Professional Services
Specifications (PSS)

Last updated:
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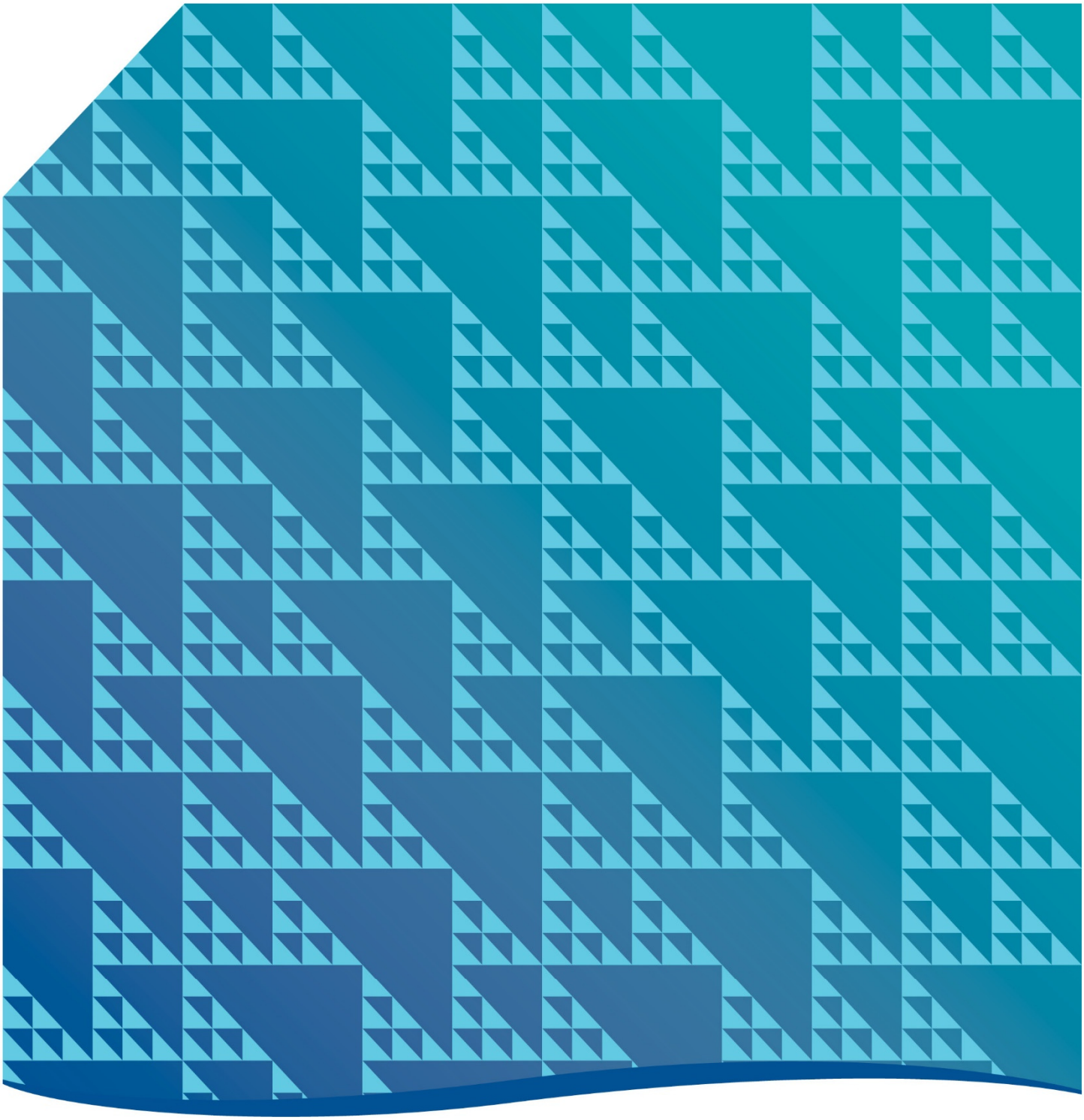
T1 – Structural Assessment and Design



Department of State Growth

Tasmanian Government

Contents

Revision History

Version No.	Date	Description of changes
1.0	December 2020	Amalgamated the previous version of T1 and T2. Added References and Standards, and Samples, Intellectual Property, Structural Inspections and Investigations, Structural Assessments and Design, Independent and Departmental reviews, and Departures. Updates to Client Supplied Product, Notifications, Deliverables and Hold Points. Updates to requirements for Qualified Engineer and Independent Proof Checker including modifications to Form T1-01 and T1-02.

