Heat Network Technical Assurance Scheme

New Build Heat Networks

Technical Specification

Consumer Connection

Phase 3: Construction

HNTAS-NB-TS-CC-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 Connection Element within a New Build Heat Network in Phase 3: Construction.

This document sits within a series of Technical Specifications for a Consumer Connection, 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 Connection within a New Build Heat Network in Phase 3: Construction.

A Consumer Connection is defined as a connection between a Distribution Network (either District or Communal) and a single Consumer Heat System, where the instantaneous hot water system is ≤ 70 kW and/or the heating/cooling system is ≤ 20 kW.

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

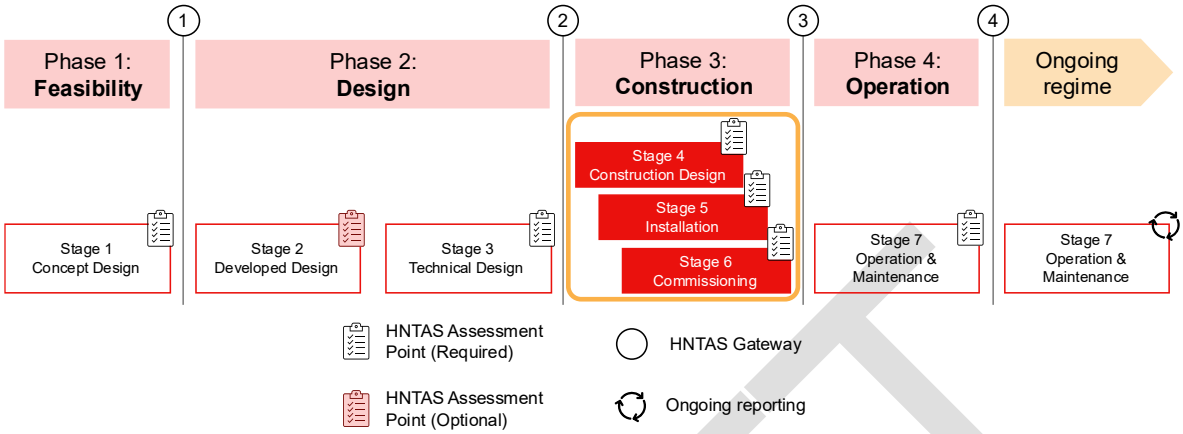

Figure 1: HNTAS New Build regime phases and stages

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.

