HIGHWAY DESIGN GUIDE

Highway Structures

STRUCTURAL PROCEDURES

Procedure Guidelines for the Design and Construction of Highway Structures requiring the consent of Highway Authority

September 2019
1.0 **Introduction**

1.1 Due to the significant design, safety, inspection and maintenance considerations associated with highway structures and their impact on highway users and the local communities, it is a strict requirement that Technical Approval procedures must be followed for the design and construction of all new or modified highway structures in compliance with the Department for Transport’s Departmental Standard BD 2-Technical Approval of Highway Structures. Technical Approval procedures also apply to proposal for structures outside the highway boundary where the design, construction, maintenance or demolition of the structure may affect the highway structure or the safety of the highway user.

1.2 The Technical Approval Procedural requirements impose a discipline on the process that encourages good practice and intended to reduce the possibility of errors affecting structural fitness for purpose. Most importantly however, the procedures minimise the possible risks to highway users and others who may be affected.

1.3 The Technical Approval Authority (TAA) for the purpose of approving new highway structure, modification to existing highway structures or other liable structures shall be the Bridges and Structures Manager in Kirklees Council.

1.4 The Technical Approval Procedures as described BD 2 require the proposer to consult the TAA at the earliest opportunity and submit outline proposals to enable the proposals to be placed in one of four categories, depending upon factors such as design complexity, potential consequences of failure and whole life costs, prior to submitting an Approval in Principle (AIP) to the TAA and to receive endorsement of the AIP before proceeding with any design work. Any detailed design work undertaken before the AIP is approved by the TAA will be at the developer’s risk.

1.5 Following the approval of the AIP and the completion of detailed design, the proposer shall be expected to submit a "Design and Check Certificate" for acceptance by the TAA, at least 4 weeks prior to the commencement of construction works on site.

1.6 Upon the completion of works on site the proposer will be required to submit a "Construction Compliance Certificate" in accordance with BD 2 certifying that the works have been implemented in compliance with the approved AIP.
2.0 Definition of a Highway Structure

2.1 Highway structures for the purpose of these guidelines are defined as:

(a) Any structure built over or under the highway with a clear span or internal diameter greater than 0.9m. This includes bridges, culverts, footbridges, cycleway bridges, service bridges, tunnels, chambers, cellars, shafts, mine shafts caps, soakaways, surface water attenuation tanks/pipes/manholes/access chambers (Refer to Drawing No SWAP/GA/19/01A for permitted size and arrangements), sign gantries, traffic signal mast arms and high mast lighting columns etc.

(b) Earth retaining structures such as retaining walls, burr walls, headwalls, basements and cellars etc. built in the highway, or otherwise potentially affecting the stability or safety of the highway with a minimum retained height of 1.35m at any cross-section.

(Note: the above is not intended to be an exhaustive list of highway structures, refer also to BD 2)

(c) In the particular case of walls supporting land above the highway (Section 167 of the Highways Act), and which are within 3.66m (4 yards) of the highway boundary, then a minimum retained height of 1.35m (4 feet 6ins) shall be used for the purpose of these guidelines (see Figure 1).

The definition of a ‘highway’ includes the carriageway, footway or verges adjacent to the structure which are maintainable at public expense, or for which the Developer is seeking adoption under Section 38 or 278 of the Highways Act 1980.

2.2 For clarity this Highway Authority uses the term "Retaining" wall for walls that support the land above the highway and "Burr" wall for walls supporting the highway itself.
3.0 Adoption Policy

3.1 In general, subject to compliance with the procedure defined in the Councils Adoption Policy document (See also Figure 1), the Highway Authority will only consider the adoption of highway structures defined in 2.1(a) and 2.1(b) which either carry an adopted highway or support an adopted highway. Any structure spanning over the highway will not be adopted unless the structure itself carries a highway, or forms an integral part of the highway, such as a footbridge or traffic sign gantry.

3.2 Retaining walls supporting private land adjacent to a public highway will not be adopted and as such these must be located outside the highway boundary.

3.3 Surface water attenuation tanks/pipes/manholes will not be adopted by the Highway Authority.

3.4 The Highway Authority will only adopt burr walls constructed to support the highway if an embankment is not practicable.

