Heat Network Technical Assurance Scheme

New Build Heat Networks

Technical Specification

Consumer Heat System

Phase 3: Construction

HNTAS-NB-TS-CH-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 Consumer Heat System Element within a New Build Heat Network in Phase 3: Construction.

This document sits within a series of Technical Specifications for a Consumer Heat System, 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.

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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 Consumer Heat System within a New Build Heat Network in Phase 3: Construction.

A Consumer Heat System is defined as the heating and/or cooling, and hot water systems on the consumer side of a Consumer Connection or Substation.

A detailed definition of the Consumer Heat System is contained within the Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – Consumer Heat System – Overview (HNTAS-NB-TS-CH-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.

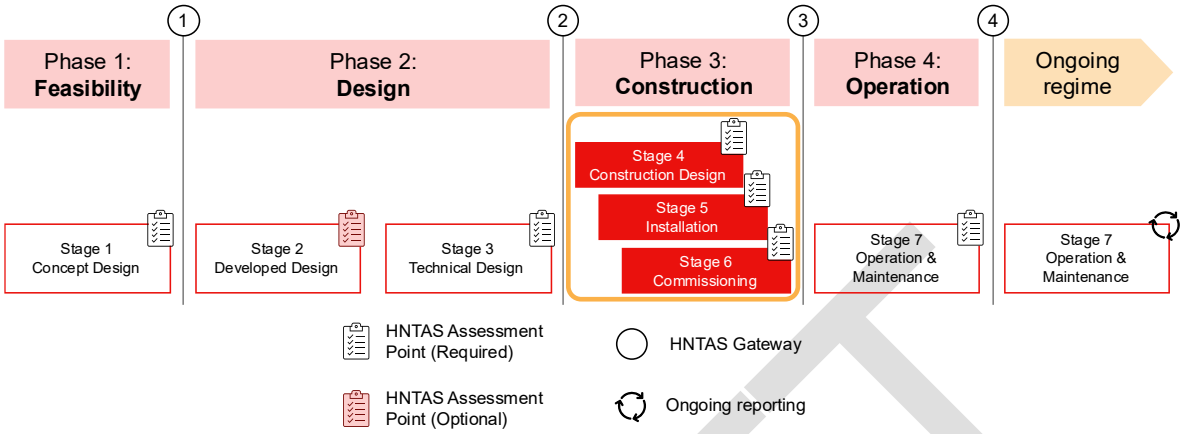

Figure 1: HNTAS New Build regime phases and stages

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.

