# Heat Network Technical Assurance Scheme

New Build Heat Networks

Technical Specification

District Distribution Network

Phase 3: Construction

**HNTAS-NB-TS-DD-P3**

# Version History

| Revision | Notes | Date |
|---|---|---|
| V0.4 | Draft issue | 05/12/25 |

# Disclaimer

The following HNTAS Code document is published in draft format. This document is intended to give the sector early sight of HNTAS requirements in their current stage of development for the purpose of facilitating sector understanding of the scheme.

Draft Code documents, including Technical Specifications and Assessment Procedures, have been reviewed and consulted on through a series of technical workshops with participation from a range of experts from across the Heat Network industry. The content of this document is still in development and subject to change. Requirements should not be considered as fixed at this stage.

Changes which may be made to this document in future include those to:

- reflect learnings from the New Build and Existing network pilot programmes;
- align with aspects of HNTAS which are subject to public policy consultation;
- align with new requirements in TS1 and MMS;
- align the terminology of this document with that used in other HNTAS documentation;
- rectify errors in this draft version; and
- improve clarity of contents.

The Key Failures set out in the draft Code documents have been identified as a specific area for review, to ensure that:

- all Key Failures enable a binary assessment;
- Key Failures are only included for genuine issues presenting major risks to KPIs, and that moderate or lower risks are considered via non-conformity processes; and
- Key Failures do not duplicate Technical Requirements unless there is a clear justification to do so.

DESNZ will be welcoming feedback on the information in this document via a change management process. This process will run in parallel to the HNTAS policy consultation and DESNZ invites stakeholders to engage with both, once they are open. You can sign up to receive updates on future detailed draft technical documents as they are published by contacting: heatnetworks@energysecurity.gov.uk.

Please be advised that this document references other HNTAS draft Code documents which have not yet been published. References to other documents will also be subject to change following the publication of updated standards. The final version of this document will be released before the launch of HNTAS.

# Note on Phase 4: Operation (initial) and Phase 5: Operation (ongoing)

The New Build Technical Specification and Assessment Procedures Overview (Phase 0) documents indicate that there are separate New Build Code Documents for Phase 4: Operation (initial) and Phase 5: Operation (ongoing).

These documents have since been consolidated to reduce the number of Code Documents, so the Phase 4: Operation documents cover requirements for New Build networks during both initial and ongoing operation.

This change does not impact the assessment of New Build networks in operation, which still occurs:

- after 1 year of operation; and
- after 2 years of operation.

# Contents

# Foreword

This Technical Specification forms part of the UK Government's Heat Network Technical Assurance Scheme (HNTAS, The Scheme) delivered by the Department for Energy Security and Net Zero, in partnership with the Scottish Government and Ofgem. The Department for Energy Security and Net Zero appointed FairHeat as technical author for this document.

The Scheme has been designed and developed in consultation with a range of experts across the Heat Network industry in the form of Technical Sub-Working Groups, culminating in a series of Technical Specifications and Assessment Procedures to facilitate the validation and verification of performance outcomes of Elements within a Heat Network.

This document specifies HNTAS Requirements for a District Distribution Network Element within a New Build Heat Network in Phase 3: Construction.

This document sits within a series of Technical Specifications for a District Distribution Network, which features within a wider Code documentation structure, as outlined in Table 1.

This Technical Specification has been issued in draft format and will be updated prior to scheme launch.

For further information on the use of this document within the Heat Network Technical Assurance Scheme, please refer to the Heat Network Technical Assurance Scheme – New Build Heat Networks – Scheme Rules – Assessment Regime (HNTAS-NB-SR-XX-AS) document.

## Authors

Lucy Sherburn (FairHeat)

Jake Adamson (FairHeat)

Gareth Jones (FairHeat)

## Technical Sub-Working Group Members

Paul Atkinson (Kingspan Logstor)

Huw Blackwell (Anthesis)

Richard Bolton (WSP)

Chris Forster (Turner & Townsend)

Craig Hanson (FVB)

Asad Kwaja (AECOM)

Christopher O'Keeffe (Thermamech)

David Owen (Taylor Wimpey)

Soulla Paphitis (Danfoss)

Michael Ridge (FairHeat)

Steve Richmond (Rehau)

Robert Temlett (Metropolitan)

Michal Niewadzisz (Vattenfall)

David Underwood (3D Technical Design Ltd)

Mark Whettall (CPV)

# Code Document Structure

## Technical Specifications

| Document Type | Element | | Part/Phase | | | | |
|---|---|---|---|---|---|---|---|
| | | | Overview | Phase 1: Feasibility | Phase 2: Design | Phase 3: Construction | Phase 4: Operation |
| | | | P0 | P1 | P2 | P3 | P4 |
| Technical Specification | Energy Centre | EC | HNTAS-NB-TS-EC-P0 | HNTAS-NB-TS-EC-P1 | HNTAS-NB-TS-EC-P2 | HNTAS-NB-TS-EC-P3 | HNTAS-NB-TS-EC-P4 |
| | District Distribution Network | DD | HNTAS-NB-TS-DD-P0 | HNTAS-NB-TS-DD-P1 | HNTAS-NB-TS-DD-P2 | HNTAS-NB-TS-DD-P3 | HNTAS-NB-TS-DD-P4 |
| | Substation | SS | HNTAS-NB-TS-SS-P0 | HNTAS-NB-TS-SS-P1 | HNTAS-NB-TS-SS-P2 | HNTAS-NB-TS-SS-P3 | HNTAS-NB-TS-SS-P4 |
| | Communal Distribution Network | CD | HNTAS-NB-TS-CD-P0 | HNTAS-NB-TS-CD-P1 | HNTAS-NB-TS-CD-P2 | HNTAS-NB-TS-CD-P3 | HNTAS-NB-TS-CD-P4 |
| | Consumer Connection | CC | HNTAS-NB-TS-CC-P0 | HNTAS-NB-TS-CC-P1 | HNTAS-NB-TS-CC-P2 | HNTAS-NB-TS-CC-P3 | HNTAS-NB-TS-CC-P4 |
| | Consumer Heat System | CH | HNTAS-NB-TS-CH-P0 | HNTAS-NB-TS-CH-P1 | HNTAS-NB-TS-CH-P2 | HNTAS-NB-TS-CH-P3 | N/A |

*Table 1: New Build Network Technical Specification structure*

# Scope

This document specifies the HNTAS Requirements for a District Distribution Network within a New Build Heat Network in Phase 3: Construction.

A District Distribution Network is defined as any pipework system that is not within a building and distributes thermal energy from one location within a Heat Network to another. For example, distributing thermal energy from an Energy Centre to a Building Connection underground.

A detailed definition of the District Distribution Network is contained within the Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – District Distribution Network – Overview (HNTAS-NB-TS-DD-P0) document.

# New Build Heat Networks

There are three stages within Phase 3: Construction, which are Stage 4: Construction Design, Stage 5: Installation, and Stage 6: Commissioning. This is outlined in Figure 1.

