

**Highways England**

**Request for Quotation**

**TMT2 49 – MS2, MS3 and MS4 Message Signs Version 3 procurement (2018)**

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**TMTF2 Request for Quotations (RfQ)**

General

1. This Request for Quotation (RfQ) applies to the submission of quotations for the TMT2 49 - MS2, MS3 and MS4 Message Signs Version 3 procurement (2018) under Lot 4 of the Crown Commercial Service (CCS) Traffic Management Technology 2 Framework.
2. The RfQ seeks to determine the most economically advantageous submission for the *Employer.* This will be a compliant, sustainable and affordable Quality Submission with the highest overall score.
3. Quotation Submissions must be made in accordance with this RfQ. Quotation Submissions not complying with this RfQ may be rejected by the *Employer* whose decision in the matter will be final.
4. For enquiries contact the *Employer* via the e-sourcing portal, <https://highways.bravosolution.co.uk>. The Procurement Officer for this further competition is Lee Bryant. Contact with the Procurement Officer must be made via the e-sourcing portal only. **Suppliers must not contact any members of the *Employer’s* staff in relation to this RfQ other than the Procurement Officer unless authorised by the Procurement Officer.** Suppliers must immediately inform the Procurement Officer if they have been contacted by anyone other than the Procurement Officer regarding this RfQ. Failure to comply with the above may lead to your RfQ being rejected.
5. Any queries from Suppliers regarding the RfQ documents must be made via the e-sourcing portal and sent to the Procurement Officer no later than **7 calendar days** prior to the date of return of quotations.
6. All Supplier queries will be acknowledged and responded to by the Procurement Officer. If any response requires a change to the RfQ documents then an amendment will be issued by the Procurement Officer via the e-sourcing portal.
7. Amendments are changes to the documents that are made in writing by the Procurement Officer and issued to all Suppliers. Only in exceptional circumstances will amendments be issued after the quotations have been submitted. In such circumstances the Procurement Officer will notify all Suppliers of the required action.
8. Highways England officers and their consultants do not have the authority to make any changes to the RfQ documents except through an amendment issued by the Procurement Officer. If a statement is made at any meeting that a Supplier considers is not in accordance with the RfQ documents then the Supplier must refer the matter to the Procurement Officer as a query.
9. This RfQ and Quotation Submission must be treated as private and confidential. Suppliers should not disclose the fact that they have been invited to submit a quotation or release details of the RfQ, other than on an “in confidence” basis to those who have a legitimate need to know or whom they need to consult for the purpose of preparing the Quotation Submission. Suppliers must not release information concerning this RfQ for publication in the press or on radio, television, screen or any other medium.
10. Under the Freedom of Information Act 2000, Public Contract Regulations 2015 (as amended) and the Environmental Information Regulations 2004 (EIR) the *Employer* may be obliged to disclose information relating to responses to this further competition including any Quotation Submissions received.
11. Under the Cabinet Office’s Guidance Note dated May 2012 entitled “Transparency – Publication of New Central Government Contracts”, or any later revision, the *Employer* is obliged to publish awarded Call Off Agreements, including the information submitted to the *Employer* by the Supplier as part of the further competition, excluding only information which is exempt from disclosure pursuant to the Freedom of Information Act 2000. The *Employer’s* initial view is that only materials likely to be excluded from publication on this basis are as follows:
* CV’s for the people listed in the Call Off Agreement
* Build ups of the prices but not the prices in the Price List
1. The Supplier is invited to identify (with reasons) those materials which he wishes to see excluded from publication. The Supplier acknowledges that the final decision as to which materials are excluded rests with the *Employer* its sole discretion. Any request by the Supplier to exclude material is for information only and will not be taken into account in the assessment process, nor will it form part of any Call Off Agreement between the *Employer* and the Supplier.
2. Suppliers should be aware that the *Employer* could receive requests for any information relating to this further competition. While the *Employer* reserves its discretion in responding to any such information request Suppliers are invited to request that certain information is not disclosed or published if to do so would prejudice their legitimate commercial interests or it is otherwise exempt from disclosure under the Freedom of Information Act 2000. Requests for non-disclosure under the Freedom of Information Act 2000 must accompany the Quotation Submission and include:
* Clear and substantive justification
* A time limit when any confidential information could be disclosed
1. The terms of any confidentiality agreement would, if requested, be available for disclosure. Any request by the Supplier under this paragraph is for information only and will not be taken into account in the tender assessment process, nor will it form part of any contract between the *Employer* and the Supplier.
2. The timetable for this further competition is included at [Annex A](#_Annex_A_-).
3. The *Employer* can request a parent company guarantee at any time during the contract using the form provided in the Service Information
4. The RfQ includes the following documentation:
* Request for Quotation (RfQ)
* The Call off Agreement which includes
	+ Contract Data
	+ Form of Agreement
* Service Information and associated Technical Specifications
* Price List
* Collaborative Performance Framework

Quotation Submission

1. The Quotation Submission will comprise of the following:
* The Quality Submission
* Financial Submission
1. The Quality Submission must follow the structure set out and cover the items identified in the award criteria tables in Table 2 of [Annex B](#_Annex_B_–).
2. Any drawings, prints, specifications, data, calculations, and analyses issued to Suppliers in connection with this further competition remain the property of the *Employer.* All such information issued to Suppliers may only be used for the purpose of providing a Quotation Submission. Such information should not be disclosed to persons unconnected with the Quotation Submission and should be returned to the *Employer* on completion of the further competition. These provisions apply equally to drawings and other information supplied for the further competition the property rights of which vest in a third party.
3. Quotation Submissions and supporting documents must be written in English.
4. Quotation Submissions must be submitted in accordance with the RfQ. Quotation Submissions must not be qualified or accompanied by statements or a covering letter that might be construed as rendering the quotations equivocal. The *Employer’s* decision as to whether or not a Quotation Submission complies with this RfQ will be final.
5. Quotation Submissions not received by the *Employer* by **14:00 29 March 2018** may be excluded from further consideration and returned to Suppliers. Quotation Submissions should remain open for acceptance for **120** calendar days from the return date.
6. The Quotation Submission should be returned together with the documents listed below via the *Employer’s* e-sourcing portal at <https://highways.bravosolution.co.uk>.
7. Documents are to be in Microsoft Office 2010 format.
8. The following online forms are included at [Annex F](#_Annex_F_-). Suppliers must indicate their acceptance by completing the relevant fields via the technical envelope on the e-sourcing portal:
* Anti-Collusion Certificate;
* Fair Payment Charter;
* Anti-Bribery Code of Conduct;
* Anti-Fraud Code of Conduct;
* Quotation declarations.
1. Suppliers are to include in their Quality Submission, via the technical envelope on the e-sourcing portal*:*
* Methodology statement, in response to the quality questions in Annex B, describing the approach proposed to complete the work in the Service Information
* A detailed plan (maximum 6 pages including charts/ diagrams) of your proposed development programme including any required testing, proposed delivery of the first signs to the NTLC for integration testing and then lead time for sign availability and proposed manufacturing schedule.
* Mean Time Between Failures (MTBF) calculations (Annex B)
* Draft Quality plan
* Risk Register identifying and describing the risk, to include the estimated effect of the risk on programme and cost. It must not include any reallocation of risks (see [Annex D](#_Annex_D_-)).
* a Parent Company Guarantee using the form provided in Service Information if requested
1. Suppliers are to include with their Financial Submission, via the commercial envelope on the e-sourcing portal:
* The completed Contract Data part 2;
* The completed Price List
* Pricing document explanatory notes (if applicable)
* a statement indicating which information the Supplier would like withheld from any transparency publication
* a statement undertaking responsibility for dealing with insurance claims or parts of such claims within the excess amount
* any request for non-disclosure under the Freedom of Information Act.