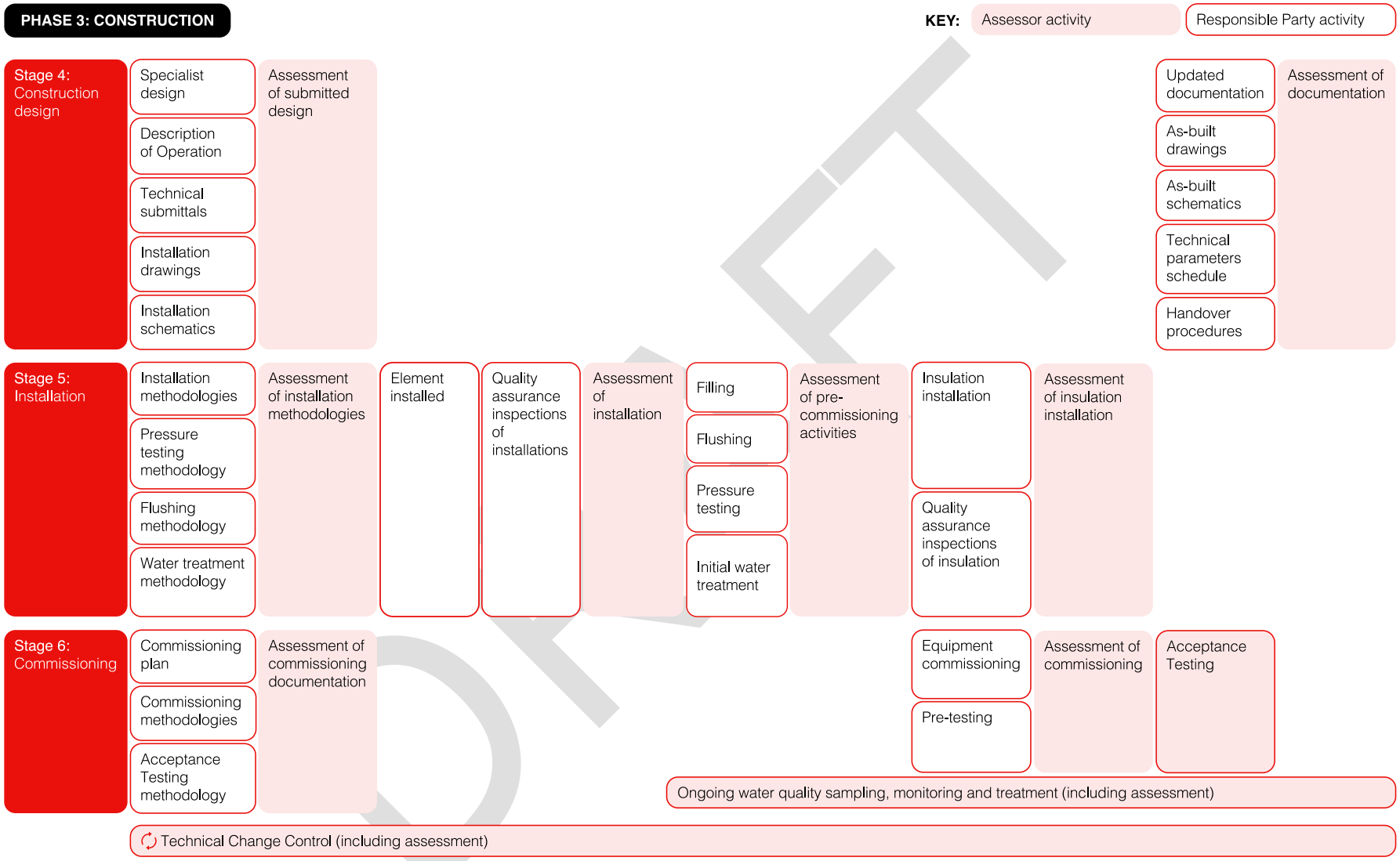

Figure 2: Example sequence of activities during Construction Phase, with activities of a Responsible Party and Assessor outlined

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 7593:2019+A1:2024: Code of Practice for the Preparation, Commissioning and Maintenance of Domestic Central Heating and Cooling Water 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: 1. the specification and performance requirements outlined within the Assessed Technical Design; and 2. any identified HNTAS Technical Requirements at the Technical Design stage which are applicable to the specialist contractor design item.		CH-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 TS1 4.6.2 TS1 4.6.3 TS1 4.17.3	CH-S4-E02
4.1.3.	For direct space heating systems, the pressure characteristics of the system shall be documented in accordance with the applicable technical standard(s). *Note: it is expected that this assessment is undertaken with consideration for the other Elements present in the Heat Network.*	TS1 4.6.6	CH-S4-E13
4.1.4.	For direct space heating systems, a filling, flushing, and water treatment/conditioning methodology shall be produced in accordance with the applicable technical standard(s).	TS1 4.11.1 TS1 4.11.2 TS1 4.11.4	CH-S4-E07
4.1.5.	For indirect space heating systems, a filling, flushing, and water treatment/conditioning methodology shall be produced in accordance with the applicable technical standard(s).	BS 7593	CH-S4-E07