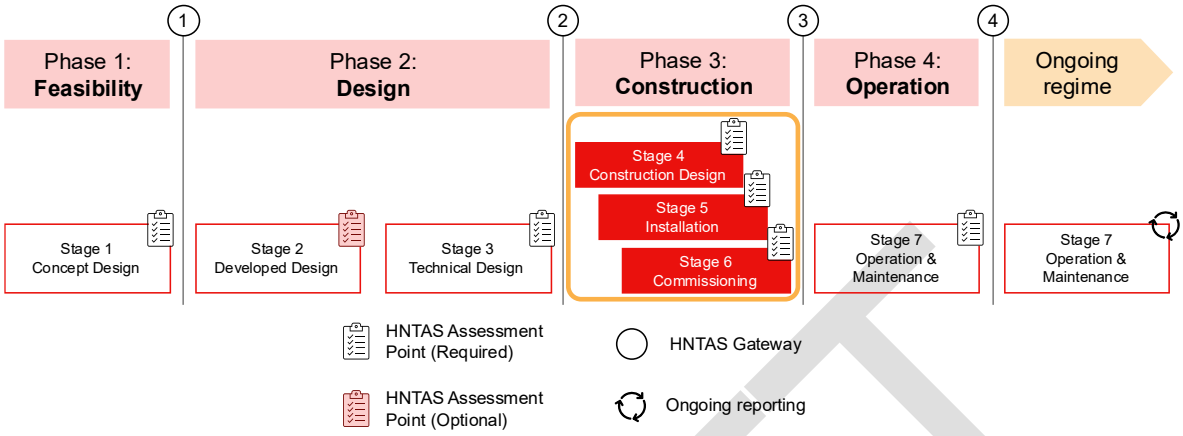


*Figure 1: HNTAS New Build regime phases and stages*

## Sequence of activities within Phase 3: Construction

During Phase 3: Construction, there are three Stages which typically overlap. Within these three Stages, there are multiple activities that are precedent on one another (and hence need to be completed prior to other activities commencing).

For example:

- prior to the installation of equipment, Technical Submittals need to be produced;
- prior to the commissioning of equipment:
  - the necessary equipment needs to be installed;
  - pre-commissioning cleaning activities need to be completed;
  - commissioning methodologies need to be produced.

Figure 2 illustrates an example sequence of activities for a typical project. This illustrates the activities of both the Responsible Party and the Assessor. Prior to the activities being undertaken, the Responsible Party and the Assessor shall agree:

- the sequence of activities; and
- where mid-stage assessments are necessary.

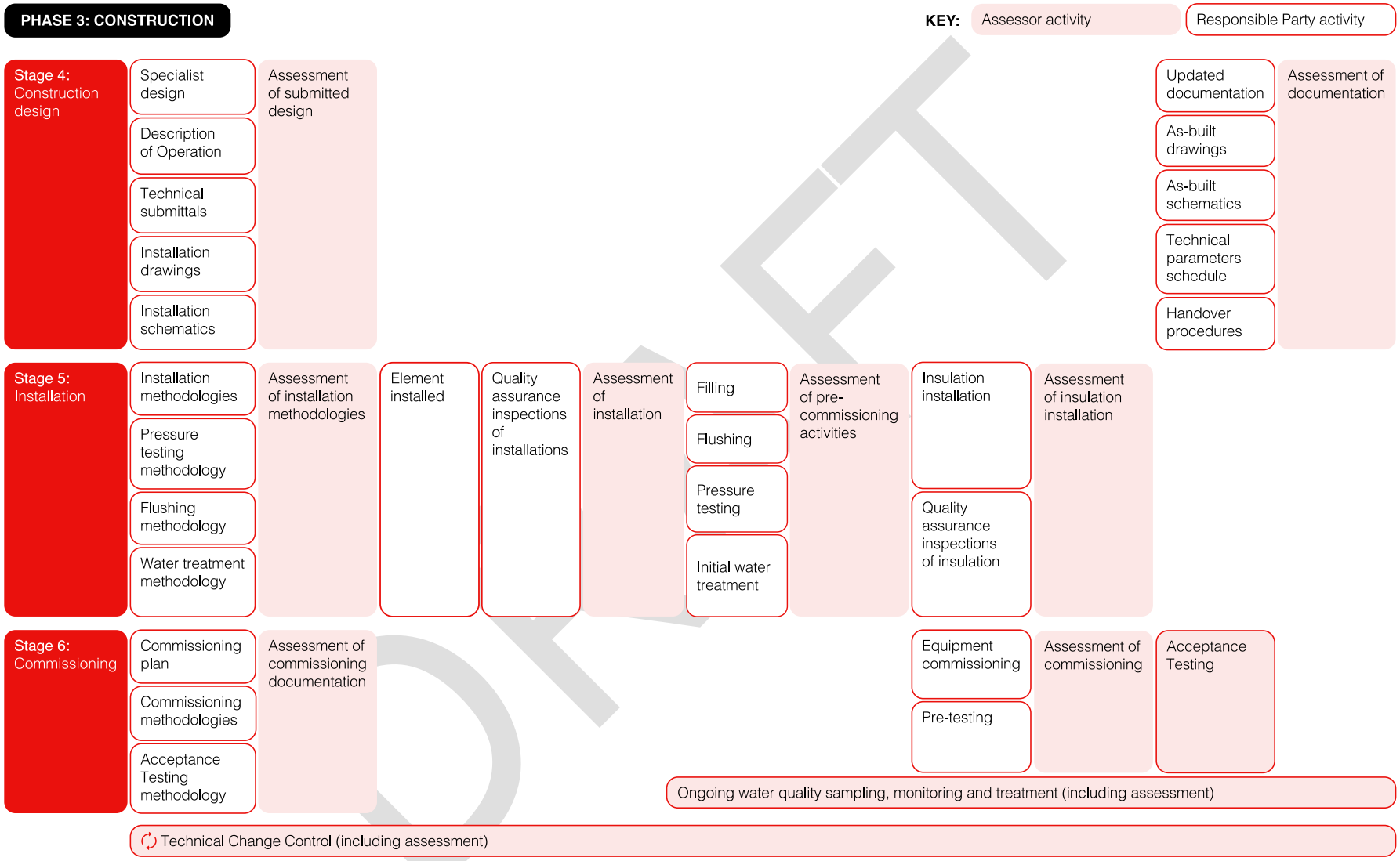


*Figure 2: Example sequence of activities during Construction Phase, with activities of a Responsible Party and Assessor outlined*

# References

## Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- Heat Network Technical Standard (TS1) (HNTAS, 2025)
- Heat Network Metering and Monitoring Standard (MMS) (HNTAS, 2025)
- BS EN 13941:2019+A1:2021: District Heating pipes – Design and Installation of Thermal Insulated Bonded Single and Twin Pipe Systems for Directly Buried Hot Water Networks (BSI, 2021)
- BS EN 14419: District Heating Pipes – Bonded Single and Twin Pipe Systems for Buried Hot Water Networks – Surveillance Systems (BSI, 2019)

## Informative references

There are no informative references in this document.

# Terms and Definitions

For the purposes of this document, the terms and definitions given in the Heat Network Technical Assurance Scheme – Terms and Definitions (HNTAS-XX-TD) document apply.