Quality Submission

1. It is important to note that information contained in the Quality Submission will be referred to in, and become an actionable term, of the Call Off Agreement.
2. The Quality Submission will become the Quality Statement in the Contract Data.
3. The approach to this further competition is to be described in the Quality Submission in the form of proposals and quality procedures in a methodology statement. The quality procedures are to set out how the proposed activities are to be carried out. The quality procedures are required to be incorporated into the successful Suppliers draft quality plan, and are limited to statements that will become contractual obligations.
4. The Quality Submission must not exceed the page limit stated in Annex B. Suppliers may use A3 size in lieu of A4, but each A3 sized page will be counted as two A4 pages. Text must be in Arial font and not smaller than 11 point.
5. If the Quality Submission exceeds the page limit than pages beyond the limit will be discounted. If Suppliers consider that the page limit is insufficient to provide the information required by this RfQ then a query should be raised. No guarantee can be given that the page limit will be increased.
6. The page limit and font size relate to the entire Quality Submission including paper covers, title pages and annexes. Text no smaller than 8 point should be used for drawings, diagrams and flow charts. The pages of the Quality Submission must be numbered. Page numbers and other header or footer information may be included in the margin space.
7. Not Used

Financial Submission

1. The Financial Submission must be completed using the Price List issued with this RfQ.
2. The prices provided by the Supplier are to be based on the information provided in Schedule 3 of the [TMTF2 Framework Agreement v4](http://share/Share/llisapi.dll?func=ll&objaction=overview&objid=43195165) . Any prices submitted for a Call Off Agreement are to be equal to or lower than the Traffic Management Technology Framework Prices.
3. The prices in the Price List are to be priced as per the defined costs of the work
4. The Price List also requests figures for energy costs. There is a “Notes for Energy Costs” worksheet included in the Price List containing instructions on how to produce these figures.
5. Suppliers must note that each item set out in the Price List must be completed and separately priced. Suppliers are not permitted to:
	* Price any item or activity within another item or activity in the Price List
	* Cross subsidise any item or activity within any other item or activity in the Price List
	* Make any assumptions regarding the use or relevance of any item or activity in the Price List
	* Price any items which have been identified in the Price List as not requiring to be priced; or
	* Duplicate any price in the Price List.
6. Suppliers who price on any other basis and/or make such assumptions will be rejected.
7. A Financial Submission that is based on any other basis than that set out in the Contract Data and Price List will be rejected.

Other Information

1. Not used
2. Not used
3. Not used

Quotation Assessment Procedure

1. The *Employer’s* assessment of the Quotation Submissions will be carried out in stages
2. In the first stage the Procurement Officer will check Quotation Submission compliance,
3. In the second stage, the Quality Assessment Panel and Finance Assessment Panel will judge the Quotation Submissions, based wholly on the contents of the Quotation Submission which must therefore contain all the information which Suppliers wish to be considered. The Quality Panel and Financial Panel assessors will work independently and will not have access to each other’s assessments until after the validation of the Financial Submission.
4. Any uncertainty over the meaning of the Quality Submission will be removed before the Quality Assessment Panel completes their marking. No further clarification queries on the Quality Submission will be made after the marking is completed.
5. The final stage will involve a sustainability check and confirmation of insurances*.*
6. Clarification queries are statements requested from Suppliers by the Procurement Officer to remove any ambiguity over the meaning of the Quotation Submission. Clarification queries will be recorded in writing. If necessary to complete their marking, the assessment panel[s] will seek clarifications from the Supplier via the Procurement Officer. If a clarification response provides information not requested by the Procurement Officer then this information will not be accepted.
7. Suppliers should note that the *Employer* will investigate a potentially abnormally low quotation as provided for under the Public Contracts Regulations 2015 (as amended) on any aspect of a quotation and at any stage of the process.
8. An equivocal quotation or a quotation which does not comply with the RfQ documents, including any amendments, may result in the quotation being rejected.
9. Not used
10. The Quality Assessment Panel assesses the Quality Submission by using the scoring matrix within [Annex C](#_Annex_C_–) and awarding marks against each of the quality questions given in [table 2 of Annex B](#_Annex_C_–)
11. The minimum quality requirement is to reach a total threshold of 115 marks (out of 230) for the Quality Submission. A Supplier that has failed to achieve the minimum quality requirements may not be considered further, and if excluded, the Supplier will be notified by the Procurement Officer. If the Quality Submission is not excluded the normalised marks achieved by the Quality Submission will be used in subsequent calculations.
12. When marking the Quality Submission, the Quality Assessment Panel will determine which submission provides the *Employer* with the most confidence that the *Employer’s* objectives as stated in the Service Information will be delivered and continual improvement achieved.
13. The Supplier with the highest total quality mark is given a score of 100. The score of the other Suppliers will be calculated by deducting from 100, one point for each full percentage point by which their mark is below the highest mark.
14. A Financial Assessment Panel will calculate a price for each Supplier who has not been excluded. The price will be calculated from the total cost of the work set out in the Price List
15. The energy costs will either be accepted or rejected based on their compliance with the requirements detailed in TR2607. Failure to adhere to the requirements detailed in TR2607 will result in energy costs being rejected, unless it is demonstrated by all Suppliers that these levels are not achievable. If rejected, the Supplier will be notified by the Procurement Officer.
16. The Supplier with the lowest price submitted is given a score of 100. The scores of other Suppliers are calculated by deducting from 100 one point for each full percentage point by which their price is above the lowest price.
17. Any uncertainty over the meaning of the Financial Submission will be removed via clarification queries and responses before the Financial Panel complete their marking.
18. The quality score and the financial score will be combined in the ratio of **65:35** refer to [Annex B](#_Annex_B_–) applied to the Quality and Finance scores respectively. The total score will be expressed to one decimal place. The Supplier that will be considered further will be the Supplier with highest total score.
19. The Financial Panel may validate the Quotation Submissions to check that the prices and energy costs included are representative of the likely costs to be incurred. As part of this validation the Financial Panel may ask to be provided with original evidence that demonstrates that the allowances made are based on costs actually incurred. The Panel may wish to interview appropriate accounting staff to provide the level of satisfaction required. Failure to provide satisfactory evidence to support any part of this aspect of the Quotation Submission may result in the Quotation Submission being rejected.
20. The Quality Assessment Panel and the Financial Assessment Panel will jointly review the material submitted with the quotation to verify that the resources proposed are likely to deliver the level of service set out in the Quality Submission.
21. Failure to provide satisfactory evidence to support any part of this aspect of the quotation may result in the Quotation Submission being rejected.
22. Not used
23. The Call Off Agreement must operate as a viable business for both partners. The *Employer* seeks to have the required level of service at an affordable cost, whilst providing a reasonable profit for the Supplier. Excessively low or high quotation will be subject to scrutiny, and may be rejected if considered not sustainable over the Call Off Agreement period or not affordable.
24. Prior to the award of any Call Off Agreement the Supplier must provide evidence that insurance required by the Call Off Agreement is in place.