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.1.6.	The design of the Consumer Heat System shall include suitable provision of flushing points. This provision shall ensure that no "dead legs" are left un-flushed, and that all sensitive equipment can be bypassed during the flushing process.		CH-S4-E03 CH-S4-E04
4.1.7.	For direct space heating systems, the Water Quality Strategy shall be updated in accordance with the applicable technical standard(s).	TS1 4.11.1	CH-S4-E13
4.1.8.	For indirect space heating systems, the Water Quality Strategy shall be updated in accordance with the applicable technical standard(s).	BS 7593	CH-S4-E13
4.1.9.	For direct space heating systems, a methodology for pipework pressure testing shall be developed in accordance with the applicable technical standard(s).	TS1 4.14.1	CH-S4-E08
4.1.10.	Prior to the installation of the Consumer Heat System, installation drawings and schematics shall be produced in accordance with the applicable technical standard(s).	TS1 4.17.4	CH-S4-E03 CH-S4-E04
4.1.11.	Changes to the design of the system which arise during the Construction Phase shall be controlled in accordance with the Technical Change Control Procedure.		
4.1.12.	Changes shall be documented in accordance with the Technical Change Control Procedure in the Change log.		CH-S4-E06
4.1.13.	Agreed changes during the Construction Phase shall be reflected in Installation documentation. This includes drawings, models, specifications, schedules, and technical submittals.		CH-S4-E09
4.1.14.	Following the installation of the Consumer Heat System, as-installed drawings and schematics shall be produced in accordance with the applicable technical standard(s).	TS1 4.17.5	CH-S4-E11

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.1.15.	Following the installation and commissioning of the Consumer Heat System, the Technical Parameters Schedule shall be completed with accurate information and references to relevant documentation.		CH-S4-E10
4.1.16.	Consumer Heat System documentation shall be updated throughout the Construction Phase in accordance with the applicable technical standard(s).	TS1 4.17.1 TS1 4.17.4	CH-S4-E13
4.1.17.	An O&M manual shall be produced in accordance with the applicable technical standard(s). *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	CH-S4-E12

Table 2: Technical Requirements for the Consumer Heat System 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.	The KPI schedule shall be updated throughout the Construction Phase. The KPI schedule shall contain: 1. the identified applicable KPIs to be measured and reported by the Metering and Monitoring System; 2. the thresholds for each KPI in operation (based on the level of information available at this stage); 3. the Monitoring Points required to measure each KPI.	MMS 4.1.12	CH-S4-E05

Table 3: Performance Monitoring Requirements for the Consumer Heat System 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. For example, project-specific heat demands are not used for heat emitter sizing.	Specialist design items not compatible with the network or suitable due to different design information being utilised.	CH-S4-E01 CH-S4-E02
4.3.2.	Incorrect methodology used for sizing Consumer Heat System emitters. For example, incorrect temperature correction factor used for the Consumer Heat System temperature profile when sizing radiators.	Incorrectly sized heat emitters, which could result in emitters not operating as per the design intent and not achieving the required heating output. This could result in: • Space becoming overheated, increasing return temperatures to the network and KPI thresholds not being achieved. • Spaces becoming underheated, reducing Consumer comfort.	CH-S4-E01 CH-S4-E02
4.3.3.	Equipment specified is not in accordance with the design criteria of the Assessed Technical Design. For example, a branch DHW plumbing specified rather than a DHW manifold as specified within the Assessed Technical Design.	Installed equipment may not be suitable to operate at the design and operating criteria. This may reduce the performance of the Consumer Heat System and could put equipment at greater risk of premature failure.	CH-S4-E02

Key Failure		Outcome to avoid	Evidence Requirement(s)
4.3.4.	Technical Submittal does not contain project specific or equipment specific design information. For example, temperature, differential pressure requirement (e.g. UFH loops), maximum operating pressure, maximum/minimum flowrates, design capacity, specific commissioning set points (e.g. pressure independent flow limiting valves).	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.	CH-S4-E02
4.3.5.	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 Consumer Heat System, 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.	CH-S4-E06