T1.1 Scope

This specification sets out the minimum requirements for undertaking structural assessments and design relating to Major Structures for the Department of State Growth (the Department). It is part of the set of Professional Services Specifications (PSS) and shall be read in conjunction with the entire set of Departmental specifications. The classification of Major Structures and Corridor / Minor Structures is found in the *Guide for Design of Major Structures*. Major Structures include the following types of assets:

- Bridges including pedestrian overpasses;
- Box culverts;
- Arch culverts;
- Pipe culverts;
- Noise walls;
- Retaining walls; and
- Gantries.

The requirements in this specification shall be incorporated when undertaking the following tasks:

- Structural assessment;
- Structural design;
- Structural inspection and investigation; and
- Reporting and presentation of data.

T1.2 Objective

This specification encompasses a wide range of work such as new designs, modification and/or strengthening of existing structures, works performed within the road reservation boundaries of a Major Structure and field and laboratory investigations.

The objectives of the specification are to:

- Provide guidance on the Department's expectations when undertaking an inspection, investigation, assessment or design for a Major Structure;
- Inform engineers of accepted Departmental methodologies and practices and to develop solutions that are cost effective and meet the functionality requirements of the project;
- Assist engineers in identifying potential risks and unknowns associated with the assessment and design processes; and
- Support informed decision-making throughout all stages of the project from concept to delivery.

Where applicable, the Department's Project Brief may contain specific information or requirements in excess of what is covered under this specification.

Examples that the structural assessment may include:

- Use of vehicles that are generally not permitted over the structure;

- Installation of equipment or utility services on the structure;
- Widening of the bridge or culvert;
- Adding fill above the culvert due to road geometrical changes;
- Increasing asphalt thickness on the bridge;
- Excavations adjacent to structural foundations;
- Strengthening and rehabilitation of the structure;
- Dredging in the waterway; and
- Stream works adjacent to the structure.

Examples that the structural design may include:

- New structure;
- Widening of bridge or culvert; and
- Strengthening of existing structure.

If there are any doubts regarding the project, it is advised that consultation with Bridge Assets is undertaken as early as possible in the project.

T1.3 References and Standards

The key references and standards below shall be used for the purpose of this specification. The list is non-exhaustive as it excludes other standards referred within each of the respective standards listed. It is the responsibility of the consultant to ensure that the requirements of all relevant legislation, standards and guides are satisfied. A comprehensive list can be found in Section 175 of the Standard Specifications.

- Department of State Growth Standard Specifications
- VicRoads Codes of Practice and Bridge Technical Notes
- Department of State Growth Professional Services Specifications
- Department of State Growth Guide for Structural Assessment of Major Structures (to be published)
- Department of State Growth Guide for Design of Major Structures (to be published)
- Department of State Growth Standard Drawings
    - *Stock* Underpass

      https://www.transport.tas.gov.au/roads_and_traffic_management/permits_and_bookings/general_works_pathways,_stock_underpass/accordion/stock_underpasses
    - Standardised Plank Design

      https://www.transport.tas.gov.au/roads_and_traffic_management/contractor_and_industry_information/standardised_bridge_superstructure_design
- Austroads
    - Austroads Guideline - Design and Construction Guideline for the Delivery of Large Cantilever and Gantry Structures (to be published)
    - Austroads Research Report AP-R445-13 Standardised Bridge Barrier Design

    - Austroads Guide to Road Design
    - Austroads Guide to Pavement Technology
    - Austroads Guide to Bridge Technology
- Australian Standards
    - AS5100 Bridge Design
    - AS1597 Precast Reinforced Box Culverts
    - AS3725 Design for Buried Concrete Pipes
    - AS4678 Earth Retaining Structures
    - AS3600 Concrete Structures
    - AS4100 Steel Structures

T1.4 Intellectual Property

Information, data, computer models and outputs that are the direct and/or indirect result of works conducted for and on behalf of the Department, is the Intellectual Property (IP) of the Department. All project information that is sourced, collated, generated and/or produced by virtue of a Department of contract, is owned by the Department.