# 4. Requirements for Stage 4: Construction Design

## 4.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 2 shall be fulfilled.

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 4.1.1. | Specialist Heat Network design items undertaken during the Construction Design stage shall be undertaken in accordance with:<br><br>1. the specification and performance requirements outlined within the Assessed Technical Design; and<br><br>2. any identified HNTAS Technical Requirements at the Technical Design stage which are applicable to the specialist contractor design item. | | DD-S4-E01 |
| 4.1.2. | Prior to the procurement of equipment, Technical Submittals shall be produced in accordance with the applicable technical standard(s). | TS1 4.6.1<br>TS1 4.6.2<br>TS1 4.6.3<br>TS1 4.9.3<br>TS1 4.13.1<br>TS1 4.17.3 | DD-S4-E02 |
| 4.1.3. | The pressure characteristics of the system shall be documented in accordance with the applicable technical standard(s).<br><br>*Note: it is expected that this assessment is undertaken with consideration for the other Elements present in the Heat Network.* | TS1 4.6.6 | DD-S4-E22 |
| 4.1.4. | The Resilience Strategy shall be updated throughout the Construction Phase in accordance with the applicable technical standard(s). | TS1 4.9.1<br>TS1 4.9.2<br>TS1 4.9.5 | DD-S4-E22 |
| 4.1.5. | The repair and replacement strategy shall be updated in accordance with the applicable technical standard(s). | TS1 4.9.6<br>TS1 4.15.1 | DD-S4-E22 |
| 4.1.6. | A methodology for the installation of the District Distribution Network shall be produced in line with the applicable technical standard(s). | TS1 4.16.1<br>TS1 4.16.2<br>TS1 4.16.3<br>TS1 4.16.4 | DD-S4-E11 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 4.1.7. | A filling, flushing, and water treatment/conditioning methodology shall be produced in accordance with the applicable technical standard(s). | TS1 4.11.1<br>TS1 4.11.2<br>TS1 4.11.4 | DD-S4-E16 |
| 4.1.8. | The design of the District Distribution Network shall include suitable provision of flushing points.<br>This provision shall ensure that no "dead legs" are left un-flushed, and that all sensitive equipment can be bypassed during the flushing process. | | DD-S4-E12<br>DD-S4-E13 |
| 4.1.9. | Water Quality documentation shall be updated in accordance with the applicable technical standard(s). This shall include:<br>• the Water Quality Strategy;<br>• the Water Quality Recording Programme. | TS1 4.11.1<br>TS1 4.11.2 | DD-S4-E22 |
| 4.1.10. | A methodology for pipework pressure testing shall be developed in accordance with the applicable technical standard(s). | TS1 4.14.1 | DD-S4-E17 |
| 4.1.11. | The District Distribution Network design heat loss shall be calculated and be within acceptable thresholds in accordance with the applicable technical standard(s). | TS1 4.13.4<br>TS1 4.13.5 | DD-S4-E14 |
| 4.1.12. | Prior to the installation of the District Distribution Network, installation drawings and schematics shall be produced in accordance with the applicable technical standard(s). | TS1 4.17.4<br>TS1 4.17.8 | DD-S4-E12<br>DD-S4-E13 |
| 4.1.13. | Changes to the design of the system which arise during the Construction Phase shall be controlled in accordance with the Technical Change Control Procedure. | | |
| 4.1.14. | Changes shall be documented in accordance with the Technical Change Control Procedure in the Change log. | | DD-S4-E15 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 4.1.15. | Agreed changes during the Construction Phase shall be reflected in Installation documentation. This includes drawings, models, specifications, schedules, and Technical Submittals. | | DD-S4-E18 |
| 4.1.16. | Following the installation of the District Distribution Network, as-installed drawings and schematics shall be produced in accordance with the applicable technical standard(s).<br>The as-installed drawings and schematics shall be affixed to the wall of each plant room. | TS1 4.17.5<br>TS1 4.17.7<br>TS1 4.17.8 | DD-S4-E20 |
| 4.1.17. | Following the commissioning and testing of the surveillance system, an updated as-built wiring diagram for the surveillance system shall be produced in accordance with the applicable technical standard(s).<br>The diagram shall include the as-surveyed wire length measurements.<br>This shall be included in the O&M manual to provide datum references and facilitate the location of any faults including leaks. | TS1 4.17.8 | DD-S4-E22 |
| 4.1.18. | Following the installation and commissioning of the District Distribution Network, the Technical Parameters Schedule shall be completed with accurate information and references to relevant documentation. | | DD-S4-E19 |
| 4.1.19. | District Distribution Network documentation shall be updated throughout the Construction Phase in accordance with the applicable technical standard(s). | TS1 4.12.4<br>TS1 4.16.3<br>TS1 4.17.1<br>TS1 4.17.4<br>TS1 4.17.8 | DD-S4-E22 |
| 4.1.20. | Prior to handover, written procedures outlining the implementation of the Disaster Recovery Plan shall be provided in accordance with the applicable technical standard(s). | TS1 4.9.5 | DD-S4-E22 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 4.1.21. | An O&M manual shall be produced in accordance with the applicable technical standard(s).<br>*Note: it is expected that the O&M manual is produced with consideration for the other Elements present in the Heat Network.* | TS1 4.17.2 | DD-S4-E21 |

*Table 2: Technical Requirements for the District Distribution Network at Stage 4: Construction Design*

## 4.2. Performance Monitoring Requirements

The applicable Performance Monitoring Requirements in Table 3 shall be fulfilled.

| Performance Monitoring Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 4.2.1. | Prior to the procurement of equipment, thermal energy meters shall be specified in accordance with the applicable technical standard(s). | TS1 4.12.1<br>MMS 1.1 | DD-S4-E08<br>DD-S4-E09 |
| 4.2.2. | Prior to the procurement of equipment, the Automatic and Remote Monitoring System (ARMS) shall be specified in accordance with the applicable technical standard(s). | TS1 4.12.2<br>MMS 2.1 | DD-S4-E07 |
| 4.2.3. | The KPI schedule shall be updated throughout the Construction Phase.<br>The KPI schedule shall contain:<br>1. the identified applicable KPIs to be measured and reported by the Metering and Monitoring System;<br>2. the thresholds for each KPI in operation (based on the level of information available at this stage);<br>3. the Monitoring Points required to measure each KPI. | TS1 4.12.4<br>MMS 4.1.12 | DD-S4-E04 |
| 4.2.4. | The Monitoring Points Schedule shall be updated.<br>The Monitoring Points Schedule shall contain:<br>1. the required Monitoring Points to measure KPIs;<br>2. the location of each Monitoring Point (which identifies the applicable Element);<br>3. a unique ID code, which follows a determined naming convention. | TS1 4.12.4<br>MMS 4.1.13 | DD-S4-E05 |
| 4.2.5. | The Metering and Monitoring Strategy shall be updated throughout the Construction Phase in accordance with the applicable technical standard(s). | TS1 4.12.4 | DD-S4-E03 |

*Table 3: Performance Monitoring Requirements for the District Distribution Network at Stage 4: Construction Design*

## 4.3. Key Failures

The applicable Key Failures listed in Table 4 shall not be present.