Table 4: Key Failures for the Consumer Heat System 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
CH-S4-E01	Specialist design documentation	Design documentation of specialist design items. Contents will be dependent on the design item, but shall include, where applicable, specification, calculations, schematics, and drawings.
CH-S4-E02	Technical submittals	Documentation for all equipment that is intended to be procured. Shall contain the site-specific design information used to inform the equipment selection and required for installation, commissioning, and operation of equipment. Shall include a cover page detailing the reviewers' names, revision number, status and date of approval of the technical submittal.
CH-S4-E03	Installation drawings	The Installation Drawings shall contain information needed by tradespeople on site to install the works and the following: • 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 between engineering services, architecture and structure. • All supports and fixings required to install the works. • Spatial allowances for installation and commissioning methodologies, and access for maintenance and replacement. Where applicable, any required builders works details and manufacturer drawings shall be produced in accordance with the Technical Design.
CH-S4-E04	Installation schematics	The Installation Schematics shall contain information needed by tradespeople on site to install the works and the following: • All functional, sensing, control and measuring items to be installed. This includes flushing provision, air vents and

Evidence Item		Detailed description and requirements
		drainage provision, isolation valves, sensors (pressure, temperature, flow). • All pipework sizes, pressures and flow rates adjusted for any changes during construction. All items shall be labelled with references to schedules
CH-S4-E05	KPI Schedule	A schedule of all KPIs required to be measured at Commissioning Stage for the Consumer Heat System. The KPI Schedule shall contain: 1. The identified applicable KPIs at Commissioning Stage 2. The thresholds for each KPI at Commissioning Stage (based on the level of information available at this stage) 3. The location for measuring each KPI
CH-S4-E06	Change log	Log of all changes to the Technical Design.
CH-S4-E07	Filling, flushing, and water treatment/conditioning methodology	Filling methodology detailing the: • methodology for sampling of mains water; • parameter limits for initial fill water quality; • approximate volume of network to be filled. Flushing methodology detailing: • type of flushing to be carried out (e.g. closed loop or open loop); • methodology for isolating sensitive equipment from the flushing process; • duration network shall be flushed for; • flushing velocity required; • methodology for providing circulation; • methodology for measuring the flushing velocity; • methodology for draining and disposing of contaminated water. Treatment/conditioning methodology detailing the: • method of water treatment/conditioning;

Evidence Item		Detailed description and requirements
		• type of chemicals/biocides/inhibitors to be used (if applicable); • duration of treatment/conditioning.
CH-S4-E08	Pressure testing methodology	Methodology detailing how the Consumer Heat System 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: • the type of pressure test; • the design pressure; • the test pressure; • the method for achieving the test pressure; • the duration of the pressure test. A methodology for pressure testing of equipment that has been tested by the 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.
CH-S4-E09	Installation documentation with changes outlined	Updated installation drawings and schematics with changes to the design reflected on the documentation.
CH-S4-E10	Technical Parameters Schedule	Schedule which outlines all technical parameters in one location, with reference to applicable documents.
CH-S4-E11	As-built drawings and schematics	Final as-built drawings and schematics reflecting the exact installation of the Consumer Heat System. Any changes made during the installation that deviate from the Installation schematics and drawings shall be reflected.
CH-S4-E12	O&M manual	Documentation containing all relevant information for the operation and maintenance of the system. Shall include contents as set out in TS1 4.17.2.
CH-S4-E13	Updated documentation following Construction Phase	Updated revisions of all Consumer Heat System documentation, including: • Consumer Heat System drawings • Consumer Heat System schematic • System pressure assessment (for direct space heating systems)

Evidence Item		Detailed description and requirements
		• Water Quality Strategy • Water Quality Recording Programme (for direct space heating systems) • KPI Schedule