For the purpose of structural assessment and design undertaken for the Department, the following documents shall be submitted to the Department for record:

Document/Drawing/File	**Format**
Options Analysis and Concept Design Report	Pdf
Basis of Design Report	Pdf
Assessment and design calculations	Pdf
Proforma for structure metadata	Microsoft Excel
Design drawings	Pdf, and other format if requested by the Department
Safety in Design Report	Pdf, Microsoft Word or Excel
Geotechnical Report	Pdf
Hydraulic Assessment Report	Pdf
Inspection/Investigation Report	Pdf
Terrestrial survey	Point Cloud in AutoCAD output file
SpaceGass Computer Model	Software input file format

T1.5 Client Supplied Product

The Department will provide copies of, or access to, relevant information in its possession. This information (where applicable) may include:

- Prior or related investigation or assessment reports;
- Bridge Management System data e.g. asset inventory, level 2 inspections;
- Drawings;
- Survey data; and
- Crash and Traffic data.

T1.6 Structural Inspections and Investigations

The consultant's proposal for undertaking structural inspections and investigations shall include, but not be limited to:

- Scope of works covered;
- Information on the team undertaking the works;
- Works program; and
- Cost to undertake these works, including access, traffic management, survey and service location etc.

The consultant shall be responsible for the Workplace Health & Safety aspect of the work scope and provide all plant, material, equipment, ancillary services and labour required to undertake all the tasks safely. When requested, access shall also be provided for the Principal's Representative.

Subject to the agreement of the Principal's Representative, the consultant shall provide notification and obtain all necessary approvals to enter or undertake work affecting properties or services. A Stakeholder & Community Engagement Plan (SCEP) is required prior to commencement of works impacting on any stakeholder.

Should any Aboriginal artefacts be uncovered by works, all works affecting the site shall stop immediately and the Principal's Representative informed.

T1.6.1 Concrete Durability Assessment

The consultant's scope for undertaking a concrete durability assessment of the nominated structure/s may include, but not be limited to:

- Visual inspection, tapping test, concrete break-outs, drilling and extraction of core samples;
- Defect mapping (includes cracking, spalls, delamination and reinforcement corrosion);
- Testing corrosion potentials;
- Testing concrete resistivity;
- Checking reinforcement cover - all data including summaries, individual measurements with their associated locations;
- Petrographic examination for alkali aggregate reactivity or permeability (as needed);

- Analysis of concrete sample/cores for carbonation depth, chloride profiles, (cement content, strength, water cement ratio, density and sulphate profiles – as needed); and
- Diffusion analysis and residual life (as needed).

The extent of sampling and testing shall be determined and recommended by the consultant in the proposal after reviewing information from any previous investigations, if supplied.

The consultant shall be responsible for reinstatement of core holes and other removed concrete in accordance with Section 687 and 689 of the Department's Standard Specifications. All repair materials shall be used strictly in accordance with the manufacturer's recommendations.

T1.6.2 Ad-hoc Inspections

The consultant's scope for undertaking an ad-hoc inspection of the nominated structure/s may include, but not be limited to:

- Visual inspection, tapping test, concrete break outs, drilling and extracting core samples;
- Defect mapping (includes cracking, spalling, delamination and reinforcement corrosion);
- Underwater inspections using divers or remotely operated vehicles (ROV);
- Underbridge, rope access and drone inspections; and
- Above and underwater three-dimensional terrestrial scans.

The consultant shall clearly present each element of the structure inspected and relate inspection records and photographs to these elements accordingly.

T1.6.3 Geotechnical Investigations

The consultant's scope for undertaking a geotechnical investigation for the nominated structure/s may include, but not be limited to:

- Boreholes and/or excavated pits at each abutment and pier location;
- Ground sampling and field/laboratory tests; and
- Seismic refraction testing.

T1.6.4 Instrumentation and Testing

The consultant scope for undertaking instrumentation and testing for the nominated structure/s may include, but not be limited to:

- Monitoring structural responses including vibration, rotation and translation;
- Monitoring crack propagation;
- Monitoring ground movements including settlement, ground vibration;
- Monitoring post-tensioned cable behaviour;
- Collecting traffic response data; and
- Load testing.

The consultant's proposal shall include the determination of critical locations for instrumentation, assessment of current stress levels, rated loads for the structure and the determination of proof loads (as needed). Structural rating shall be in accordance with the current Australian Standard AS5100:7.