 Award

1. The *Employer* reserves the right not to proceed with any Quotation Submissions made in response to this RfQ.
2. When satisfied that the correct procedures have been followed the Procurement Officer informs all Suppliers which Quotation Submission the *Employer* proposes to accept if any, including written feedback of the assessments, starting a **ten** day standstill period.
3. To award a Call Off Agreement the *Employer* will issue a Form of Agreement to the Supplier, for signature and return.
4. The *Employer,* upon receipt,will then also sign the Form of Agreement and issue a copy to the Supplier. A Call Off Agreement will then be formed.
5. The *Employer* intends to award the Call Off Agreement but reserves the right not to proceed with any of the Quotation Submissions received in response to this RfQ.
6. Details of awarded Call Off Agreements over £10k will be published on the Contracts Finder website.

## Annex A – Further Competition Timetable

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Activity** | **Date** | **Week** |
| 1 | Issue RfQ documents | 02/03/18 | 0 |
| 2 | Last Date for Supplier queries  | 22/03/18 | *3* |
| 3 | Quotation Submission Return  | 29/03/18 | *4* |
| 4 | Marking of the Quality Submission  | 06/04/18 | *5* |
| 5 | Financial Scoring | 06/04/18 | *5* |
| 6 | Supplier with the highest score identified |  | *6* |
| 7 | Validation & Sustainability checks |  | *6* |
| 8 | Pre Award checks |  | *7* |
| 10 | Standstill period |  | *7* |
| 11 | Award Call Off Agreement |  | *9*  |

## Annex B – Call off Agreement Award Criteria

**Table 1**

|  |  |  |
| --- | --- | --- |
| **Criteria Ref** | **Criteria** | **Percentage Weightings (or rank order of importance where applicable) - to be set by the *Employer* conducting the further competition**  |
| A | **Quality** Sub-criteria* Delivery time
* Service fitness for purpose
 | **65%** |
| B | Price | **35%** |

**Quality Criteria**

Suppliers should use the headings, and respond to the quality questions below in their Methodology Statement.

**Table 2**

|  |  |  |
| --- | --- | --- |
| **Methodology Statement headings** | **Issues** | **Issue page limit** |
| **Service fitness for purpose** |
| **1** | **Health and Safety***(Note – please use clear cross referencing where/ as appropriate across the 2 issues)* | * 1. **Organisational Arrangements**

Describe how you will manage and organise the H&S of the workforce (and Supply Chain if applicable) in the delivery of the service demonstrating how they will support our imperative for safety, and fulfil the requirements detailed in SI 1000 and SI 1005.Provide supporting evidence from previous similar projects, showing that your approach is likely to be successfully delivered.Note: You should clearly show how your approach applies throughout your organisation from Board Level (or equivalent) to trainees or your Supply Chain.. | **2** |
| **1.2** Your H&S processes and management system (accredited or otherwise) should include arrangements to satisfy the requirements for the various activities detailed throughout the Service Information. With reference to risks identified in your supplied risk register in Annex D, describe your approach on the following aspects.1. The delivery of the service showing your company and workforce use safe, robust, efficient and effective working practices when supplying, delivering and installing Signs.
2. How your H&S management system allows you to monitor and apply continuous improvement to safety in the delivery of the service.
3. How procedures are updated based on experience to improve safety in delivery of the service and for all stakeholders.

Provide supporting evidence from similar projects demonstrating your approach is likely to be successful. | **3** |
| **Service fitness for purpose** |
| **2** | **Collaborative Behaviour** | **2.1** Collaboration is critical to the successful delivery of the service. Present your approach to both implementing and running collaborative communication systems and processes. Describe how you will effectively engage to successfully operate the contract with all of the relevant stakeholders as detailed in the *Service Information*, including the *Service Manager* and schemes that the equipment will be installed on.Highlight the benefits of your approach in the delivery of this service, and how you mitigate any risks identified in your risk register in Annex D, as well as positive mechanisms you will have in place and any innovation that can be offered. | **2** |
| **Service fitness for purpose** |
| **3** | **Customer and Stakeholders** | **3.1** Present your approach to the development of delivery plans as required and detailed in SI 405 in liaison with the *Service Manager*.Describe how your approach will ensure that delivery plans are maintained in line with any changes in scheme requirements and that any actions required by the *Service Manager* are clearly communicated in a timely manner.Highlight how you will manage potentially competing demands from multiple schemes and your approach to risk management and escalation with regards to the delivery of the service and with reference to your risk register in Annex D. | **2** |
| **Service fitness for purpose** |
| **4** | **Sustainability** | **4.1** The provision of warranty support is critical to ensuring the availability of the TMT2 49 V3 signs. Describe how you will deliver the warranty as detailed in the *Service Information* referencing your risk register in Annex D.  Provide evidence or specific examples (including details such as mean time to repair, percentage of repairs returned to time, etc.) of where you have done this previously to demonstrate how you will deliver the warranty support for this contract. | **4** |
| **4.2** Describe the structured mechanisms you will have in place in the delivery of the service to:• encourage and enable the realisation of continuous improvement• provide efficiencies in delivering this service• re-use and develop best practices• identify and develop innovations | **3** |
| **Service fitness for purpose** |
| **5** | **Quality** | **5.1** The Signs are to be supplied in accordance with BS EN 12966, TR1100 and the relevant Version 3 standard(s) referred to in TMT2 49 ServiceInformationand supporting technical specifications.Provide a product description detailing:* The product being offered
* How your technical solution complies with the TMT2 49 Serviceinformation & supporting technical specifications
* How all aspects of the manufacturing process (including any outsourced elements) are monitored as part of your quality management system
* How this will meet Highways England’s values and mitigate any risks identified in your risk register in Annex D

Your response must demonstrate that your solution provides an appropriate balance between: * requirements for reliability, maintainability, and sustainability
* achieving value for money across the whole life of the asset
* reducing the environmental impact of operating the network
* minimising road worker exposure to risk
* providing a high quality service to Highways England’s customers.
 | **4** |
| **5.2** As detailed in SI 310, it is a requirement of the service to provide full traceability of requirements documentation for the equipment supplied, detailing how all elements of the relevant specifications will be satisfied. Describe how you will deliver the Traceability of Requirements documentation explaining:* The format and approach taken to ensure all requirements are captured and mapped and any risks identified in your risk register in Annex D
* Your approach to maintaining the documentation throughout the product lifetime to ensure all updates are captured
* Your approach to sharing the documentation throughout the service life of the products.

