment of the effects of settlement on movement and serviceability.
- hh)
- ii) Suitable provision shall be made to allow for movement of foundations without detrimental effect to services and utilities.
- jj)
- kk) The foundation system shall be designed such that the net downward load is always positive, in the construction, operation and accident conditions.
- ll)
- mm) NHBC Standards shall be considered for the design of low rise building foundations.
- nn)
- oo) The design of temporary or permanent Underground Structures and of dewatering systems shall, as far as is reasonably practical, avoid lowering of the external water table and shall minimise the reduction of piezometric head in the adjacent soils.
- pp)

3.1.15 Loading

The structure shall be designed to carry and transfer design loads and load effects for the Design Life.



3.1.16 Provision for maintenance

- 3.1.16.1 The design shall incorporate provisions, to facilitate the inspection, Maintenance and periodic component replacement operations necessary for the achievement of the Required Duty for the Design Life.
- 3.1.16.2 As part of the design, the Supplier shall produce a plan for inspection, instrumentation, measurement and Maintenance of the asset to ensure serviceability throughout the Design Life.
- 3.1.16.3 The use of low maintenance materials shall be considered where it will be difficult to gain access to inspect and maintain.

3.1.17 Temporary Works

- 3.1.17.1 Temporary Works required for the construction of the permanent works shall be fully compatible with the continuing safe and reliable operation of the adjacent facilities.

Note: Also refer to LU Standard 1-354 and for spatial constraints refer to LU Standard 1-133

- 3.1.17.2 Any loads which Temporary Works impose on new assets shall be allowed for in the design.
- 3.1.17.3 Existing assets which will be required to sustain loads imposed by the Temporary Works associated with the construction of new assets shall be checked for their ability to do so and if necessary, additional support shall be designed.

3.1.18 Design documents

- 3.1.18.1 A design report shall be prepared in accordance with LU Standard S1050.
- 3.1.18.2 The design report shall describe any requirements for instrumentation and Monitoring including full details of purpose, installation requirements, and frequency of readings.
- 3.1.18.3 The Supplier shall have a process for checking and verifying design calculations.

3.1.19 Construction documents

Construction documents shall be prepared in accordance with LU Standard S1050.

3.2 Construction, installation, testing and commissioning

3.2.1 General

- 3.2.1.1 LU Standard S1552 shall be complied with during all construction, installation, testing and commissioning work.
- 3.2.1.2 Construction installation, testing and commissioning work, including Strengthening and Renewal, shall put into effect the design requirements as defined in Section 3.1 of this Standard.
- 3.2.1.3 No new or Strengthening and Renewal construction work shall start until the design for that work has been approved in accordance with LU Standards S1538 S1050.
- 3.2.1.4 A system to control and manage the construction process shall be maintained.

Note: This system is required to enable LU:

- a) to discharge their responsibilities to HMRI;
- b) to discharge their responsibilities to maintain safe structures and operating railway systems during construction works;
- c) to satisfy itself that the construction is in accordance with the design; and



- | | |
|----|---|
| d) | to satisfy itself in respect of the adequacy of the system for the recording of construction data and information that may be relevant to the subsequent Maintenance, Strengthening and Renewal and eventual decommissioning of the Miscellaneous Assets. |
|----|---|

3.2.1.5 Procedures shall be in place for controlling any changes to the design during the construction, installation, testing and commissioning phases including staged and temporary construction work. Such procedures shall ensure that:

qq) proposed design changes are not implemented until they have been duly considered and approved by a person competent to appreciate their impact on construction methodology and their implications for the safety of the operational railway; and

rr)

ss) records are made of the design changes and their approval.

tt)

3.2.1.6 At the end of construction the drawings shall record the works as built.

3.2.1.7 Adjacent buildings, structures, utilities and facilities shall be protected from the effects of construction work in accordance with LU Standard S1050.

3.2.1.8 Sufficient testing of systems, sub-systems, materials and components shall be carried out to give assurance that they are in accordance with those specified in the approved design.