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 4.3.1. | Project-specific information is not used when undertaking specialist design items.<br>For example, the incorrect use of temperatures, pressures, flow rates etc. | Specialist design items not compatible with the network or suitable due to different design information being utilised. | DD-S4-E01 |
| 4.3.2. | Equipment specified is not in accordance with the design criteria of the Assessed Technical Design.<br>For example, the equipment specified does not have sufficient temperature/pressure rating for the temperature/pressure profile of the network. | Installed equipment may not be suitable to operate at the design and operating criteria. This may reduce the performance of the District Distribution Network, increased risk of KPI thresholds not being achieved and could put equipment at greater risk of premature failure. | DD-S4-E02 |
| 4.3.3. | Material of equipment specified is not compatible with the water treatment strategy.<br>For example, equipment specified contains materials which requires a different pH range to that required by the other specified equipment and/or specified in the water treatment strategy. | Equipment not operating within required water quality parameters, leading to risk of equipment failure and/or poor water quality, risking KPIs not being achieved. | DD-S4-E02 |
| 4.3.4. | Technical Submittal does not contain project specific or equipment specific design information.<br>For example, temperature, differential pressure requirement (e.g. valves), maximum operating pressure, maximum/minimum flowrates, specific commissioning set points. | Increased risk of equipment procurement that is not in accordance with the Assessed Technical Design. Increased risk that equipment will be commissioned and operated to criteria which differs to the Technical Design requirement, which could lead to KPI thresholds not being achieved. | DD-S4-E02 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 4.3.5. | Metering and Monitoring System is not in line with the Metering and Monitoring Technical Design.<br><br>Specifically, it does not contain the following:<br>• The required Monitoring Points to measure KPI<br>• The ability measure, extract, record, and store data at the required frequency<br>• The ability to calculate and report on KPIs | System specified and installed does not have the ability to measure, extract, record and store the necessary performance data at the required frequency or is unable to calculate the KPIs. Risking the ability to monitor performance and report on KPIs. | DD-S4-E03<br>DD-S4-E04<br>DD-S4-E05<br>DD-S4-E06<br>DD-S4-E07<br>DD-S4-E08<br>DD-S4-E09<br>DD-S4-E10 |
| 4.3.6. | Equipment specified for Monitoring Point (e.g. thermal energy meter, utility meter, sensor) not compatible with ARMS. | ARMS unable to extract data from Monitoring Point, and therefore cannot record and store the necessary data to calculate KPIs. | DD-S4-E08 |
| 4.3.7. | Thermal energy meters sized incorrectly. | Inaccurate measurement of performance data due to incorrect sizing of heat and/or utility meter. | DD-S4-E09 |
| 4.3.8. | Thermal energy meter not correctly specified for heat transfer fluid. | Inaccurate measurement of performance data due to inappropriate specification of thermal energy meter. | DD-S4-E08 |
| 4.3.9. | Changes to the Technical Design are not managed appropriately, leading to design changes (e.g. equipment specification, pipework routing etc.) that does not conform with the Technical Design intent. | Changes that are not signed-off may negatively impact the performance of the District Distribution Network, which could lead to construction of the Heat Network not being in accordance with the design intent, which could risk KPI thresholds not being achieved. | DD-S4-E15<br>DD-S4-E18 |
| 4.3.10. | As-built schematics and drawings do not accurately reflect the installation.<br><br>For example, joint and weld positions are not | Inaccurate documentation being used during operation and maintenance, inhibiting the ability to effectively operate, and undertake maintenance and replacement of the District | DD-S4-E20<br>DD-S4-E22 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| | accurate, or not recorded at all. | Distribution Network over its lifecycle. | |

*Table 4: Key Failures for the District Distribution Network at Stage 4: Construction Design*

## 4.4. Evidence Requirements

The applicable Evidence Items listed in Table 5 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| DD-S4-E01 | Specialist design documentation | Design documentation of specialist design items.<br><br>Contents will be dependent on the design item, but shall include, where applicable, specification, calculations, schematics, and drawings. |
| DD-S4-E02 | Technical submittals | Documentation for all equipment that is intended to be procured.<br><br>Shall contain the site-specific design information used to inform the equipment selection and required for installation, commissioning and operation of equipment.<br><br>Shall include a cover page detailing the reviewers' names, revision number, status and date of approval of the technical submittal. |
| DD-S4-E03 | Metering and Monitoring Strategy | The Metering and Monitoring Strategy shall contain a description of how data required to calculate KPIs will be measured, extracted, recorded, and stored at the required read frequency, how the raw data will be transformed, and how KPIs will be calculated and reported.<br><br>The strategy shall also include:<br><br>1. Schedule of KPIs (item DD-S4-E04)<br><br>1. Schedule of Monitoring Points (item DD-S4-E05)<br><br>2. Monitoring Points unique ID code naming methodology (item DD-S4-E06)<br><br>3. Schematic with labelled Monitoring Points<br><br>4. Data flow diagram (item DD-S4-E10)<br><br>5. ARMS specification (item DD-S4-E07)<br><br>6. Monitoring Points specification (thermal energy meters, utility meters, sensors) (items DD-S4-E08 & DD-S4-E09) |
| DD-S4-E04 | KPI Schedule | A schedule of all KPIs required to be measured by the Metering and Monitoring System. |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | The KPI schedule shall contain:<br>1. The identified applicable KPIs to be measured and reported by the Metering and Monitoring System<br>2. The thresholds for each KPI in operation (based on the level of information available at this stage)<br>3. The Monitoring Points required to measure each KPI |
| DD-S4-E05 | Monitoring Points Schedule | A schedule of all Monitoring Points required to measure KPIs.<br>The Monitoring Points Schedule shall contain:<br>1. All required Monitoring Points to measure KPIs<br>2. Location of each Monitoring Point (which identifies the applicable Element)<br>3. A unique ID code, which follows a determined naming convention<br>4. Serial number<br>5. Postal address and plot number<br>6. Photographic evidence of point and on-site label<br>7. Communications address for ARMS<br>8. Date commissioned<br>9. Initial reading<br>10. Date of last calibration |
| DD-S4-E06 | Unique ID code naming convention | Methodology used to label each Monitoring Point with a unique ID code. |
| DD-S4-E07 | ARMS Specification | Shall provide description of the intended system operation and the materials, products to be used, standard of work required, performance requirements and the condition of which the work is to be executed. |
| DD-S4-E08 | Monitoring Point Specification | Specification for each type of Monitoring Point (thermal energy meter, utility meter, sensors etc.).<br>Shall provide description of the intended system operation and the materials, products |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | to be used, standard of work required, performance requirements and the condition of which the work is to be executed. |
| DD-S4-E09 | Meter sizing calculations | Shall outline the inputs, methodology and calculations used to size pipework applicable meters. |
| DD-S4-E10 | Data flow diagram(s) | Diagrams illustrating the route of data flow from the Monitoring Point to the ARMS, including hierarchy of Monitoring Points. |
| DD-S4-E11 | Installation methodologies for District Distribution Network | Method statement detailing how the District Distribution Network will be installed. This shall provide methodology for each stage of the installation. |
| DD-S4-E12 | Installation drawings | The Installation Drawings shall contain information needed by tradespeople on site to install the works and the following:<br>• The precise locations and sizes of all items of equipment and pipework, using specific objects representing actual intended or procured equipment, in positions that have been spatially coordinated.<br>• All supports and fixings required to install the works.<br>• Spatial allowances for installation and commissioning methodologies, and access for maintenance and replacement.<br>• Where applicable, any required builders works details and manufacturer drawings shall be produced in accordance with the Technical Design.<br>This shall include general arrangements, with utility overlay, and standard details for valve chambers, congested areas, building entry points etc. |
| DD-S4-E13 | Installation schematics | The Installation Schematics shall contain information needed by tradespeople on site to install the works and the following:<br>• All functional, sensing, control and measuring items to be installed. This includes flushing provision, air vents and drainage provision, isolation valves, sensors (pressure, temperature, flow).<br>• All pipework sizes, pressures and flow rates adjusted for any changes during construction. |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | All items shall be labelled with references to schedules |
| DD-S4-E14 | Heat loss calculations | Evidence shall contain the calculations, methodology and assumptions used to calculate District Distribution Network heat loss. |
| DD-S4-E15 | Change log | Log of all changes to the Technical Design. |
| DD-S4-E16 | Filling, flushing, and water treatment/conditioning methodology | Filling methodology detailing the:<br>• methodology for sampling of mains water;<br>• parameter limits for initial fill water quality;<br>• approximate volume of network to be filled.<br>Flushing methodology detailing:<br>• type of flushing to be carried out (e.g. closed loop or open loop);<br>• methodology for isolating sensitive equipment from the flushing process;<br>• duration network shall be flushed for;<br>• flushing velocity required;<br>• methodology for providing circulation;<br>• methodology for measuring the flushing velocity;<br>• methodology for draining and disposing of contaminated water.<br>Treatment/conditioning methodology detailing the:<br>• method of water treatment/conditioning;<br>• type of chemicals/biocides/inhibitors to be used (if applicable);<br>• duration of treatment/conditioning. |
| DD-S4-E17 | Pressure testing methodology | Methodology detailing how the District Distribution Network will be pressure tested. This shall provide detail for all types of pressure test to be carried out. For each type of pressure test, this shall include:<br>• the type of pressure test;<br>• the design pressure;<br>• the test pressure;<br>• the method for achieving the test pressure;<br>• the duration of the pressure test.<br>A methodology for pressure testing of equipment that has been tested by the |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | manufacturer is not required. Confirmation from the manufacturer that the equipment has been pressure tested is acceptable. This shall detail the pressure the equipment has been pressure tested to. |
| DD-S4-E18 | Installation documentation with changes outlined | Updated installation drawings and schematics with changes to the design reflected on the documentation. |
| DD-S4-E19 | Technical Parameters Schedule | Schedule which outlines all technical parameters in one location, with reference to applicable documents. |
| DD-S4-E20 | As-built drawings and schematics | Final as-built drawings and schematics reflecting the exact installation of the District Distribution Network. Any changes made during the installation that deviate from the Installation schematics and drawings shall be reflected. |
| DD-S4-E21 | O&M manual | Documentation containing all relevant information for the operation and maintenance of the system.<br>Shall include contents as set out in TS1 4.17.2. |
| DD-S4-E22 | Updated documentation following Construction Phase | Updated revisions of all District Distribution Network documentation, including:<br>• Surveillance system wiring diagrams<br>• District Distribution Network drawings<br>• District Distribution Network schematic<br>• System pressure assessment<br>• Resilience Strategy, including:<br>  ○ Disaster Recovery Plan, including written procedures outlining its implementation<br>• Repair and replacement strategy<br>• Water Quality Strategy<br>• Water Quality Recording Programme<br>• Metering and Monitoring Strategy<br>• Monitoring Points Schedule<br>• KPI Schedule<br>• Data flows diagram |