Provide supporting evidence from similar projects demonstrating how your approach is likely to be successful. | **3** |
| **5** | **Quality** | **5.3** The signs will be supplied, installed and commissioned in accordance with the TMT2 49 Service Information.Detail your approach to the supply, installation and commissioning as detailed in the Service Information referencing and explaining your completed Risk Register at Annex D.  Provide evidence to show your company has a track-record for the successful and safe delivery of signalling assets over both the short and medium-term on similar contracts. | **2** |
| **5.4** Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system**\*** Mean Time Between Failures (MTBF) for version 3 **MS2s 2x12**, in accordance with the Annex H. * **\*** *“System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device”*
 | **No limit** |
| **5.5** Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system**\*** Mean Time Between Failures (MTBF) for version 3 **MS3s 3x18,** in accordance with the Annex H. **\*** *“System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device”* | **No limit** |
| **5.6** Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system**\*** Mean Time Between Failures (MTBF) for version 3 **MS3s 2x16**, in accordance with Annex H.**\*** *“System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device”* | **No limit** |
| **5.7** Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system**\*** Mean Time Between Failures (MTBF) for version 3 **MS4s**, in accordance with Annex H. **\*** *“System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device”* | **No limit** |
| **Delivery Time** |
| **6** | **Time** | **6.1** Describe your approach to meeting/ exceeding target order turnaround times for supply, referencing your risk register in Annex D. Provide evidence to demonstrate how your approach is likely to be successful. | **2** |
| **6.2** Describe your approach to meeting/ exceeding target order turnaround times for installation, referencing your risk register in Annex D. Provide evidence to demonstrate how your approach is likely to be successful. | **2** |

## Annex C – Marking the Quality Submission

**Table 1a – Scoring Matrix**

The following Issues will be marked using Table 1a: 1.1, 1.2, 2.1, 3.1, 4.1, 4.2, 5.1, 5.2, 5.3, 6.1 & 6.2

|  |  |  |
| --- | --- | --- |
|  | **How well does the Quality Submission meet the Call Off requirements as described in the Service Information and demonstrate an understanding of the risks to the work?** | **Mark** |
| Weak | The Quality Submission has not considered fully the requirements of the Call Off objectives and fails to address adequately the main management and technical risks. | 1-4 |
| Acceptable | The Quality Submission demonstrates an adequate understanding of the requirements of the service information and mitigates the main management and technical risks in delivering the service. The response demonstrates that the key elements of the service are likely to be delivered. The programme and proposed resources are just sufficient for the methodology described. | 5 |
| Good | The Quality Submission demonstrates a good understanding of the requirements listed in the service information. It identifies and mitigates the majority of the management and technical risks. The response demonstrates that most elements of the service are likely to be delivered. The response also provides some relevant evidence that the Call Off will meet the service requirements and that the proposed resources are appropriate for the methodology described. | 6 |
| In addition to the requirements to achieve a score of 6 the submission and approach proposed provides further evidence that the majority of risks are mitigated in the delivery of the service, and increased likeliness that the approach will meet the service requirements. | 7 |
| Very Good | The Quality Submission demonstrates a detailed understanding of the requirements listed in the service information. It identifies and mitigates all anticipated management and technical risks. The response demonstrates that all elements of the service are likely to be delivered. The response also provides strong relevant evidence that the Call Off will meet the service requirements. The proposed resources and programme are likely to deliver a high quality service based on the methodology described. | 8 |
| In addition to the requirements to achieve a score of 8 the submission and approach proposed provides further evidence that all anticipated management and technical risks are mitigated in the delivery of the service and demonstrates that the Call Off will be likely to meet and even exceed the service requirements. | 9 |
| Excellent | The Quality Submission has clearly been developed based on a highly detailed understanding of the requirements listed in the service information. It identifies and mitigates all anticipated management and technical risks and uses innovative approaches to address these. The response demonstrates that the approach, proposed resources and programme is likely to exceed the service requirements without increasing costs. | 10 |

**The following Issues will be marked using Table 1b:**

5.4, 5.5, 5.6 & 5.7

**Table 1b – Scoring Matrix for MTBF**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MS2s 2x12** | **MS3s 3x18** | **MS3s 2x16** | **MS4s** | **Mark** |
| 0 to 6,629 | 0 to 4,419 | 0 to 4,419 | 0 to 4,419  | 1 |
| 6,630 to 13,259 | 4,420 to 8,839  | 4,420 to 8,839  | 4,420 to 8,839  | 2 |
| 13,260 to 19,889  | 8,840 to13,259  | 8,840 to 13,259 | 8,840 to 13,259  | 3 |
| 19,890 to 26,519 | 13,260 to 17,679 | 13,260 to 17,679 | 13,260 to 17,679 | 4 |
| 26,520 to 35,215  | 17,680 to 23,143  | 17,680 to 24,143  | 17,680 to 24,143  | ***5*** ***minimum MTBF***  |
| 35,216 to 43,911  | 23,144 to 28,607  | 24,144 to 30,607  | 24,144 to 30,607 | 6 |
| 43,912 to 52,607  | 28,608 to 34,071  | 30,608 to 37,071  | 30,608 to 37,071  | 7 |
| 52,608 to 61,303  | 34072 to 39,535  | 37,072 to 43,535  | 37,072 to 43,535  | 8 |
| 61,304 to 69,999 | 39,536 to 44,999 | 43,536 to 49,999 | 43,536 to 49,999 | 9 |
| 70,000 and over | 45,000 and over | 50,000 and over | 50,000 and over | 10 |

**Table 2: Quality Submission weighted marking table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Issues** | **Mark**out of 10 | **Sub Weighting** | **Total Mark**(mark **X** sub weighting) |
| **Service fitness for purpose** |
| **1** | **Health and Safety Management** |
| **1.1** | Describe how you will manage and organise the H&S of the workforce (and Supply Chain if applicable) in the delivery of the service demonstrating how they will support our imperative for safety, and fulfil the requirements detailed in SI 1000 and SI 1005.Provide supporting evidence from previous similar projects, showing that your approach is likely to be successfully delivered.Note: You should clearly show how your approach applies throughout your organisation from Board Level (or equivalent) to trainees or your Supply Chain. |  | **X2** | --/20 |
| **1.2** | Your H&S processes and management system (accredited or otherwise) should include arrangements to satisfy the requirements for the various activities detailed throughout the Service Information. With reference to risks identified in your supplied risk register in Annex D, describe your approach on the following aspects.a) The delivery of the service showing your company and workforce use safe, robust, efficient and effective working practices when supplying, delivering and installing Signs.b) How your H&S management system allows you to monitor and apply continuous improvement to safety in the delivery of the service.c) How procedures are updated based on experience to improve safety in delivery of the service and for all stakeholders.Provide supporting evidence from similar projects demonstrating your approach is likely to be successful. |  | **X2** | --/20 |
| **Service fitness for purpose** |
| **2** | **Collaborative Behaviour** |  |  |
| **2.1** | Collaboration is critical to the successful delivery of the service. Present your approach to both implementing and running collaborative communication systems and processes. Describe how you will effectively engage to successfully operate the contract with all of the relevant stakeholders as detailed in the *Service Information*, including the *Service Manager* and schemes that the equipment will be installed on.Highlight the benefits of your approach in the delivery of this service, and how you mitigate any risks identified in your risk register in Annex D, as well as positive mechanisms you will have in place and any innovation that can be offered. |  | **X1** | --/10 |
| **Service fitness for purpose** |
| **3** | **Customer and Stakeholders** |  |  |
| **3.1** | Present your approach to the development of delivery plans as required and detailed in SI 405 in liaison with the *Service Manager*.Describe how your approach will ensure that delivery plans are maintained in line with any changes in scheme requirements and that any actions required by the *Service Manager* are clearly communicated in a timely manner.Highlight how you will manage potentially competing demands from multiple schemes and your approach to risk management and escalation with regards to the delivery of the service and with reference to your risk register in Annex D. |  | **X1** | --/10 |
| **Service fitness for purpose** |
| **4** | **Sustainability** |  |  |
| **4.1** | The provision of warranty support is critical to ensuring the availability of the TMT2 49 V3 signs. Describe how you will deliver the warranty as detailed in the *Service Information* referencing your risk register in Annex D.  Provide evidence or specific examples (including details such as mean time to repair, percentage of repairs returned to time, etc.) of where you have done this previously to demonstrate how you will deliver the warranty support for this contract. |  | **X1** | --/10 |
| **4.2** | Describe the structured mechanisms you will have in place in the delivery of the service to:• encourage and enable the realisation of continuous improvement• provide efficiencies in delivering this service• re-use and develop best practices• identify and develop innovations |  | **X1** | --/10 |
| **Service fitness for purpose** |
| **5** | **Quality** |  |  |
| **5.1** | The Signs are to be supplied in accordance with BS EN 12966, TR1100 and the relevant Version 3 standard(s) referred to in TMT2 49 ServiceInformationand supporting technical specifications.Provide a product description detailing:* The product being offered
* How your technical solution complies with the TMT2 49 Serviceinformation & supporting technical specifications
* How all aspects of the manufacturing process (including any outsourced elements) are monitored as part of your quality management system
* How this will meet Highways England’s values and mitigate any risks identified in your risk register in Annex D