Table 5: Evidence Requirements for the Consumer Heat System 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 Consumer Heat System shall be installed in accordance with the Assessed Construction Design.		CH-S5-E01
5.1.2.	The Consumer Heat System shall be installed in accordance with the applicable technical standard(s).	TS1 5.14.4 TS1 5.14.5 TS1 5.14.6 TS1 5.16.1	CH-S5-E01
5.1.3.	Ancillary equipment shall be installed in accordance with the applicable technical standard(s).	TS1 5.15.1	CH-S5-E01
5.1.4.	All persons performing installation activities shall have received training and certification.		
5.1.5.	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. Photographs (where applicable) shall be clearly presented with no blur.		CH-S5-E02
5.1.6.	For direct space heating systems, the Consumer Heat System shall be filled and treated/conditioned in accordance with the applicable technical standard(s).	TS1 5.11.1 TS1 5.11.2 TS1 5.11.4 TS1 5.11.6 TS1 5.11.7	CH-S5-E05 CH-S5-E06
5.1.7.	For indirect space heating systems, the Consumer Heat System shall be filled and treated/conditioned in accordance with the applicable technical standard(s).	BS 7593	CH-S5-E05 CH-S5-E06
5.1.8.	For direct space heating systems, 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	CH-S5-E03 CH-S5-E04

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
5.1.9.	For direct space heating systems, the Consumer Heat System shall be flushed in accordance with the applicable technical standard(s).	TS1 5.11.3 TS1 5.11.5 TS1 5.11.8	CH-S5-E05 CH-S5-E06
5.1.10.	For indirect space heating systems, the Consumer Heat System shall be flushed in accordance with the applicable technical standard(s).	BS 7593	CH-S5-E05 CH-S5-E06
5.1.11.	For direct space heating systems, 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 TS1 5.11.10	CH-S5-E06

Table 6: Technical Requirements for the Consumer Heat System at Stage 5: Installation

5.2. Performance Monitoring Requirements

There are no Performance Monitoring Requirements at Stage 5: Installation.

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.	Incorrect plumbing of heat emitters. Examples include radiators plumbed back to front, radiator inlet and outlet orientation not as per the design.	Heat emitters not operating as per design intent. Examples include reduced heat transfer from heat emitters and increased return temperatures.	CH-S5-E01 CH-S5-E02
5.3.2.	Heating system emitter not installed as per the Assessed Construction Design. For example, incorrect size of radiator installed, incorrect grille size of FCU installed.	Heat emitters not operating as per design intent. This could reduce the heat transfer from heat emitters result in reduced consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.3.	Domestic hot water services or heating services pipework not installed as per design specification. For example, installed pipework size not as per the Assessed Construction Design.	The impact of larger pipe sizes includes lower velocities, which can result in air and debris not being removed, which can result in poor water quality (corrosion, bacterial growth) and poor system performance. Pipework that is too small can increase differential pressure requirement on space heating circuits, which may not be achieved by the installed pump. This then impacts heat delivery to consumers.	CH-S5-E01 CH-S5-E02
5.3.4.	Domestic hot water services not installed as per the Assessed Construction Design. For example, manifold approach not utilised, or design pipework routing not followed.	Increased delivery times of hot water services, which could reduce Consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.5.	Air vents not installed on high points of space heating circuits.	Air collection at high points which could reduce the heat output of the space heating circuit.	CH-S5-E01 CH-S5-E02