*Table 5: Evidence Requirements for the District Distribution Network at Stage 4: Construction Design*

# 5. Requirements for Stage 5: Installation

## 5.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 6 shall be fulfilled.

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 5.1.1. | The District Distribution Network, including the Metering and Monitoring System, shall be installed in accordance with the Assessed Construction Design. | | DD-S5-E01 |
| 5.1.2. | The District Distribution Network, including the Metering and Monitoring System, shall be installed in accordance with the applicable technical standard(s). | TS1 5.11.10<br>TS1 5.12.1<br>TS1 5.12.2<br>TS1 5.14.3<br>TS1 5.14.4<br>TS1 5.14.5<br>TS1 5.14.6<br>TS1 5.14.7<br>TS1 5.14.8<br>TS1 5.16.1<br>TS1 5.16.2<br>TS1 5.16.3<br>TS1 5.16.4<br>TS1 5.16.5<br>TS1 5.17.1 | DD-S5-E01 |
| 5.1.3. | Ancillary equipment shall be installed in accordance with the applicable technical standard(s). | TS1 5.15.1 | DD-S5-E01 |
| 5.1.4. | Pre-insulated materials shall be stored in accordance with the applicable technical standard(s). | TS1 5.16.8 | DD-S5-E03 |
| 5.1.5. | All persons performing installation activities shall have received training and certification. | TS1 5.14.1<br>TS1 5.14.2 | DD-SS-E04 |
| 5.1.6. | Quality assurance inspections shall be undertaken and documented throughout each stage of the installation process to confirm that requirements 5.1.1 - 5.1.3 are fulfilled and the installation process is in accordance with the applicable technical standard(s).<br><br>Photographs (where applicable) shall be clearly presented with no blur. | TS1 5.16.4<br>TS1 5.17.1<br>TS1 5.17.2 | DD-S5-E02 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 5.1.7. | The District Distribution Network shall be filled and treated/conditioned in accordance with the applicable technical standard(s). | TS1 5.11.1<br>TS1 5.11.2<br>TS1 5.11.4<br>TS1 5.11.6<br>TS1 5.11.7 | DD-S5-E08<br>DD-S5-E09 |
| 5.1.8. | Pressure testing of pipework shall be carried out in accordance with the Assessed pressure testing methodology and the applicable technical standard(s). | TS1 5.14.13 | DD-S5-E05<br>DD-S5-E06 |
| 5.1.9. | The District Distribution Network shall be flushed in accordance with the applicable technical standard(s). | TS1 5.11.3<br>TS1 5.11.5<br>TS1 5.11.8 | DD-S5-E08<br>DD-S5-E09 |
| 5.1.10. | The risk to water quality posed by stagnation shall be assessed and mitigated in accordance with the applicable technical standard(s). | TS1 5.11.9<br>TS1 5.11.10 | DD-S5-E08<br>DD-S5-E09 |
| 5.1.11. | District Distribution Network insulation shall be installed in accordance with the Assessed Construction Design. | | DD-S5-E10 |
| 5.1.12. | District Distribution Network insulation shall be installed in accordance with the applicable technical standard(s). | TS1 5.13.1<br>TS1 5.13.2<br>TS1 5.13.3<br>TS1 5.13.4<br>TS1 5.16.2<br>TS1 5.16.3 | DD-S5-E10 |
| 5.1.13. | District Distribution Network pipework shall be labelled upon completion of the insulation installation in accordance with the applicable technical standard(s). | TS1 5.14.10<br>TS1 5.14.11 | DD-S5-E10 |
| 5.1.14. | Quality assurance inspections of the installation of the District Distribution Network insulation shall be undertaken and documented prior to cladding, backfilling, or covering by building finishes in accordance with the applicable technical standard(s). | TS1 5.13.5<br>TS1 5.17.1 | DD-S5-E12 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 5.1.15. | The backfilling material grading curve shall be in accordance with:<br>• manufacturer requirements; and<br>• the applicable technical standard(s). | TS1 5.14.9 | DD-S5-E15 |

*Table 6: Technical Requirements for the District Distribution Network at Stage 5: Installation*

## 5.2. Performance Monitoring Requirements

The Metering and Monitoring System shall be installed in accordance with the Technical Requirements set out in Section 5.1.

## 5.3. Key Failures

The applicable Key Failures listed in Table 7 shall not be present.