Your response must demonstrate that your solution provides an appropriate balance between: * requirements for reliability, maintainability, and sustainability
* achieving value for money across the whole life of the asset
* reducing the environmental impact of operating the network
* minimising road worker exposure to risk
* providing a high quality service to Highways England’s customers.
 |  | **X2** | --/20 |
| **5.2** | As detailed in SI 310, it is a requirement of the service to provide full traceability of requirements documentation for the equipment supplied, detailing how all elements of the relevant specifications will be satisfied. Describe how you will deliver the Traceability of Requirements documentation explaining:* The format and approach taken to ensure all requirements are captured and mapped and any risks identified in your risk register in Annex D
* Your approach to maintaining the documentation throughout the product lifetime to ensure all updates are captured
* Your approach to sharing the documentation throughout the service life of the products.

Provide supporting evidence from similar projects demonstrating how your approach is likely to be successful. |  | **X3** | --/30 |
| **5.3** | The signs will be supplied, installed and commissioned in accordance with the TMT2 49 Service Information.Detail your approach to the supply, installation and commissioning as detailed in the Service Information referencing and explaining your completed Risk Register at Annex D.  Provide evidence to show your company has a track-record for the successful and safe delivery of signalling assets over both the short and medium-term on similar contracts. |  | **X2** | --/20 |
| **5.4** | Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system\* Mean Time Between Failures (MTBF) for version 3 MS2s 2x12, in accordance with the Annex H. • \* “System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device” |  | **X1.5** | --/15 |
| **5.5** | Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system\* Mean Time Between Failures (MTBF) for version 3 MS3s 3x18, in accordance with the Annex H. \* “System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device” |  | **X1.5** | --/15 |
| **5.6** | Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system\* Mean Time Between Failures (MTBF) for version 3 MS3s 2x16, in accordance with Annex H.\* “System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device” |  | **X1.5** | --/15 |
| **5.7** | Please provide a set of calculations (to sub assembly level (i.e. line replaceable units), showing the design system\* Mean Time Between Failures (MTBF) for version 3 MS4s, in accordance with Annex H. \* “System” is defined as: “From the National Roads Telecommunications Service (NRTS) interface to, and including, the end device” |  | **X1.5** | --/15 |
| **Delivery Time** |
| **6** | **Time** |  |  |  |
| **6.1** | Describe your approach to meeting/ exceeding target order turnaround times for supply, referencing your risk register in Annex D. Provide evidence to demonstrate how your approach is likely to be successful. |  | **X1** | --/10 |
| **6.2** | Describe your approach to meeting/ exceeding target order turnaround times for installation, referencing your risk register in Annex D. Provide evidence to demonstrate how your approach is likely to be successful. |  | **X1** | --/10 |
|  | Subtotal |  |  | ---/230 |

##

## Annex D - Form of Risk Register

Suppliers should identify the risks addressed in their Quality Submission and describe the action proposed to deal with the risk. They should also include any identified opportunities. Add additional lines as required.

|  |  |  |  |
| --- | --- | --- | --- |
| **Number** | **Risk or Opportunity Description**  | **Proposed Action to deal with risk** | **Effect of risk (or opportunity) on programme and cost** |
|  |  |  |  |
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## Annex E – Not Used

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## Annex F - Online forms

Highways England, working with its suppliers in good faith and in a spirit of mutual trust and respect, is committed to preventing and identifying collusion, meeting the principles of fair payment, meeting the principles of anti-bribery (as enacted by the Bribery Act 2010 and Ministry of Justice guidance), and working fairly, honestly, with integrity and transparency. Highways England seeks to gain the same commitment from Suppliers through their acknowledgement of these declarations upon submission of quotations.

### Anti-Collusion Certificate

1. We certify that this quotation is made in good faith, and that we have not fixed or adjusted the amount of the quotation in accordance with any agreement or arrangement with any other person(s).
2. We also certify that, prior to the award of any Call Off Agreement for the work, we have not and will not:
	1. communicate the amount or approximate amount of the quotation to any person[[1]](#footnote-1) outside of the parties pertaining to this quotation procedure, other than:
		1. the Secretary of State (or a person duly authorised by him); or
		2. where the confidential disclosure of the approximate amount of the Quotation Submission was necessary to obtain insurance premium quotations required for the Call Off Agreement.
	2. enter into any agreement or arrangement with any person outside of the parties pertaining to this quotation that such person shall refrain from submitting a quotation, that they shall withdraw any quotation once offered, or vary the amount of any quotation to be submitted.
	3. pay, give or offer to pay any sum of money or other valuable consideration directly or indirectly to any person outside of the parties responsible for this quotation for doing, having done, causing, or having caused to be done any act or thing of the sort described at (a) or (b) in relation to any other quotation.
3. We further certify that the principles described in paragraph 2 have been, or will be, brought to the attention of all sub-contractors, suppliers and associated companies providing services or materials connected with the quotation and any Call Off Agreement entered into with such sub-contractors, suppliers or associated companies will be made on the basis of compliance with the above principles by all parties.