3.5 For new highway structures, a 3m horizontal easement strip adjacent to retaining structures and 5m horizontal easement strip adjacent to carrying structures will normally be required for the purpose of future maintenance / reconstruction.

3.6 All structures earmarked for adoption must specifically be written into the Section 30, 38 or 278 Agreements and be clearly shown on the relevant adoption drawings.

3.7 When a highway structure is to be adopted, a commuted sum for future maintenance and renewal of the structure will be required by the Highway Authority.

3.8 Inspection and Maintenance Agreement for private structures including surface water attenuation systems, liable for technical approval, will be required by the Highway Authority.

3.9 Structures will not be adopted if the correct procedures have not been followed.
Figure 1: Highway Structures Liable for Technical Approval

1. RETAINING STRUCTURES e.g. walls / embankments etc
   - WILL THE STRUCTURE BE EARTH RETAINING?
     - Yes
     - No

2. WILL THE RETAINED HEIGHT OF STRUCTURE BE EQUAL OR GREATER THAN 1.35M?
   - Yes
   - No

3. HIGHWAY AUTHORITY (HA) APPROVAL WILL BE REQUIRED - HIGHWAYS ACT 1980 (SECTION 167)
   - Yes
   - No

4. APPROVAL IN PRINCIPLE (AIP) WILL BE REQUIRED IN ACCORDANCE WITH BD2 - TECHNICAL APPROVAL OF HIGHWAY STRUCTURES AS DETERMINED BY THE TECHNICAL APPROVAL AUTHORITY (i.e. HA)
   - Design to relevant and current highway structures design codes, DMRB, codes of practice
   - Yes
   - No

5. TECHNICAL APPROVAL GRANTED BY HA?
   - Yes
   - No

6. WILL ADOPTION BE SOUGHT UNDER SECTION 38 AGREEMENT?
   - Yes
   - No

7. All burr walls with a retained height smaller than 1.35m supporting an adoptable highway will also be liable to a technical approval.
   - All surface water attenuation tanks/pipes/manholes/access chambers with a clear span or internal diameter exceeding 0.9m must be located off the adoptable highway. In exceptional circumstances where a manhole/access chamber greater than 0.9m internal diameter is required, this must be limited to less than 1.8m in internal diameter. This will be classed as a highway structure and be liable for a systematic inspection regime. This will therefore have to be accompanied by a legally binding agreement from Yorkshire Water (adopting authority) in relation to their regular inspection by either YW or their agents in compliance with BD63 Inspection of Highway Structures. In the absence of any agreement from YW, a commuted sum will become payable in lieu of their inspection by the Highway Authority in the wider interest of safeguarding public safety. Furthermore, surface water attenuation tanks/pipes/manholes including manholes with a clear span or internal diameter equal to or exceeding 1.8m must be located outside the highway footprint.
   - Structure to remain in private ownership
   - Yes
   - No

8. THE STRUCTURE TO BE ADOPTED AND THE MAINTENANCE RESPONSIBILITY TRANSFERRED TO THE HIGHWAY AUTHORITY
   - Yes
   - No

Note 1: Surface water attenuation systems comprising 2no. pipes with an internal diameter not exceeding 0.9m will be permitted subject to strict compliance with the configurations shown on drawing no. 3M5A/10/01A.
4.0 **Design Approval Procedure**

4.1 Technical approval of all highway structures will be required in accordance with Department of Transport Standard BD 2 and the following:

- All structures including retaining walls with a minimum retained height of 1.35m shall be classified as at least Category 1. The classification of retaining walls with a retained height less than 1.35m shall be subject to agreement but will normally be Category 0.

**STAGE 1- Preliminary Design**

4.2 Application for Approval in Principle (AIP) for each structure should be submitted electronically in draft form as early as possible in the design process. The application shall include;

a) Location plan,

b) General Arrangement drawing of the proposed structure

c) Site plan with appropriate cross-sections and long-sections.

d) Completed AIP including all design parameters, loading, assumptions and method of analysis

e) Design statements on sustainability, buildability, durability environmental impact, whole life costing and compliance with the current Construction Design Management (CDM) Regulations 2015.

f) Completed Technical Approval Schedule (TAS) in Appendix A of the AIP- highlight all relevant design codes and specifications to be used in conjunction with the design of proposed structure.

g) Appropriate and relevant Site Investigation Report. I with whole life on scheme drawings and site investigation information as well as the completed AIP form.

h) Specification

i) Detailed Calculations and drawings are not normally required at this stage pending the conditional approval of the AIP (i.e. subject to the submission of satisfactory documents and certificates detailed in stages 2&3).
Following the approval of the AIP, any material changes to the proposals should be submitted for approval as an Addendum to the AIP in accordance with BD 2.