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 5.3.1. | Installation of damaged pipework (carrier pipe and/or outer casing). | Installation of a damaged carrier pipe could lead to leaks during operation and/or equipment failure, which could cause issues with water quality and result in KPIs not being achieved.<br>Installation of damaged outer casing could increase the heat losses from the network and lead to KPIs not being achieved. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.2. | Foam pad expansion design not followed on steel pipework systems. | Increased equipment failure rate due to not following the expansion design. This could increase the REPEX of the Heat Network as a result of high failure rates. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.3. | Poor storage and protection for equipment and pipework during construction. | Damage to pipework and equipment leading to increased failure rates during operation. | DD-S5-E03 |
| 5.3.4. | Poor dewatering, trenching and backfilling processes. | Risk of damaged equipment. This could increase the REPEX of the Heat Network due to more frequent equipment failure. | DD-S5-E02<br>DD-S5-E15 |
| 5.3.5. | Poorly constructed valve chambers. | Risk of leaks into the valve chamber and flooding. This could result in submersion and premature failure of equipment, which could lead to a lack of maintainability of the Heat Network in operation. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.6. | Ancillary equipment to aid with maintenance not installed as per the design and specification (e.g. vent and drain provision, | Lack of maintainability of the Heat Network in operation. | DD-S5-E01<br>DD-S5-E02 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| | isolation valves, disaster recovery valve access points). | Resilience strategy cannot be executed as per the intent if a disaster were to occur. This could result in end Consumers not receiving heating at all. | |
| 5.3.7. | Fill water used for initial fill not as per the water treatment strategy. | Issues with poor water quality during Construction and Operation phases. This could result in increased risk of pipework corrosion, KPIs not being achieved and premature equipment failure. | DD-S5-E08<br>DD-S5-E09 |
| 5.3.8. | Temporary end caps not installed during phases of sectional completion. | Moisture ingress to the system, leading to degradation of pipework and increased likelihood of poor water quality during commissioning and operation. This could increase the maintenance requirements on the network and result in water quality KPIs not being achieved. | DD-S5-E07 |
| 5.3.9. | Sections of Distribution Network left empty without being filled with Nitrogen during long periods before commissioning. | Degradation of pipework and increased likelihood of poor water quality when re-filled. This could increase the maintenance requirements on the network and result in water quality KPIs not being achieved. | DD-S5-E07 |
| 5.3.10. | Incorrect installation of surveillance system.<br>For example, wires not aligned between pipe sections. | Lack of maintainability of Heat Network in operation. Leaks may go undetected throughout the Heat Network, which may lead to increased risk of moisture spreading through network insulation, risk of corrosion and increased maintenance requirements on the Heat Network. | DD-S5-E01<br>DD-S5-E02 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 5.3.11. | Insulation installed is not sufficient to meet heat loss requirements (applicable to both buried pipework and above ground external pipework):<br>• Incorrect material<br>• Incorrect thickness | Increased heat losses as a result of installation. This could result in the heat losses not meeting the KPI threshold. | DD-S5-E09<br>DD-S5-E10 |
| 5.3.12. | Non-pre-insulated equipment installed below ground. This is includes pipework and ancillary equipment. | Increased heat losses as a result of out of specification equipment. Increased risk of water ingress to non-pre-insulated parts, which could result in reduced water quality and in increased likelihood of corrosion and equipment failure. Heat loss and water quality KPIs may not be achieved. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.13. | Incorrect backfill material used during installation and/or inadequate compaction of backfill material. | Network expansion characteristics may differ to the parameters used throughout expansion design due to a different backfill material. Unexpected sharp objects in the backfill material may cause damage to the outer casing of the pipework and insulation, which may allow ingress of moisture. | DD-S5-E02 |
| 5.3.14. | Incorrect location of pipework, casing joints and welds on as-built layout drawings. | Inability to pinpoint location of leaks and issues quickly during operation.<br>This causes a disruptive process for carrying out remedial actions and could increase the cost and disruption for rectifying leaks due to a lack of certainty with its location. | DD-S5-E13 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 5.3.15. | Incorrect practices used for installation of pipework joints, such as not following manufacturer requirements, or using non-standard welding joints to facilitate changes in pipework direction when not previously agreed with the supplier. | Moisture ingress as a result of poor joint installation, which could result in damage to insulation and increase heat losses. This could also increase the likelihood of premature pipework failure. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.16. | Insufficient, incorrect or no training received for pipework joint installation. | Poor installation of joints, which may result in moisture ingress, which could result in damage to insulation and increase heat losses. This could also increase the likelihood of premature pipework failure. | DD-SS-E04 |
| 5.3.17. | NDT methodology and requirements not carried out in accordance with the project class under BS EN 13941. | Risk of failure at pipework joints as a result of reduced NDT, which could increase the likelihood of weld failure and leaks from the system. This could lead to excess water consumption, failure spreading across the network and KPIs not achieving their threshold. | DD-S5-E01<br>DD-S5-E02 |
| 5.3.18. | Necessary pipework routing changes required during the installation phase not checked with the Designer. | Expansion of system may differ to the original design, which could lead to an increased rate of equipment failure. | DD-S5-E13 |
| 5.3.19. | Spacing between pipework not installed as per the design requirement. | Increased heat gain into the return pipework from the flow pipework, which would decrease the network temperature differential, increase heat losses and may result in KPIs not being achieved. | DD-S5-E01<br>DD-S5-E02 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 5.3.20. | Energy Centre or Substation equipment used for flushing of the network when not sized to do so. | Flushing velocities aren't achieved, meaning debris is not removed from the system that otherwise would have been if the required velocity was achieved. This may result in issues with water quality through commissioning and operation, and could lead to KPI thresholds not being achieved. | DD-S5-E08 |
| 5.3.21. | Monitoring Points not installed, or not installed in the correct location as per the design. Most commonly includes bulk thermal energy meters (e.g. block level, Energy Centre and Substation thermal energy meters). | Unable to measure the required performance data due to Monitoring Points not being installed.<br>Where Monitoring Points are installed but not as per the design intent, this could lead to inaccurate data being recorded. | DD-S5-E01 |
| 5.3.22. | Infrastructure not installed to enable all required Monitoring Points to connect to the ARMS. | ARMS unable to extract data from Monitoring Point, and therefore cannot record and store the necessary data to calculate KPIs. | DD-S5-E01 |
| 5.3.23. | Not all required Monitoring Points are connected to the ARMS. Most commonly occurs for bulk meters (e.g. block level, Energy Centre and Substation thermal energy meters) and utility meters. | ARMS unable to extract the required data from all Monitoring Points, and therefore cannot record and store the necessary data to calculate KPIs. | DD-S5-E01 |

*Table 7: Key Failures for the District Distribution Network at Stage 5: Installation*

## 5.4. Evidence Requirements

The applicable Evidence Items listed in Table 8 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| DD-S5-E01 | Installation offered for inspection | The installation shall be offered following completion of the install for an inspection. |
| DD-S5-E02 | Quality assurance inspection records | Shall include inspection records, photographs of the installed District Distribution Network, a snagging log with remedial actions undertaken to fix these, justification for non-compliances with requirements.<br>Photographs shall be presented clearly with no blur. Where equipment has been installed, close-up photographs shall be provided of the installation. Where equipment has a visible setting or set point, photographs shall ensure that this setting is clearly visible. |
| DD-S5-E03 | District Distribution Network storage facilities offered for inspection | The location(s) for storing pre-insulated pipework materials shall be offered to the Assessor for an on-site inspection. |
| DD-SS-E04 | Evidence of training and qualifications of personnel carrying out installation activities | A register of personnel intending to carry out installation activities, including the relevant training and qualifications that each person has received. |
| DD-S5-E05 | Pressure testing activities offered for witnessing | The pressure testing activities shall be offered for on-site witnessing. |
| DD-S5-E06 | Pressure testing certification | Certification for each pressure test shall be provided, which provides, as a minimum:<br>• the type of pressure test;<br>• the date of test;<br>• the design pressure;<br>• the test pressure;<br>• the time the test commenced;<br>• the time the test pressure was reached;<br>• the duration held at test pressure;<br>• the name of the operative performing the test;<br>• the pressure gauge calibration certificate. |
| DD-S5-E07 | Non-live pipework treatment methodology | Method statement detailing how specific parts that are not required for extensive periods will be filled with inert gas. This shall detail the |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | charging and filling process, how the absence of oxygen will be demonstrably met and how the parts of the network will be sealed. |
| DD-S5-E08 | Water treatment activities offered for witnessing | The water treatment activities shall be offered for on-site witnessing. |
| DD-S5-E09 | Water treatment records | Records for the filling, flushing, and sampling of the network shall be provided. This shall include:<br>Filling: Date system was filled, number of fill water samples, location of fill water samples, value of each fill water parameter.<br>Flushing: Type of flushing, date of flushing, equipment isolated or removed from the network during flushing, time flushing was commenced, duration network was flushed for, required flushing velocity, flushing velocity reached, method of velocity measurement, flushing circulation methodology, confirmation that contaminated water was drained and disposed of correctly.<br>Treatment/conditioning: Type, date and duration of activities, type of chemicals/biocides/inhibitors used (if applicable).<br>Sampling: Date samples were taken, type of samples taken, number of samples taken, location of samples taken, value of each parameter of sampled water. |
| DD-S5-E10 | Installation of above-ground insulation offered for inspection | The installation of any above-ground insulation on a District Distribution Network shall be offered to the Assessor for an inspection following completion of the install. |
| DD-S5-E12 | Quality assurance inspection records (above ground insulation installation) | Shall include inspection records, photographs of the installed insulation on the entire District Distribution Network, a snagging log with remedial actions undertaken to fix these, justification for non-compliances with requirements.<br>Photographs shall be presented clearly with no blur. |
| DD-S5-E13 | Documentary evidence of GPS co-ordinates of pipework joints and welds | Shall include as-built layout drawings of the District Distribution Network and contain GPS co-ordinates of all pipework joints and welds. |
| DD-S5-E14 | Designer sign-off of pipework routing changes required | Evidence that necessary changes to the pipework routing during the installation phase have been communicated to the Designer of |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | during the installation phase | the District Distribution Network and that sign-off of any changes has been acquired. |
| DD-S5-E15 | Backfilling methodology | Method statement outlining the backfilling process to be carried out following completion of the network construction for that part. Shall include the grading curve for the backfill material. |