### Fair Payment Charter

1. We will strive to meet the ‘Fair Payment’ commitments set out below. We will additionally seek to embed the principles throughout our supply chain.
	1. Companies have the right to receive correct full payment as and when due. Deliberate late payment or unjustifiable withholding of payment is ethically not acceptable;
	2. ‘Fair Payment’ will apply equally between Highways England, the lead contractor and throughout the supply chain;
	3. The process will be transparent and members of the supply chain will have certainty of how much and when they will be paid;
	4. Companies will consider, where appropriate, operating relevant contracts on an open book basis;
	5. The correct payment will represent the work properly carried out, or products supplied, in accordance with the contract. Any withholding of payment due to defects or non-delivery will be proportionate and demonstrably justified in line with arrangements made at the time of contract;
	6. To ensure effective and equitable cash flow for all those involved, all contracts will provide for regular payments and have payment periods not exceeding 30 days from receipt of invoice;
	7. In order to avoid payment delays, Highways England and all supply chain members will agree payment procedures at the outset of their contracts. Payment will be through electronic BACS transfer and will apply throughout the supply chain;
	8. Monitoring compliance with these principles will be built into the performance management requirements pertaining to this Call Off Agreement.

### Anti-Bribery Code of Conduct

1. We confirm that we acknowledge the commitments set out below and have (and shall) maintain equivalent principles throughout our supply chain.
2. We are committed to ensuring that our business operates with the upmost integrity.
3. We, and those employed by us, will not:
	1. Offer, promise, pay or provide bribes[[2]](#footnote-2) to any person;
	2. Request, agree to accept or receive bribes;
	3. Offer hospitality to Highways England staff that would breach the following requirements:
		1. Gifts other than low-value items such as diaries or calendars (up to £10 in value). Calendars, diaries or other small items of office equipment may be offered and accepted but the gift must bear the company's name or insignia and can legitimately be regarded as being in the nature of advertising material;
		2. Benefits and/or hospitality such as cocktail parties, receptions, presentations and conferences;
		3. Invitations to social, cultural and sporting events; or
		4. Overnight accommodation and travel to and from a venue at which an event is being held.
4. We are committed to having robust procedures and controls in place within the parties pertaining to this quotation to minimise the risk of bribery with the aim of preventing bribery and confirm that we:
	1. Have a zero-tolerance of bribery offences throughout our organisation(s);
	2. Conduct risk assessments to identify and monitor potential bribery risks;
	3. Adopt due diligence measures to vet and approve third parties performing services on our behalf;
	4. Have clear, practical and accessible policies and procedures to address potential risks of bribery, and to prevent bribery;
	5. Provide education and awareness to all our employees;
	6. Have a mechanism in place to allow employees to report potential bribery issues in confidence and have a process to deal with reports protecting the reporting individual;
	7. Deal effectively with any occurrences of bribery; and
	8. Act at all times in good faith, impartially and in accordance with a position of trust.

### Anti-Fraud Code of Conduct

1. We confirm that we acknowledge the commitments set out below and have (and shall) maintain equivalent principles throughout our supply chain.
2. We are committed to ensuring that our business operates with the utmost integrity.
3. We, and those employed by us, will not commit any fraudulent acts or carry out any of the following acts which could amount to fraud including, but not limited to:
	1. Submission of false or inflated claims or invoices for payment or reimbursement;
	2. Intentional distortion of financial statements or other records;
	3. False or fraudulent financial reporting or making false or fictitious entries concerning accounts, equipment or supplies;
	4. Forgery or alteration of any documents such as cheque, bank draft or any other financial documents, including destruction or removal of records;
	5. Impropriety in the handling or reporting of money or financial transactions;
	6. Theft or misappropriation of assets or funds;
	7. Disclosure of confidential information to third parties without authority for personal gain; and
	8. The payment of excessive prices or fees where they are not justified.
4. We agree to:
	1. Keep accurate and up to date records showing all payments made and received and all other advantages given and received, and permit Highways England to inspect those records as required; and
	2. Promptly notify Highways England of any breach of these principles.

**Quotation declarations**

1. Your name
2. Your position
3. I confirm that I am authorised to submit quotations and acknowledge the contents of the Anti-Collusion Certificate, Fair Payment Charter, Anti-Bribery Code of Conduct and Anti-Fraud Code of Conduct on behalf of the Supplier in question.
4. I confirm that this quotation and any Call Off Agreement which may result from it shall be based upon the documents listed in the RfQ. I acknowledge that Highways England is unable to enter into negotiation on the terms and conditions to be used, that any Call Off Agreement that may result from this quotation shall be subject to English law, and confirm that any resulting Call Off Agreement will be based on the model contract document as stipulated in the RfQ.
5. I confirm that this quotation consists of all the relevant documents as requested in the RfQ and has been submitted in accordance with the RfQ. I have not qualified or accompanied the quotation with statements or a covering letter that might be construed as rendering the quotation equivocal. I acknowledge that quotations not complying with this RfQ may be rejected by Highways England whose decision in the matter will be final.
6. I confirm that this quotation shall remain open for acceptance for 120 calendar days from the deadline for quotations.
7. I confirm that this RfQ has been treated as private and confidential by all parties pertaining to this quotation and will continue to be treated in such a manner until otherwise directed by Highways England.
8. I confirm that we have taken account of our legal and statutory obligations, as well as all relevant Government codes and policies (e.g. taxes, environmental protection, employment protection and working conditions) where they are applicable to our quotation.
9. I acknowledge that, under the Freedom of Information Act 2000 (FOIA) and the Environmental Information Regulations 2004 (EIRs) as amended, Highways England is obliged (subject to the application of any relevant exemptions and, where applicable, the public interest test) to disclose information in response to requests for information. I acknowledge that Highways England could receive requests for any information relating to this Call Off Agreement and may be legally obliged to release information.
10. I confirm that if this offer is accepted we will execute such documents in the form of the Call Off Agreement within 10 days of being called on to do so.
11. Please check this box if your company is an SME as per the [European Commission definition](http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm).

## Annex G – Not Used

**Annex H - Equipment Design System MTBF Calculations**

*Highways England ref: 2 December 2014 Version: 0.3 (NEC 3 terms added 14 February 2017)*

**Contents**

Background to use of MTBF Equipment Reliability

Introduction to Equipment Design System MTBF Calculations

Calculation Variables

Working Phases for MTBF Calculations

Climatic Table for MTBF Calculations

Mission Profile

Definition of Failure

Basis of Supplier Temperature Entries

Other Calculation Factors

Summary of Submission Requirements

**Background to use of MTBF Equipment Reliability:**

It is critically important to *the Employer* that any technology installed at the roadside is reliable for the following reasons:

* In the event of a fault an engineer will have to remove and replace Assembly or Sub-Assembly Items. This increases the exposure of the engineers to a live traffic environment and increases their safety risk.
* The replacement of Sub-Assembly Items can also lead to costly traffic management, lane closures and interrupted service to our customers.
* In the event of us not being able to set or display a message or signal due to a faulty asset, we lose credibility with our customers.

Design System MTBF has been chosen for the following reasons:

* We need a measure that reflects the reliability of the end to end service.
* We need a measure that reflects the reliability of all of the equipment being purchased in terms of an end to end service (i.e. excluding ancillary items). Therefore, the calculation must include all equipment that is needed to display a message or signal.
* Operational MTBF on our network is currently not available and has the following issues:
	+ Inventory inaccuracies
	+ Relative asset age
	+ How frequently signals are set
	+ No operational data for new designs

We have chosen a method that rewards high quality products and encourages continuous improvement from our suppliers as follows:

* The better your product is from the other Suppliers the bigger the quality mark gap you will receive in comparison.
* If some or all of the rest of the other Suppliers improve their products then this gap will reduce.