**STAGE 2- Detailed Design**

Following the successful completion of stage 1, additional documents in full compliance with the approved AIP to be submitted shall include:

a) A copy of checked structural design calculations including all assumptions and justifying all input data.

b) Design and Check Certificates with original signatures

c) Checked Construction Issue drawings and bar bending schedules (2 copies)

d) the Specification Appendices if any, and a copy of the design calculations.

The above documents shall be submitted and accepted by the TAA prior to any works starting on site.

**STAGE 3- Post Construction**

Following the successful construction of approved structure additional documents to be submitted shall include:

a) "Construction Compliance Certificate" in accordance with BD 2

b) “As Built” Drawings

c) Completed Health & Safety File

5.0 **Design Requirements**

5.1 All highway structures shall be designed in accordance with the latest relevant British Standards and Codes of Practice and the Standards in the Department of Transport (DoT) Design Manual for Roads and Bridges (DMRB). Where conflict arises DoT Design Standards and Advice Notes take precedence over British Standards and Codes of Practice.

5.2 All highway structures including bridges, buried structures and retaining walls must be designed for a design working life of 120 years (min) in compliance with BS EN 1990:2002.

5.3 Submission of an Approval in Principle document will not be required for walls with an effective retained height of less than 1.35m. However, the proposer shall still be expected to submit structural calculations and drawings for review and approval by the TAA.

5.4 Grouted cavity walls (sometimes referred to as reinforced masonry wall) where the reinforcement is placed in the middle of wall cavity, can not be used to retain carriageways nor earthworks supporting carriageways.

5.5 All highway retaining walls must be located outside the influence zone of loading from adjacent buildings or other structures.

5.6 All highway burr walls shall be provided with an appropriate parapet to withstand vehicular impact/ pedestrian and wind loading in compliance with BS6779 or the DfT “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures”. All highway retaining walls supporting private land above the highway will also need to be provided with a suitable pedestrian parapet 1.1m high (min).

5.7 The minimum surcharge loading to be applied to walls (whether the wall retains the highway or not) shall be 10kN/m² plus the appropriate earth pressures. Retaining walls which support footways/cycleway/private land and can be demonstrated to be inaccessible by vehicular traffic shall be designed using the appropriate earth pressures plus a surcharge of 5.00 KN/m². A higher surcharge loading may be required if heavy vehicle loading is likely immediately behind the wall. (BS8002:2015 –Table 7).

5.8 The overall stability of an earth retaining structure should be verified in accordance with BS EN. 1997-1:2004 + A1:2013, 9.7.2

5.9 The Ultimate limit state design of an earth retaining structure should conform to BS EN 1997-1:2004 + A1:2013, 2.4.7,9.2 and 9.7

5.10 In the global stability calculations passive resistance in front of the toe of the wall or any downstand (shear key) where the ground may be disturbed by future “unplanned excavation” shall not be permitted.
6.0 Specifications

6.1 Unless otherwise agreed, materials and workmanship shall be specified in accordance with the DTp Specification for Highway Works (SHW).

6.2 Reference to the SHW, or other specification if appropriate, shall be made on the drawings. Where materials and workmanship are not fully specified on the drawings, Specification Appendices shall be prepared by the designer and submitted for approval as described in paragraph 4.2.

6.3 The Specification Appendices shall include testing requirements. The minimum acceptable testing requirements shall be a) testing of backfill materials to ensure compliance with the specification and the assumed designed parameters, b) concrete test cubes and c) cover meter surveys of all concrete surfaces.

6.4 The Specification Appendices shall be issued to the contractor along with the final checked drawings.

6.5 Due to durability considerations all reinforced concrete structures shall have a specified minimum 28 day compressive cube strength of at least 40 N/mm².