For monitoring sites, the consultant shall clearly present the monitoring results and trends in a report at regular intervals not less than the timeframes proposed by the consultant and acceptable to the Department.

For load test sites, the consultant shall include, but not be limited to:

- Development, provision and installation of all instrumentation, test rigs and equipment needed;
- Traffic management to undertake the activities. A traffic management plan shall be submitted to the Department for approval a minimum of 3 weeks before commencement to allow sufficient time for public notification;
- Measurement of the static and dynamic responses induced by the various load combinations proposed by the consultant and acceptable to the Department. Proof load calculations and a risk assessment for the testing shall be provided before commencement;
- Measurement of the dynamic response during ambient traffic conditions for a prescribed time;
- Measurement, recording and photography of defects including cracking before and after the testing;
- Interpretation of results from instrumentation of the bridge and calibration of structural analysis models; and
- Determination of the effects of the loadings taking into account the above results and calibration.

T1.7 Structural Assessments

The Consultant shall carry out structural assessments of the nominated structure/s in accordance with *Guide for Structural Assessment of Major Structures (to be published)*.

The results of any inspection and investigations undertaken under Section T1.6 shall be taken into account for existing structures.

T1.8 Structural Design

The Consultant shall carry out structural design of the nominated structure/s in accordance with *Guide for Design of Major Structures*.

Asset numbers and asset names (if not provided) shall be obtained from the Department for each new or replaced Major Structure. Asset numbers will be retained where only part of the structure is modified e.g. superstructure replacement or structure widening. However, if a minor part of the original substructure is retained for batter/scour protection, then the structure will be classified as a new Major Structure and a new asset number is required.

T1.9 Independent Review

Proof engineering is an independent review and certification of a design to ensure that the design can be constructed safely and also meets the specified performance and durability requirements. Proof engineering cannot be undertaken by an engineer in the same organisation. Refer to the *Guide for Design of Major Structures* for more details.

Complex designs requiring Proof Engineering will be specified in the Project Brief or otherwise requested by the Department.

T1.10 Departmental Review

The design documentation for the Hold Points listed in Section T1.13 shall be submitted to the Department for review. A minimum of 2 weeks is required for the Departmental review.

T1.11 Departures from a Guide or Standard

Refer to T3 for the Application for Departure from a Guideline, Standard or Planning Scheme.

T1.11.1 New Major Structures

Departures from a Guide or Standard for the purposes of design of new Major Structures shall be discussed with Bridge Assets at the earliest opportunity. Where it is accepted by Bridge Assets, the consultant shall submit an application for formal approval.

T1.11.2 Assessments and Design for existing Major Structures

Where the work scope includes modification of an existing bridge or culvert as part of a larger project to improve the asset functionality, any departures from a Guide or Standard shall be discussed with Bridge Assets at the earliest opportunity. Where it is accepted by Bridge Assets, the consultant shall submit an application for formal approval.

Where the work scope includes modification or addition of traffic barriers for collision protection of an existing bridge substructure, any departures from a Guide or Standard shall be discussed with Bridge Assets at the earliest opportunity. Where it is accepted by Bridge Assets, the consultant shall submit an application for formal approval.

Where the work scope includes assessment and design primarily for strengthening/modification of an existing bridge or culvert to improve its load carrying ability, an application for departure from a Guide or Standard is not required provided that it forms part of an overall asset management strategy acceptable to Bridge Assets. Examples of departures may include use of a lower dead load factor, live load factor or dynamic load allowance. Acceptance of these departures will be on a case-by-case basis. More guidance on these type of departures can be found in the *Guide for Structural Assessment of Major Structures (to be published)*.

T1.12 Notifications to Principal's Representative

On detecting significant defects after an inspection/investigation, which may affect the outcome of the structural assessment and design, the consultant shall immediately advise the Principal's Representative. On-site scaffolding access shall not be removed until the Principal's Representative has inspected the defects.

On discovery of any impediments impacting the assessment and design for the Major Structure, the consultant shall immediately advise the Principal's Representative.