We will monitor the effectiveness of this method and reserve the right to change it for future competitions in order to deliver the best available technology assets for use on our road network.

**Introduction to Equipment Design System MTBF Calculations**

* *The Employer* needs to review the reliability of products being offered as part of its tender assessment process and to have confidence that the data submitted by Suppliers provides a fair and accurate estimation of this, so the most reliable products can be selected.

Suppliers must therefore provide a copy of their detailed Mean Time Between Failure (MTBF) analysis (including methodology, high-level system block diagrams and all relevant supporting details, including details of the temperature measurement records discussed later) for all equipment covered in this tender based on calculated values, excluding ancillary equipment. The figures submitted for individual products will then inform a 'system MTBF' based on one signalling product and one Controller, where Controllers are separate.

The MTBF calculations must be carried out in accordance with PD IEC TR62380 with the results expressed in hours. The Highways England assumes that the analysis will be carried out by suitably qualified staff who are familiar with the requirements of PD IEC TR62380 and its principles.

While PD IEC TR62380 is not prescriptive in how the matter of component redundancy is dealt with, the submission must be clear and consistent in the method used and will be subject to review during tender assessment.

* **Calculation Variables**

Equipment operating and temperature parameters inform variables to be used in the calculation of failure rates at module/PCB level, from which the overall MTBF for the product is built up. These variables, in accordance with 35PD IEC TR62380, are given below:

|  |  |
| --- | --- |
| (tae)i | average outside ambient temperature surrounding the equipment, during the ith phase of the mission profile. |
| (tac)i | average ambient temperature of the printed circuit board (PCB) near the components, where the temperature gradient is cancelled (or the one of the component considered as the most critical for reliability, during the ith phase of the mission profile). |
| 𝝉 *i* | annual ratio of times for the PCB, in permanent working mode with supply, and at the (tac)i temperature. |
| 𝝉 *on* | total annual ratio of time for the PCB, in permanent working mode with supply  |
| 𝝉 *off* | total annual ratio of time for the PCB, in non working or storage/dormant modes. |
| *ni* | annual number of thermal cycles seen by the components of the PCB, corresponding to the ith phase of the mission profile with an average swing ∆*Ti* |
| ∆*Ti* | average swing of the thermal variation seen by the components of the PCB, corresponding to the ith phase of the mission profile. |

* **Working Phases for MTBF Calculations**

The equipment working phases which must be used in the calculation of MTBFs in accordance with PD IEC TR62380 are defined below.

For **Signs and Signal Equipment**, this is defined in terms of Display States, as follows:

* Display State 1 - Equipment powered ON but with a blank display; ready to display any aspect/ message/pictogram, as requested by the control system within specified response times;
* Display State 2 - Equipment powered on and displaying the aspect and/or message/ pictogram detailed in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Product** | **Display State 1****(19 hrs per day)** | **Display State 2** **(Assume 2 setting cycles per day each of 2.5 hours, with sufficient interval to enable temperatures to return to Display State 1 values)**  | **Ambient Lum Level** |
| AMI | OFF | 60R | 08H |
| MS 2x12 | OFF | CONGESTION STAY IN LANE | 08H |
| MS3 2x16 | OFF | CONGESTION STAY IN LANE+ 60 | 08H |
| MS3 3x18 | OFF | CONGESTION STAY IN LANE+ 60 | 08H |
| MS4 | OFF | CONGESTION Pictogram | 08H |

For external **ancillary equipment**, permanent operation must be assumed.

For **cabinet located equipment** (e.g. Roadside Controllers), permanent operation must be assumed, during which all monitoring/control/interface functions are supported, with maintenance visits of 5 hours on a nominal monthly basis during which any additional features in operation should be assessed (e.g. display screen, keyboard, interfaces, control buttons etc).

* **C****limatic Table for MTBF Calculations**

The daily temperature variation profile for equipment must be based on the following simplified climatic table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment Type** | tae night | tae daylight | tae mean daylight/night | ∆*Ti* mean daylight/night |
| Signs, Signals and Outside Ancillaries | 6°C | 14°C | 11°C | 8°C |
| Roadside Cabinet-Mounted Equipment \* | 16°C | 24°C | 21°C | 8°C |

\*Assumes no other heat-producing equipment present except cabinet heater, set to the standard Highways England setting of 15°C.

* **Mission Profile**

From the information above, the equipment 'mission profile' to be used in the MTBF calculations can be substantially defined, but with a number of variables remaining for the Supplier to declare (highlighted), as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Equipment Types/ Operating Scenarios1** | (tae)i°C | (tac)i°C | 𝝉 *i* | 𝝉 *on* | 𝝉 *off* | *ni*Cyc/yr | ∆*Ti* °C/Cyc | 𝝅*n \** |
| 1. Sign/Signal Equipment items always 'ON' | 11 | ***mfr12*** | 1 | 1 | 0 | 365 | 8 | ***Note 5*** |
| 2. Sign/Signal Equipment items only 'ON' when displaying | ***mfr23*** | ***mfr32*** | 0.21 | 0.21 | 0.79 | 730 | ***mfr3- mfr24*** | ***Note 5*** |
| 3. Roadside Cabinet Equipment always 'ON' | 21 | ***mfr42*** | 1 | 1 | 0 | 365 | 8 | ***Note 5*** |
| 4. Roadside Cabinet Equipment only 'ON' during Mtce visits | ***mfr53*** | ***mfr62*** | 0.0068 | 0.0068 | 0.9932 | 12 | ***mfr6-mfr54*** | ***Note 5*** |
| 5. Ancillary Externally Mounted Equipment | 11 | ***mfr72*** | 1 | 1 | 0 | 365 | 8 | ***Note 5*** |

* **Mission Profile Notes**
1. To minimise complexity, the mission profile considers only a limited number of equipment type-based operating scenarios, as shown.
2. Supplier to provide (tac)i values where highlighted (***mfr1, mfr3, mfr4, mfr6, mfr7***) for the average ambient temperature of the printed circuit board (PCB) near the components in the operational scenario stated. The basis of these temperature entries is discussed further below.
3. Supplier to provide (tae)i values where highlighted (***mfr2, mfr5***) for the average ambient temperature surrounding the components/ modules in the OFF state. This could be a similar value to that provided for the preceding (tac)i entry. The basis of these temperature entries is discussed further below.
4. Supplier to provide (∆*Ti* °C/Cyc) values where highlighted based on the (tac)i °C and (tae)i °C entered.
5. Where manual calculations are derived, the mission profile would then be used to calculate the final column for the overall 'Influence Factors' (𝝅*n*) to be applied to individual failure rates in working towards the overall MTBF.