Key Failure		Outcome to avoid	Evidence Requirement(s)
5.3.6.	Insufficient space and/or access, and/or inappropriate location for equipment maintenance. For example, equipment installed at a high level or manifold installed behind fixed wall/panel.	Lack of maintainability and ability for replacement of Consumer Heat System items in operation. Equipment installed at high-level creating a health and safety risk for operators during maintenance activities.	CH-S5-E01 CH-S5-E02
5.3.7.	Radiator TRV heads not installed correctly. For example, TRVs installed in areas exposed to direct sunlight or TRV head not installed in the correct orientation.	Consumer Heat System shutting off earlier than desired. Equipment not operating as intended. Reduced heat output of Consumer Heat System.	CH-S5-E01 CH-S5-E02
5.3.8.	Radiator TRV heads installed on reference radiator, or ability to isolate reference radiator installed (indirect space heating systems).	Consumer Heat System can call for heat from the network with flow restricted to all emitters, which can induce a bypass at the Consumer Connection. If this occurs, elevated return to the network would be experienced, which may increase heat losses and energy consumption, result in KPI thresholds not being achieved.	CH-S5-E01 CH-S5-E02
5.3.9.	Installed radiator TRV specification not in accordance with the Assessed Construction Design.	This could present difficulties in balancing the heating system, which could result in the incorrect temperatures being achieved in heating zones. This could reduce consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.10.	Underfloor heating system not installed as per the Assessed Construction Design. For example, not installed as a concentric layout.	Uneven or reduced heat distribution to Consumer Heat System, leading to reduced consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.11.	Underfloor heating manifolds not labelled or not labelled correctly.	Lack of maintainability during operation.	CH-S5-E01 CH-S5-E02

Key Failure		Outcome to avoid	Evidence Requirement(s)
5.3.12.	Thermostat installed in incorrect location. For example, installed in a location that gets direct sunlight onto the thermostat.	Heat system turns off prior to the temperature being reached. This could reduce consumer comfort as a result of colder room temperatures.	CH-S5-E01 CH-S5-E02
5.3.13.	Thermostat enables the incorrect underfloor heating loop.	Reduced consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.14.	Pressure testing not done correctly.	Risk of heating system failure in operation due to lack of pressure testing. Heating system failure could result in leakages, a lack of heat supply to the Consumer and reduced Consumer comfort.	CH-S5-E03 CH-S5-E04
5.3.15.	Push-fit fittings not installed correctly.	Risk of failure of push-fit fittings during operation, which could cause leakages, a lack of heat supply to the Consumer and reduced Consumer comfort.	CH-S5-E01 CH-S5-E02
5.3.16.	Air not fully removed from space heating system (e.g. air present in underfloor heating manifold, air present in radiators).	This can result in the design space heating flow rates not being achieved due to air in the space heating circuit. This results in a reduced heat output from the space heating system.	CH-S5-E05

Table 7: Key Failures for the Consumer Heat System 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
CH-S5-E01	Installation offered for inspection	The installation shall be offered following completion of the install for an inspection.
CH-S5-E02	Quality assurance inspection records	Shall include inspection records, photographs of the installed Consumer Heat System, a snagging log with remedial actions undertaken to fix these, justification for non-compliances with requirements. Photographs shall include the entire installation of the Consumer Heat System and shall be presented clearly with no blur. Photographs shall include all pipework, ancillaries, and emitters. For underfloor heating systems, photographs shall be taken prior to the floor being installed so that all pipework is visible.
CH-S5-E03	Pressure testing activities offered for witnessing	The pressure testing activities shall be offered for on-site witnessing.
CH-S5-E04	Pressure testing certification	Certification for each pressure test shall be provided, which provides, as a minimum: • the type of pressure test; • the date of test; • the design pressure; • the test pressure; • the time the test commenced; • the time the test pressure was reached; • the duration held at test pressure; • the name of the operative performing the test; • the pressure gauge calibration certificate.
CH-S5-E05	Water treatment/conditioning activities offered for witnessing	The water treatment activities shall be offered for on-site witnessing.
CH-S5-E06	Water treatment records (e.g. flushing pack, water quality results)	The water treatment records for the filling, flushing, and sampling of the system shall be provided. This shall include: Flushing: type of flushing, date of flushing, equipment isolated or removed from the system

Evidence Item		Detailed description and requirements
		during flushing, time flushing was commenced, duration system 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. Filling: Date system was filled, number of fill water samples, location of fill water samples, value of each fill water parameter. Sampling: Date samples were taken, type of samples taken, number of samples taken, location of samples taken, value of each parameter of sampled water.