T1.13 Deliverables

T1.13.1 Reports

Any report prepared for the Department shall include (where relevant), but not be limited to:

- A description of the proposed project;
- The scope and objectives of the report;
- Locality information;
- Descriptions of nomenclature and standards used;
- All factual information collected or used;
- Description of the site and Major Structure covered;
- Description of the methods of investigations/assessments used;
- Description of design concept options proposed with respective P50/P90 cost estimates;
- Project Risk Management including Constructability and Safety-in-Design;
- Recommendation and Conclusion; and
- Statements concerning reliability of the data and interpretations and opinions where expressed, deficiencies or inconsistencies in the data, residual uncertainties and risks to the Principal;

Any information sources not included in the report shall be referenced. In preparing the report, it should be recognised that the report has uses beyond the design and project specification functions. The whole of life phases from concept, development, delivery and removal shall be considered. For example, it may be used by the Principal to assess priorities and risks, by the Contractor to determine construction methodology and costs, by the Superintendent to make decisions throughout construction and finally by the Contractor to determine a safe methodology for its removal.

Data presentation shall be clear and unambiguous. Where data is voluminous it should be summarised by utilising pictorial, graphical and tabulation techniques.

The report shall clearly distinguish between fact, interpretation and opinion. Opinion should be avoided unless it is necessary to fulfil the objectives of the investigation.

T1.13.2 Drawings

Any drawings prepared for the Department shall include (where relevant), but not be limited to:

- Cover page with project description, locality and list of drawings;
- Departmental title block with project description, the asset number (with a prefix B) and the name of the Major Structure on each drawing title block. Each Major Structure in a project shall be separated from the drawing set and provided in a single bound pdf;
- For the 100% Final design drawings submission, the spaces in the title block of each drawing shall be duly signed by all signatories, especially by Qualified Engineer (See Guide for Design of Major Structures) and the Independent Proof Checker (where relevant); and
- As-Constructed drawings shall be marked-up by clouding and any amendments clearly indicated.

T1.13.3 Certificates

All structural designs shall be certified by a Qualified Engineer and an Independent Proof Checker (where relevant). These certificates shall accompany the 100% Final design drawings submission. A copy of the certificates can be found in the Appendix A of this specification.

T1.14 Samples

The consultant shall seek advice from the Principal's Representative regarding the need for retention of any drill cores or samples collected.

Appendices

T1.A – Certificates

- T1.A.1 Certificate of Design T1-01
- T1.A.2 Certificate of Independent Proof Check T1-02

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CERTIFICATE OF DESIGN

Project	Click here to enter text.
Asset Number/s and Name/s of Major Structure/s	Click here to enter text.
Subject of Certificate	Click here to enter text.

I hereby certify that the design of the above structure/s has/have been carried out in accordance with sound contemporary practice and knowledge by a Professional Engineer with at least 8 years of relevant experience in the field of bridge engineering.

I am a qualified Chartered Professional Engineer registered on the National Engineering Register in the civil/structural area of practice and the design conforms with the requirements of the above Project Brief as follows (tick the relevant checkbox):

☐ without amendment

☐ amended by agreement (list relevant correspondence)

Click here to enter text.

Details of Qualified Engineer

Name of Qualified Engineer	Click here to enter text.	**Name of Principal of Design Firm**	Click here to enter text.
Company	Click here to enter text.	**Signature of Principal**	
Registration Number	Click here to enter text.	**Date**	Click here to enter a date.
Signature of Certifier			
Date	Click here to enter a date.		

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CERTIFICATE OF INDEPENDENT PROOF CHECKER

Project	Click here to enter text.
Asset Number/s and Name/s of Major Structure/s	Click here to enter text.
Subject of Certificate	Click here to enter text.

I hereby certify that the design of the above structure/s has/have been independently proof-checked in accordance with sound contemporary practice and knowledge by a Professional Engineer with at least 15 years of relevant experience in the field of bridge engineering.

I am a qualified Chartered Professional Engineer registered on the National Engineering Register in the civil/structural area of practice and the design conforms with the requirements of the above Project Brief as follows (tick the relevant checkbox):

☐ without amendment

☐ amended by agreement (list relevant correspondence)

Click here to enter text.

Details of Independent Proof Checker

Name of Independent Proof Checker	Click here to enter text.	**Name of Principal of Proof Checking Firm**	Click here to enter text.
Company	Click here to enter text.	**Signature of Principal**	
Registration Number	Click here to enter text.	**Date**	Click here to enter a date.
Signature of Certifier			
Date	Click here to enter a date.		

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