**Definition of Failure**

For the purposes of the calculations, *the Employer’s* policy is that a failure occurs when the network operator unable to pass sufficient information to the road user for them to alter their driving plan accordingly and as intended, as viewed from a road user perspective. In practice, 'Failure' therefore means 'inoperable', based on the required functional and/or display requirement, as further clarified below:

* Signs and Signals - unable to set and maintain the display required for Display State 2 (defined above), based on current equipment specification **critical fault thresholds** (Pack 3):
	+ Where, display cells use multiple emitters, a display cell may be regarded as operating until the number of functional emitters in that display cell falls below 50%;
* Roadside Cabinet Equipment (e.g. Roadside Controllers) - unable support monitoring/ control/interface functions and the additional functionality required during maintenance visits, based on normal quality and fitness for purpose requirements;

**Basis of Supplier Temperature Entries**

1. Ambient and operating temperatures form an important part of the MTBF mission profile, so it is essential that the temperature values used are determined in a repeatable and consistent way to ensure a fair and accurate outcome in the calculations.
2. Supplier temperature entries should be based on the following (in preferential order):
3. If an existing product is being tendered, then measurements shall be taken from identical equipment previously supplied,

Only if an existing product is not available, then:

1. Measurements shall be taken from equipment of comparable or similar design and appropriate allowances made

Only if no existing, comparable or similar product is available not available, then:

1. Measurements shall be taken from, where reasonably feasible to construct, an upgraded/prototype product/modules and appropriate allowances made. Purely calculated values will only be considered where no existing or similar product exists, and it can be demonstrated within the report that it is impractical to construct an upgraded or prototype product or module.
2. Measurements must be carried out in a free air (wind-free) environment, free from the effect of solar gain, at a nominal ambient temperature of 11°C. Where it is not possible to achieve an ambient temperature of 11°C, the temperature results may be extrapolated on the basis of the actual ambient temperature, provided that a stable temperature is maintained (and measured) over the test period. For the purposes of this procedure, a stable temperature is assumed when the rate of temperature change does not exceed 1°C in a 30 minute period.
3. Values ***mfr1, mfr3, mfr4, mfr6*** and ***mfr7*** must be recorded after a period of 5 hours operation in the relevant operating scenario, or when stable, based on the definition above.
4. Values ***mfr2*** and ***mfr5*** must be recorded after a period of 5 hours operation in the relevant preceding operating scenario, or when stable, based on the definition above.
5. **For Signs and Signals**, any maintenance doors shall remain closed throughout the test period and calibrated thermocouples must be fitted at six (6) locations as follows:
* Three (3) fitted to the centre of the top edges of display modules: one at the top; one centrally; one at the bottom of the display area. Where heaters are fitted, at least one of these thermocouples must be fitted to the display module nearest to the heater.
	+ The average these three (3) readings must be used in the calculations for display module failure rates.
* Three (3) fitted to the centre of the top edges/ surfaces of other selected modules, including at least one power supply unit, if fitted within the Sign/ Signal. Where heaters are fitted, at least one of these thermocouples must be fitted to the module nearest to the heater.
	+ The average these three (3) readings must be used in the calculations for 'other' module failure rates.
1. **For Roadside Cabinet Equipment (e.g. Roadside Controllers):**
* The equipment must be mounted within a standard Highways England Cabinet Type 600 Mk6.
* The cabinet should be free-standing (i.e. not on its plinth) on packing foam (or similar) to provide adequate sealing at the cabinet base while allowing cable entry.
* Access doors must remain closed throughout the test period for the measurement of values ***mfr4***.
* By necessity, the cabinet front door must be opened to simulate the maintenance visit and must remain open throughout that test period in the measurement of ***mfr6.***
* Three (3) calibrated thermocouples must be fitted inside the equipment as follows:
	+ One (1) at the centre of the top edge of the engineer's display screen
	+ One (1) at the centre of the top edge/surface of the largest PCB
	+ One (1) at the centre of the top edge/surface of the power supply unit (or in the PSU area of the PCB, if integrated).
	+ The average these three (3) readings must be used in the calculations for module failure rates.

**Other Calculation Factors**

1. Where reliable Supplier data is available for components or wholly bought in modules, this may be used in preference to generic component values for base failure rate values.
2. It is presumed likely that Suppliers may use specialist software certified as compliant with PD IEC TR62380 in order to derive their calculations, in which case the specialist software reporting output should be presented as part of the tender submission.
3. Where derived manually, to assist with the tender review, the calculations must be presented in spreadsheet format and built up from a modular level with each component and module being identified, together with the source of the data used, and considering quantity, base failure rate, influence factor (including calculations) and final failure rate.
4. **Summary of Submission Requirements**
5. Description of the methodology used for MTBF calculation, including details of any specialist software package used and its certification of compliance with PD IEC TR62380, the source of base failure rates used in the calculations and any assumptions made.
6. High-level system block diagram.
7. A report detailing of the temperature measurements taken to inform the mission profile in report format, including photographs showing thermocouple locations, details of the equipment used, temperature over time plots and calibration certificates. **This report must be signed off by a chartered engineer. CEng Standard or equivalent, a recognised technology specialist with a proven track record related to NMCS/HATMS hardware and software (or equivalent), and systems engineering.**
8. Completed mission profile table as below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Equipment Types/ Operating Scenarios1** | (tae)i°C | (tac)i°C | 𝝉 *i* | 𝝉 *on* | 𝝉 *off* | *ni*Cyc/yr | ∆*Ti* °C/Cyc | 𝝅*n \** |
| 1. Sign/Signal Equipment items always 'ON' | 11 | ***tbc*** | 1 | 1 | 0 | 365 | 8 | ***tbc*** |
| 2. Sign/Signal Equipment items only 'ON' when displaying | ***tbc*** | ***tbc*** | 0.21 | 0.21 | 0.79 | 730 | ***tbc*** | ***tbc*** |
| 3. Roadside Cabinet Equipment always 'ON' | 21 | ***tbc*** | 1 | 1 | 0 | 365 | 8 | ***tbc*** |
| 4. Roadside Cabinet Equipment only 'ON' during Mtce visits | ***tbc*** | ***tbc*** | 0.0068 | 0.0068 | 0.9932 | 12 | ***tbc*** | ***tbc*** |
| 5. Ancillary Externally Mounted Equipment | 11 | ***tbc*** | 1 | 1 | 0 | 365 | 8 | ***tbc*** |

*\* Required where available from the reporting output or where calculations are built up manually and presented in spreadsheet format.*

1. The specialist software reporting output OR calculation spreadsheet(s).
2. The calculated values:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Individual MTBF (hours)** | **Combined System MTBF (with 1 sign/ signal device1)** | **Min Acceptable MTBF (years)** |
| **Service**  | **Sign/Signal** | **Roadside Controller (if any)**  | **(hours)** | **(years)** |
| AMI |  |  |  |  | ***2yrs*** |
| MS 2x12 |  |  |  |  | ***3yrs*** |
| MS3 2x16 |  |  |  |  | ***2yrs*** |
| MS3 3x18 |  |  |  |  | ***2yrs*** |
| MS4 |  |  |  |  | ***2yrs*** |

*1 - Combined system MTBF is equal to the product of “sign/signal MTBF” and “roadside controller MTBF”, divided by, the sum of those two.*

1. The word 'person' includes any persons and any body or association, corporated or unincorporated; 'agreement’ or ‘arrangement' includes any transaction, formal or informal and whether legally binding or not; and 'work' means the work in relation to which the quotation is made. [↑](#footnote-ref-1)
2. A bribe for this purpose being the provision of any financial or other advantage to encourage that person to perform their functions or activities improperly or to reward that person for having already done so. [↑](#footnote-ref-2)