6.6 All reinforcement in reinforced concrete structures shall be high yield reinforcement and have a min cover, as defined by an appropriate exposure class in accordance with BS8500-1 for an intended working life of at least 100 years.

6.7 All buried reinforced concrete surfaces shall be treated with waterproofing membrane in compliance with Specification for Highway Works (SHW). 2 coats of tar or bituminous waterproofing is permitted for plain concrete surfaces.

6.8 All facing stonework shall be natural stone and conform to BS 5628-3 and BS 5390 and tied to the structure using stainless steel wall ties.

6.9 All granular fill to rear of walls to be class 6N in accordance with SHW.

6.10 Unless agreed otherwise, all exposed concrete surfaces on structures to be adopted shall be treated with monomeric alkyl (isobutyl) trialkoxy silane or an approved non toxic alternative.

6.11 Unless the design allows for hydrostatic pressure, all retaining walls shall be provided with weep pipes and back of wall longitudinal drainage connected to a positive drainage system and with facilities for rodding.
7.0 **Construction**

7.1 The construction of approved design for highway structures shall not commence until the TAA is in receipt of all relevant certified confirmation that construction issue drawings and specifications are accurate and fully compliant with the approved AIP.

7.2 The Developer shall arrange for supervision of the construction of the works by a suitably qualified person to ensure that the structure is constructed in a safe manner and in accordance with the drawings and specification.

7.3 The Council’s Bridges and Structures Manager and any person authorised by him shall be allowed access to the site at any time subject to compliance with the Contractor’s site safety regulations.

7.4 The Developer shall afford the Council’s Bridges and Structures Manager or his representative the opportunity to examine foundations and any work which is to be covered. A minimum notice period of 24 hours shall be provided and the examination will be carried out without unreasonable delay unless it is considered unnecessary when the Developer will be advised accordingly. Notice of concrete pours in reinforced concrete structures shall be not less than 48 hours.

7.5 Delivery tickets for all materials incorporated within the structure shall be retained for inspection and copies provided to the Council’s Bridges and Structures Manager if requested.

7.6 The Developer shall arrange for testing of material to be carried out in accordance with the specification, at Developer’s expense.

7.7 Upon completion of the structure, the Developer shall request a final structural inspection which will be carried out by a representative of the Council’s Bridges and Structures Manager. Access equipment shall be provided by the Developer, where necessary, to allow all areas of the structure to be inspected. The Developer will be provided with a list of outstanding works or remedial works identified during the inspection.

7.8 A Provisional Certificate in accordance with the Section 38 Agreement will not be issued for the structure and the associated highway until the outstanding and remedial works to the structure are completed.
8.0  **As-Built Records**

8.1 On completion of a highway structure which is to be adopted, the Developer shall provide the Highway Authority with a Maintenance Manual in accordance with BD62, “As Built, Operational and Maintenance Records for Highway Structures”.

The Maintenance Manual shall include as a minimum

- Location plan showing the structure and road name
- “As Built” drawings and bar bending schedules
- Names and addresses of contractors, sub-contractors, materials and component suppliers etc
- Test certificates
- Health and Safety File

9.0  **Completion Certificate**

9.1 Approximately 11 months after issue of the Provisional Certificate, a representative of the Council’s Bridges and Structures Manager will carry out an acceptance inspection of the structure. Access equipment shall be provided by the Developer, where necessary, to allow all areas of the structure to be inspected. The Developer will be provided with a list of remedial works identified during the inspection.

9.2 A Completion Certificate in accordance with the Section 38 Agreement will not be issued for the structure and associated highway until the remedial works to the structure have been satisfactorily completed and the corresponding Maintenance Manual has been received by the Highway Authority.
10.0  Further Information

10.1 If any further information or guidance is required it can be obtained from the Council at the address given below. If in any doubt, developers are advised to contact the Council at an early stage to confirm that a proposal is acceptable.

Kirklees Council
Highways and Operations
Highway Structures Section
Flint Street, Fartown,
Huddersfield
HD1 6LG

Contact: - Mr Farhad Khatibi
Bridges and Structures Manager
Telephone number: 01484221000
Email: farhad.khatibi@Kirklees.gov.uk