Table 8: Evidence Requirements for the Consumer Heat System 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: • the commissioning plan produced during the Construction Design Stage; and • the applicable technical standard(s).	TS1 6.17.2 TS1 6.17.3 TS1 6.17.5	CH-S6-E01
6.1.2.	Commissioning methodologies for the Consumer Heat System shall be developed in accordance with the applicable technical standard(s). These shall include commissioning methodologies for all equipment that requires commissioning.	TS1 6.2.1 TS1 6.2.3 TS1 6.2.4 TS1 6.2.5 TS1 6.2.11 TS1 6.17.1 TS1 6.17.2	CH-S6-E02
6.1.3.	The Consumer Heat System shall be commissioned in accordance with the commissioning methodologies and the applicable technical standard(s). A commissioning record sheet shall be produced following complete commissioning and pre-testing of each Consumer Heat System, outlining the design settings and final commissioned parameters for the Consumer Heat System in accordance with the applicable technical standard(s). The document shall be retained where the major Consumer Connection equipment is installed and shall be readily accessible. A pre-testing record sheet shall be produced for each of the Consumer Heat System which are subject to pre-testing. *Note: these documents may be combined with the Consumer Connection.*	TS1 6.2.1 TS1 6.2.3 TS1 6.2.4 TS1 6.2.5 TS1 6.2.9 TS1 6.2.10 TS1 6.2.11 TS1 6.2.17 TS1 6.12.4 TS1 6.17.6 TS1 6.17.7	CH-S6-E05 CH-S6-E10

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
6.1.4.	The commissioning engineer(s) shall undergo training specific to the Consumer Connection and Consumer Heat System equipment involved, in accordance with the applicable technical standard(s).	TS1 6.2.12 TS1 6.2.13	CH-S6-E07
6.1.5.	Prior to Acceptance Testing, a methodology and criteria shall be produced in accordance with the applicable technical standard(s).	TS1 6.2.14	CH-S6-E06
6.1.6.	Acceptance Testing shall be undertaken on 100 % of the Consumer Heat Systems on the Heat Network by a [trained individual] and in accordance with the applicable technical standard(s). An Acceptance Testing report shall be produced demonstrating fulfilment with the applicable technical standard(s) listed, for each Consumer Heat System. *Note: the following may be done in combination with the Consumer Heat System.* • *The undertaking of Acceptance Testing.* • *The production of Acceptance Testing reports.*	TS1 6.2.15 TS1 6.2.16 TS1 6.2.18	CH-S6-E08 CH-S6-E09
6.1.7.	Instructions detailing how to operate the Consumer Heat System shall be developed and distributed in accordance with the applicable technical standard(s).	TS1 6.17.11	CH-S6-E11
6.1.8.	The handover procedures shall be followed in accordance with the applicable technical standard(s).	TS1 6.17.8 TS1 6.17.9 TS1 6.17.10	CH-S6-E12

Table 9: Technical Requirements for the Consumer Heat System at Stage 6: Commissioning

6.2. Performance Monitoring Requirements

There are no Performance Monitoring Requirements at Stage 6: Commissioning.