*Table 8: Evidence Requirements for the District Distribution Network at Stage 5: Installation*

# 6. Requirements for Stage 6: Commissioning

## 6.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 9 shall be fulfilled.

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 6.1.1. | A commissioning plan shall be produced with appropriate coordination with the other Elements present in the Heat Network in accordance with:<br>• the commissioning plan produced during the Construction Design Stage; and<br>• the applicable technical standard(s). | TS1 6.17.2<br>TS1 6.17.4<br>TS1 6.17.5 | DD-S6-E01 |
| 6.1.2. | Commissioning methodologies for the District Distribution Network shall be developed in accordance with the applicable technical standard(s). These shall include commissioning methodologies for all equipment that requires commissioning.<br>Where equipment that requires commissioning is supplied from multiple manufacturers, a commissioning methodology shall be provided for the specific equipment from each manufacturer. | TS1 6.8.2<br>TS1 6.8.9<br>TS1 6.12.5<br>TS1 6.17.1<br>TS1 6.17.2 | DD-S6-E06 |
| 6.1.3. | Commissioning methodologies for the District Distribution Network surveillance system shall be developed in accordance with the applicable technical standard(s). | TS1 6.12.9 | DD-S6-E02 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 6.1.4. | Where network keep-warm bypasses, valves and other equipment require commissioning on the District Distribution Network, these shall be commissioned in accordance with the commissioning methodologies.<br><br>The commissioning shall enable the District Distribution Network to perform in line with the design intent, Metering and Monitoring Strategy, and within KPI thresholds.<br><br>Data shall be provided to demonstrate that each piece of equipment has been commissioned in line with the commissioning methodologies. | TS1 6.8.2<br>TS1 6.8.9<br>TS1 6.8.10<br>TS1 6.12.5 | DD-S6-E06 |
| 6.1.5. | The District Distribution Network surveillance system shall be commissioned in accordance with the commissioning methodologies and the applicable technical standard(s). | TS1 6.12.10<br>TS1 6.12.12 | DD-S6-E03 |
| 6.1.6. | On completion of a section of the surveillance system, an active detector shall be commissioned in accordance with the applicable technical standard(s). | TS1 6.12.11 | DD-S6-E04 |
| 6.1.7. | Water quality parameters shall be recorded after pre-commission cleaning activities via:<br>• sampling; and<br>• continuous monitoring where applicable for the system,<br>prior to practical completion in accordance with the applicable technical standard(s). | TS1 6.11.1<br>TS1 6.11.3<br>TS1 6.11.4 | DD-S6-E07 |
| 6.1.8. | Water quality KPIs shall be maintained within acceptable limits in accordance with the applicable technical standard(s). | TS1 6.11.2 | DD-S6-E08 |
| 6.1.9. | Prior to Acceptance Testing, a methodology and criteria shall be produced in accordance with the applicable technical standard(s). | TS1 6.8.15 | DD-S6-E11 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 6.1.10. | Pre-testing shall be carried out prior to the Acceptance Test. The aim of pre-testing is to carry out trial Acceptance Tests to identify any performance problems with the District Distribution Network operation that would result in non-conformance with the applicable technical standard(s).<br><br>Where issues are identified during pre-testing, these shall be resolved and recorded in a failure log.<br><br>A pre-testing report shall be produced, containing the failure log, which demonstrates the performance of the District Distribution Network achieves the required criteria as outlined within the [HNTAS Acceptance Testing Standard]. | TS1 6.8.9<br>TS1 6.8.10<br>TS1 6.8.16 | DD-S6-E12 |
| 6.1.11. | Acceptance Testing of the District Distribution Network shall be undertaken in accordance with the applicable technical standard(s) to demonstrate that the District Distribution Network operates in accordance with its design intent, Description of Operation, and acceptable thresholds for all applicable KPIs. | TS1 6.8.9<br>TS1 6.8.10<br>TS1 6.8.16 | DD-S6-E13 |
| 6.1.12. | After the Acceptance Test, performance data shall be provided to demonstrate the performance during the Acceptance Test. The data shall be in its raw form as a minimum, and in a usable format (e.g. .csv, .xlsx) | | DD-S6-E14 |
| 6.1.13. | The District Distribution Network heat loss shall be determined in accordance with the applicable technical standard(s). | TS1 6.12.6<br>TS1 6.12.8 | DD-S6-E14 |
| 6.1.14. | The condition of equipment and pipework shall be determined, and remedial actions undertaken where necessary, in accordance with the applicable technical standard(s). | TS1 6.16.1<br>TS1 6.16.2<br>TS1 6.16.3<br>TS1 6.16.4<br>TS1 6.16.5<br>TS1 6.16.6 | DD-S6-E15 |

| Technical Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 6.1.15. | The handover procedures shall be followed in accordance with the applicable technical standard(s). | TS1 6.17.8<br>TS1 6.17.9<br>TS1 6.17.10 | DD-S6-E18 |

*Table 9: Technical Requirements for the District Distribution Network at Stage 6: Commissioning*

## 6.2. Performance Monitoring Requirements

The applicable Performance Monitoring Requirements in Table 10 shall be fulfilled.

| Performance Monitoring Requirement | | Applicable technical standard(s) | Evidence Requirement(s) |
|---|---|---|---|
| 6.2.1. | Monitoring Points shall be clearly labelled with references in accordance with the applicable technical standard(s) and that match the Monitoring Points Schedule and KPI Schedule. | TS1 4.12.1<br>TS1 4.12.4<br>MMS 4.1.13 | DD-S6-E16 |
| 6.2.2. | Commissioning checks shall be carried out on all Monitoring Points in accordance with the applicable technical standard(s).<br>The check shall also to ensure that all data required to enable KPIs to be calculated and reported during Acceptance Testing is available on the ARMS before Acceptance Testing and what is being recorded at the Monitoring Point is being correctly reported to the ARMS.<br>The checks shall ensure that:<br>• the data required for all applicable KPIs to be calculated and reported during Acceptance Testing is available on the ARMS prior to Acceptance Testing; and<br>• measurements taken at each Monitoring Point are correctly extracted, recorded, transformed, and reported by the ARMS. | TS1 4.12.2<br>TS1 6.8.14<br>TS1 6.12.1<br>TS1 6.12.2 | DD-S6-E17 |

*Table 10: Performance Monitoring Requirements for the District Distribution Network at Stage 6: Commissioning*

## 6.3. Key Failures

The applicable Key Failures listed in Table 11 shall not be present.