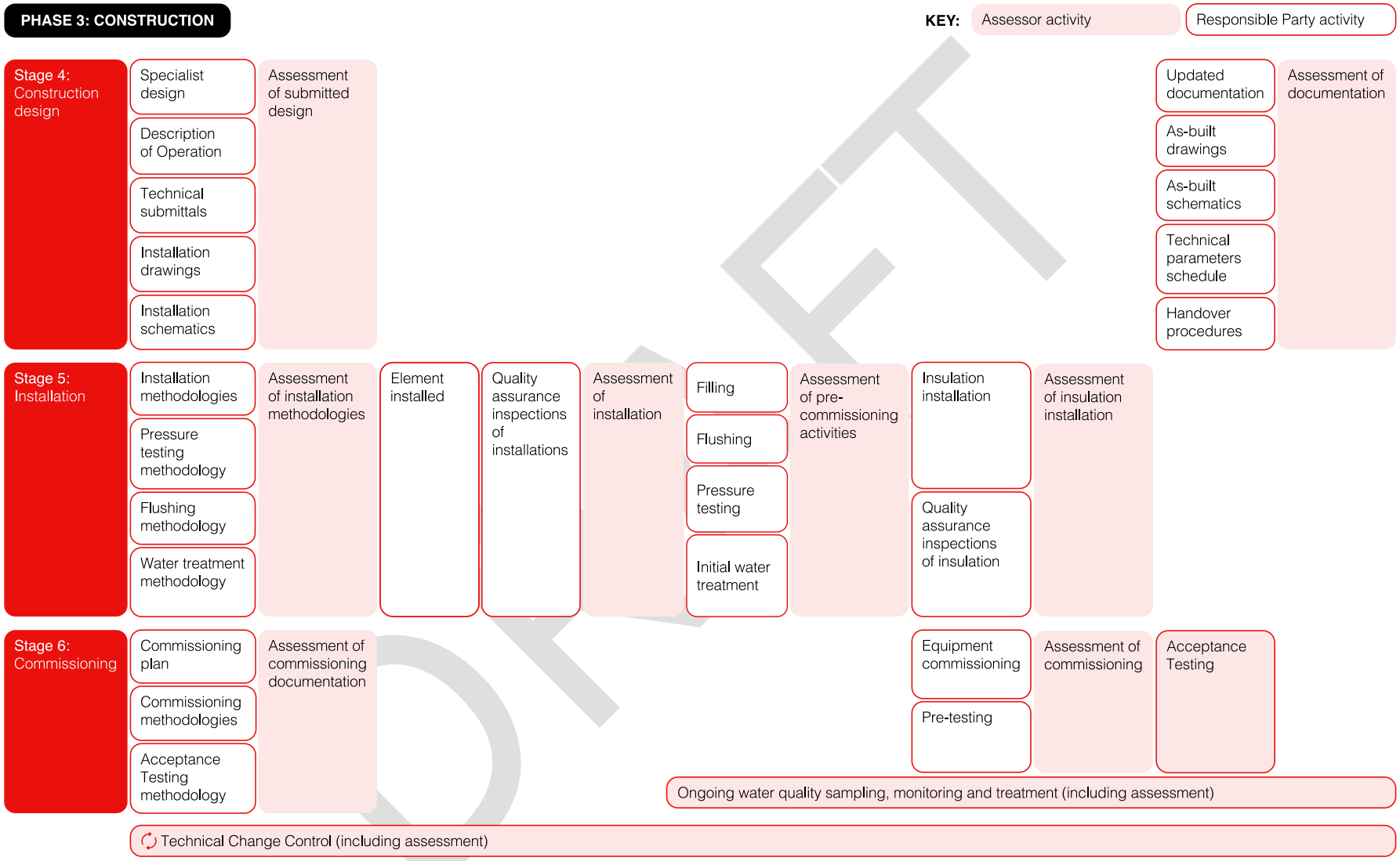

Figure 2: Example sequence of activities during Construction Phase, with activities of a Responsible Party and Assessor outlined

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)

Informative references

The following informative references apply to this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- BESA UK HIU Test Regime (BESA, 2023, or latest edition)

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.		CC-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 4.2.1 TS1 4.6.1 TS1 4.6.2 TS1 4.6.3 TS1 4.9.3 TS1 4.13.1 TS1 4.17.3	CC-S4-E02
4.1.3.	The design of the pressure safety system(s) shall be developed in accordance with the applicable technical standard(s).	TS1 4.6.4	CC-S4-
4.1.4.	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	CC-S4-
4.1.5.	The repair and replacement strategy shall be updated in accordance with the applicable technical standard(s).	TS1 4.9.6 TS1 4.15.1	CC-S4-
4.1.6.	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	CC-S4-

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.1.7.	The design of the Consumer Connection 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.		CC-S4-E03 CC-S4-E04
4.1.8.	Water Quality documentation shall be updated in accordance with the applicable technical standard(s). This shall include: • the Water Quality Strategy; • the Water Quality Recording Programme.	TS1 4.11.1 TS1 4.11.2	CC-S4-
4.1.9.	A methodology for pipework pressure testing shall be developed in accordance with the applicable technical standard(s).	TS1 4.14.1	CC-S4-
4.1.10.	Prior to the installation of the Consumer Connection, installation drawings and schematics shall be produced in accordance with the applicable technical standard(s).	TS1 4.17.4	CC-S4-E03 CC-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.		CC-S4-
4.1.13.	Agreed changes during the Construction Phase shall be reflected in Installation documentation. This includes drawings, models, specifications, schedules, and technical submittals.		CC-S4-

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.1.14.	Following the installation of the Consumer Connection, as-installed drawings and schematics shall be produced in accordance with the applicable technical standard(s). The as-installed drawings and schematics shall be affixed to a wall within the relevant plant room(s).	TS1 4.17.5 TS1 4.17.6	CC-S4-
4.1.15.	Following the installation and commissioning of the Consumer Connection, the Technical Parameters Schedule shall be completed with accurate information and references to relevant documentation.		CC-S4-
4.1.16.	Consumer Connection documentation shall be updated throughout the Construction Phase in accordance with the applicable technical standard(s).	TS1 4.12.4 TS1 4.17.1 TS1 4.17.4	CC-S4-
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	CC-S4-

Table 2: Technical Requirements for the Consumer Connection 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 TS1 4.12.2 MMS 1.1	CC-S4-
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 MMS 2.1	CC-S4-
4.2.3.	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.	TS1 4.12.4 MMS 4.1.12	CC-S4-
4.2.4.	The Monitoring Points Schedule shall be updated. The Monitoring Points Schedule shall contain: 1. the required Monitoring Points to measure KPIs; 2. the location of each Monitoring Point (which identifies the applicable Element); 3. a unique ID code, which follows a determined naming convention.	TS1 4.12.4 MMS 4.1.13	CC-S4-

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.2.5.	The Metering and Monitoring Strategy shall be updated at the end of the Construction Design, Installation and Commissioning stages in accordance with the applicable technical standard(s).	TS1 4.12.4	CC-S4-

Table 3: Performance Monitoring Requirements for the Consumer Connection at Stage 4: Construction Design

4.3. Data Protection and Smart Metering Requirements

The applicable Data Protection and Smart Metering Requirements in Table 4 shall be fulfilled.