6.3. Key Failures

The applicable Key Failures listed in Table 10 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 Consumer Heat System and lack of competent persons to commission equipment, which could lead to the Consumer Heat System not performing as the design intended, KPIs not being achieved and a risk of reduced consumer comfort.	CH-S6-E01
6.3.2.	Incorrect commissioning of heat emitter flow rate (e.g. pressure independent TRV set too high/underfloor heating circuit flow rate set too high).	This can lead to the flowrate to heat emitters being set too high or low, causing an imbalance of the system. If the set point is too high: This could lead to elevated return temperatures. If the set point is too low: This could lead to the design heat output not being achieved.	CH-S6-E05 CH-S6-E08 CH-S6-E09
6.3.3.	Heating system does not enable, or does not enable for the intended zone, when heating demand initiated.	Failure to deliver heat to the consumer, or heat delivered at incorrect output. This could result in reduced Consumer comfort.	CH-S6-E05 CH-S6-E08 CH-S6-E09
6.3.4.	Poor water quality management of space heating circuit during construction phase (direct systems).	This can result in, for example, reduced equipment efficiency due to poor water quality, increased equipment failure rate due to poor water quality and increased maintenance requirement due to poor water quality.	CH-S6-E03 CH-S6-E04
6.3.5.	Long DHW delivery times achieved at the kitchen tap outlet.	Reduced consumer comfort.	CH-S6-E06 CH-S6-E09 CH-S6-E10

Table 10: Key Failures for the Consumer Heat System at Stage 6: Commissioning

6.4. Evidence Requirements

The applicable Evidence Items listed in Table 11 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
CH-S6-E01	Commissioning plan	A document outlining the intended programme for commissioning of the Consumer Heat System. This shall include the critical path for commissioning of the Consumer Heat System. Where updates are made to the programme, the updated commissioning plan shall be made available. *Note the commissioning plan may be a wider Heat Network commissioning plan that contains multiple Elements.*
CH-S6-E02	Commissioning methodology	Methodology for the commissioning of equipment that requires commissioning procedures. 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.
CH-S6-E03	Water quality sampling schedule	A schedule outlining the intended dates that samples shall be taken for monitoring the water quality of the Consumer Heat System. This shall include the location that water quality samples shall be taken from. *This may be provided as part of the Water Quality Recording Programme for the system.*
CH-S6-E04	Water quality sample results (including appended remedial action log)	For direct space heating systems, results shall be provided in accordance with the wider Heat Network water quality sampling schedule and strategy. These shall clearly outline the sample location for each set of results. 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). For indirect space heating systems, sample results shall be provided for each Consumer Heat System after commissioning The remedial action log shall detail any actions taken to maintain the water quality throughout the commissioning phase.

Evidence Item		Detailed description and requirements
CH-S6-E05	Consumer Heat System commissioning certificates	Commissioning Certificate for each individual Consumer Heat System. The certificate shall contain the commissioning criteria and final commissioned value following commissioning and pre-testing. *Note the Commissioning Certificate may contain commissioning information in relation to the Consumer Connection.*
CH-S6-E06	Acceptance Testing methodology	Methodology outlining the intended procedure for demonstrating the Consumer Heat System performance and criteria for achieving performance.
CH-S6-E07	Training Register	Evidence of training for all persons carrying out Consumer Heat System commissioning activities. This shall be specific to the equipment involved.
CH-S6-E08	Consumer Heat System offered for Acceptance Testing	Consumer Heat System access shall be offered for Acceptance Testing.
CH-S6-E09	Acceptance Test Report	A report following completion of the Acceptance Test. This shall outline the performance achieved against the Acceptance Testing criteria during the Acceptance Test.
CH-S6-E10	Commissioning Record Sheet	A document outlining the key information for the Consumer Connection and Consumer Heat System. This shall include: • Design DHW temperature • Recorded DHW temperatures • DHW temperature setting • Design space heating flow and return temperature • Space heating temperature setting • Space heating flow and return temperature at each emitter • Space heating flowrate or flow rate setting for each emitter • Space heating pump setting (where applicable)
CH-S6-E11	Consumer Heat System instructions	A document outlining a brief overview of how Consumer Heat System is to be operated by the Consumer.
CH-S6-E12	Evidence demonstrating	Written sign-off from the organisation responsible for carrying out operation and maintenance activities that they accept that all handover

Evidence Item		Detailed description and requirements
	Operator handover sign-off	procedures meet HNTAS requirements and that they accept responsibility for the operation and maintenance of the Consumer Heat System going forward.

Table 11: Evidence Requirements for the Consumer Heat System at Stage 6: Commissioning