3.2.1.9 All necessary attendance during site visits shall be afforded to LU to enable LU to discharge its responsibilities in respect of its duties including verification.

3.2.1.10 Where appropriate to the scope of work, a design capability shall be made available throughout construction to ensure and certify implementation of the design intent.

Note:	Ensuring implementation of the design intent includes interpretation of monitoring data and modification of the design if necessary.
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3.2.2 Work sites and access

3.2.2.1 The location and size of the working sites required for the efficient and safe servicing of construction activity shall be selected.

3.2.2.2 Arrangements necessary to obtain permission to use sites for the intended purpose for the duration of construction activity shall be made.

3.2.3 Construction methods

3.2.3.1 The construction method(s) shall lead to the provision of the asset defined in the documentation for implementation within the specified tolerances and of the specified dimensions and quality.

3.2.3.2 Before any modifications are made to a construction method the design shall be checked and if necessary modified.

3.2.4 Materials

All construction materials supplied to the works shall comply with the requirements of LU S1050 and T0005.

3.2.5 Instrumentation and monitoring

3.2.5.1 Where appropriate to the scope of work, the following shall be carried out:

uu) verify the predictive ground movement and the effects which such ground movement will have on LU and adjacent assets by measurement;

vv) determine the impact on Outside Party assets in accordance with LU Standard S1023;

ww) establish monitoring base readings of the construction activity sufficiently in advance to ensure underlying and seasonal environmental trends are understood;

xx) implement contingency plans if the results of monitoring so indicates.

yy)



3.3 Inspection

Inspection shall be carried out in accordance with LU Standard S1060 – Bridges & Structures Inspection Standard

3.4 Analytical assessment

- 3.4.1 Where an Analytical Assessment is required it shall be carried out in accordance with LU Standard S1061 Bridges & Structures Assessment.

Note: An Analytical Assessment is not normally required for Miscellaneous Assets. However an Analytical Assessment may be required if the inspection raises a Specific Concern about the structural performance or the ability to meet its Required Duty. Engineering judgement is required to determine whether an Analytical Assessment is required, and consideration should be given to the Condition of the asset as inspected, its Required Duty, and the available knowledge about the asset.

3.5 Condition Assessment and certification

3.5.1 General

- 3.5.1.1 This Section identifies specific requirements and processes for establishing the Asset Condition Assessment and Classification (ACAC) of Miscellaneous Assets, which shall apply in conjunction with the general requirements for ACAC identified in LU Standard S1050 for all civil assets, where applicable to the scope of work and asset type.
- 3.5.1.2 Where applicable to the scope of work, this section shall be read in conjunction with LU Engineering Standard 1-031 and the Foundation Documents for Bridges and Structures.

Note: The procedure for Condition Assessment and Condition Certification is diagrammatically represented Attachment 7.9. This is based on the procedure used for Bridge Structure assets.

3.5.2 Desk top studies

- 3.5.2.1 A review shall be undertaken to take into account the available knowledge about the asset, including interfacing assets where they have affected the Condition of the asset. The review shall include all of the relevant data and information necessary to determine the Condition of the asset and its ability to meet the Required Duty.

Note: The desk top study should typically include:

- a) Database records;
- b) Current inspection reports, and whether the physical Condition of the asset affects the ability of the asset to meet the Required Duty;
- c) Recommendations made by inspectors or engineers who appraise inspections, including any identified work (IDW) and information on rates of deterioration;
- d) Known defects and Specific Concerns;
- e) Regulatory Notices, Vulnerable Structures Notices, Improvement Notices or Restriction/Prohibition Notices;
- f) History, performance, Maintenance and age of the asset where available;
- g) Any generic susceptibility to defects;
- h) Any recent reports of significant deterioration, or change in loading;
- j) Any Incident reports;
- k) The results of the Analytical Assessment and whether as a consequence of the physical Condition of the asset a re-evaluation of a previous Analytical Assessment is required.