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 6.3.1. | Failure to develop realistic commissioning plan which allows sufficient time for commissioning and/or failure to appoint personnel to carry out commissioning. | Insufficient time to carry out commissioning of the District Distribution Network and lack of competent persons to commission equipment, which could lead to the District Distribution Network not performing as the design intended and KPIs not being achieved. | DD-S6-E01 |
| 6.3.2. | Surveillance system not commissioned and tested in accordance with EN 14419 (Steel pipework). | Undetected leaks through braking in outer casing, leading to corrosion under insulation of steel pipework. This could cause leaks to go unnoticed, which could result in moisture spreading through the network insulation and reduced longevity. | DD-S6-E02<br>DD-S6-E03 |
| 6.3.3. | Surveillance system alerts and active alarms not correctly commissioned, or not commissioned at all (Steel pipework). | Lack of ability to identify surveillance system faults when leaks occur due to a lack of alerts and/or active alarms. This could require a more exhaustive process for fixing a leak, or leaks going unnoticed which could cause leaks and moisture to spread through the network insulation, reducing its longevity. | DD-S6-E04 |
| 6.3.4. | Bypass not commissioned to correct set point (e.g. temperature or flow rate). | Elevated return temperatures due to increased flow rates. This would increase heat losses and result in KPIs not being achieved. Increased flowrates would unnecessarily increase the energy consumption from the pumps. | DD-S6-E09<br>DD-S6-E10 |

| Key Failure | | Outcome to avoid | Evidence Requirement(s) |
|---|---|---|---|
| 6.3.5. | Poor water quality management during construction phase (lack of sampling, analysis and issue identification and rectification). | Reduced equipment efficiency due to poor water quality. This could increase the pipework and equipment failure rate as a result of poor water quality, thus increasing maintenance requirements. | DD-S6-E07<br>DD-S6-E08 |
| 6.3.6. | Sections of Distribution Network not circulated during construction phase. | Poor water quality due to lack of circulation in the District Distribution Network and increased risk of bacteria growth due to stagnant water. | DD-S6-E07<br>DD-S6-E08 |
| 6.3.7. | Insufficient and/or incorrect O&M documentation and handover to Heat Network Operator (e.g. inaccurate as-built drawings, missing information from O&M manual). | Unclear District Distribution Network requirements to O&M contractor. Network maintenance not carried out in line with system requirements. | DD-S6-E18 |

*Table 11: Key Failures for the District Distribution Network at Stage 6: Commissioning*

## 6.4. Evidence Requirements

The applicable Evidence Items listed in Table 12 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| DD-S6-E01 | Commissioning plan | A document outlining the intended plan and programme for commissioning of the District Distribution Network.<br>This shall include the critical path for commissioning of the District Distribution Network.<br>Where updates are made to the programme, the updated commissioning plan shall be made available.<br>*Note the commissioning plan may be a wider Heat Network commissioning plan that contains multiple Elements.* |
| DD-S6-E02 | Surveillance system commissioning and testing methodology | Methodology statements for the surveillance detailing how it shall be commissioned and tested on a joint-by-joint, network section and whole-network basis. |
| DD-S6-E03 | Surveillance system commissioning and testing certificate | Commissioning and testing certificate for each surveillance system test carried out. Shall indicate which, joint or network section the test has been carried out on, including the GPS coordinates of the joint. |
| DD-S6-E04 | Surveillance system detector commissioning certificate | Certificate following the commissioning of an active detector. Shall outline all data relevant to the detector, including the joints, section and whole-network the system is performing surveillance on. |
| DD-S6-E05 | As-built surveillance system wiring diagrams | An updated diagram following completion of all testing and commissioning procedures on the surveillance system. |
| DD-S6-E06 | Commissioning methodology | Methodology for the commissioning of equipment that requires commissioning procedures.<br>Methodology shall include all specific criteria that the equipment is to be commissioned to. This shall include, for example, temperature, pressure and/or flow rate set points for equipment. |
| DD-S6-E07 | Water quality sampling schedule | A schedule outlining the intended dates that samples shall be taken for monitoring the water quality of the District Distribution Network and the network it shall be provide heat to.<br>*This may be provided as part of the Water Quality Recording Programme for the system.* |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| DD-S6-E08 | Water quality sample results | Results shall be provided for all water quality samples taken, clearly outlining the sample location for each set of results.<br><br>Results shall also be provided to show the trends for each water quality parameter over time. This shall be in a format where the trend and minimum/maximum limits (where applicable) can be identified (e.g. graphical format). |
| DD-S6-E09 | District Distribution Network equipment commissioning certificates | Commissioning certificates for any equipment that requires a commissioning procedure.<br><br>This shall outline the required design criteria for the equipment that requires commissioning and the final commissioned value for each criteria. |
| DD-S6-E10 | Performance data to show equipment functioning in accordance with the commissioning methodology | Data taken from the commissioned equipment to evidence that the equipment performs in accordance with the design.<br><br>This shall include, where necessary:<br>• Temperature<br>• Differential pressure<br>• Operating pressure<br>• Flow rate<br>• Manual set point |
| DD-S6-E11 | Acceptance testing methodology | Methodology outlining the intended procedure for demonstrating the District Distribution Network performance and criteria for achieving performance. |
| DD-S6-E12 | Pre-testing report | A report following completion of pre-testing shall be provided.<br><br>This shall demonstrate the performance of the District Distribution Network is acceptable for Acceptance Testing to be undertaken.<br><br>The report shall contain a failure log of any issues identified and resolved during pre-testing. |
| DD-S6-E13 | Acceptance Test offered for witnessing | The District Distribution Network Acceptance Test shall be offered for on-site witnessing. |
| DD-S6-E14 | Acceptance Test data | Performance data required to demonstrate fulfilment with the requirements of the Acceptance Test shall be provided for the entire duration of the District Distribution Network Acceptance Test.<br><br>For example, this includes:<br>• Temperature sensors<br>• Pressure sensors |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| | | • Control valve positions<br>• Alarms<br>• Equipment enable signals<br>• Thermal energy meter readings, including:<br>  ○ Flow temperature<br>  ○ Return temperature<br>  ○ Power<br>  ○ Flow rate<br>  ○ Utility meter consumption<br>Data shall be provided in both its raw format as minimum. This shall be provided electronically in a useable file type (e.g. .csv, .xlsx). |
| DD-S6-E15 | Condition Log | To include all basic asset data and condition data for all Heat Network equipment within the District Distribution Network, including:<br>• asset name;<br>• asset ID;<br>• asset classification code;<br>• asset classification description;<br>• asset criticality;<br>• asset maintainer;<br>• asset location;<br>• asset install date;<br>• asset condition grade;<br>• asset priority grade;<br>• whether asset is beyond economic repair;<br>• asset operational status;<br>• date of last condition survey; and<br>• remaining life expectancy (years). |
| DD-S6-E16 | Photographic evidence of labelled Monitoring Points | Photographic evidence shall be provided for each labelled Monitoring Point within the District Distribution Network.<br>The photograph shall clearly show the on-site labelling which corresponds to the as-built District Distribution Network schematics and layout drawings. |
| DD-S6-E17 | Monitoring Points Commissioning Record Sheet | Commissioning record evidencing check of each Monitoring Point. |

| Evidence Item | | Detailed description and requirements |
|---|---|---|
| DD-S6-E18 | Evidence demonstrating Operator handover sign-off | Written sign-off from the organisation responsible for carrying out operation and maintenance activities that they accept that all handover procedures meet HNTAS requirements and that they accept responsibility for the operation and maintenance of the District Distribution Network going forward. |

*Table 12: Evidence Requirements for the District Distribution Network at Stage 6: Commissioning*