Data Protection and Smart Metering Requirement		Applicable technical standard(s)	Evidence Requirement(s)
4.3.1.	The Metering and Monitoring System shall allow system operators to comply with their obligations of data protection by design and by default in accordance with the applicable technical standard(s).	MMS 2.2	CC-S4-
4.3.2.	The Metering and Monitoring System shall allow system operators to comply with their obligations of secure data processing in accordance with the applicable technical standard(s).	MMS 2.3	CC-S4-
4.3.3.	A smart metering system / advanced meter infrastructure (AMI) shall be specified in accordance with the applicable technical standard(s).	MMS 3.1	CC-S4-

Table 4: Data Protection and Smart Metering Requirements for the Consumer Connection at Stage 4: Construction Design

4.4. Key Failures

The applicable Key Failures listed in Table 5 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
4.4.1.	Equipment specified in technical submittal does not meet the design criteria in accordance with the Assessed Technical Design. For example, the Consumer Connection specified is not BESA registered (or equivalent).	Installed equipment may not be suitable to operate at the design and operating criteria. This may reduce the performance of the Consumer Connection, increased risk of KPI thresholds not being achieved and could put equipment at greater risk of premature failure.	CC-S4-E02
4.4.2.	Technical Submittal does not contain project specific or equipment specific design information to enable a review and approval of Technical Submittal. For example, temperature profiles, differential pressure requirement (e.g. valves), design differential pressure provision, maximum operating pressure, maximum/minimum flowrates, design capacity, 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.	CC-S4-E02
4.4.3.	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 Connection, 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.	CC-S4- CC-S4-

Key Failure		Outcome to avoid	Evidence Requirement(s)
4.4.4.	Metering and Monitoring System Design and Specification is not in line with the Metering and Monitoring Technical Design. Specifically, it does not contain the following: 1. The required Monitoring Points to measure KPI 2. The ability measure, extract, record, and store data at the required frequency 3. 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.	CC-S4- CC-S4- CC-S4- CC-S4- CC-S4- CC-S4- CC-S4- CC-S4-
4.4.5.	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.	CC-S4-
4.4.6.	Thermal energy meter not correctly specified for heat transfer fluid.	Inaccurate measurement of performance data due to inappropriate specification of thermal energy meter.	CC-S4-

Table 5: Key Failures for the Consumer Connection at Stage 4: Construction Design

4.5. Evidence Requirements

The applicable Evidence Items listed in Table 6 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
CC-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.
CC-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. Technical Submittal shall be provided for each Consumer Connection type.
CC-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.
CC-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

Evidence Item		Detailed description and requirements
		includes flushing provision, air vents and 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.
CC-S4-E05	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. The strategy shall also include: 1. Schedule of KPIs (item CC-S4-) 2. Schedule of Monitoring points (item CC-S4-) 3. Monitoring points unique ID code naming methodology (item CC-S4-) 4. Schematic with labelled Monitoring points 5. Data flow diagram (item CC-S4-) 6. ARMS specification (item CC-S4-) 7. Monitoring points specification (thermal energy meters, utility meters, sensors) (item CC-S4- & CC-S4-)
CC-S4-E06	KPI Schedule	A schedule of all KPIs required to be measured by the Metering and Monitoring System. 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
CC-S4-E07	Monitoring Points Schedule	A schedule of all Monitoring Points required to measure KPIs.

Evidence Item		Detailed description and requirements
		The Monitoring Points Schedule shall contain: 1. All required Monitoring Points to measure KPIs 2. Location of each Monitoring Point (which identifies the applicable Element) 3. A unique ID code, which follows a determined naming convention 4. Serial number 5. Postal address and plot number 6. Photographic evidence of point and on-site label 7. Communications address for ARMS 8. Date commissioned 9. Initial reading 10. Date of last calibration
CC-S4-E08	Unique ID code naming convention	Methodology used to label each Monitoring Point with a unique ID code.
CC-S4-E09	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.
CC-S4-E10	Monitoring Point Specification	Specification for each type of Monitoring Point (thermal energy meter, utility meter, sensors etc.). 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.
CC-S4-E11	Meter sizing calculations	Shall outline the inputs, methodology and calculations used to size thermal energy meters for each Consumer Connection type.
CC-S4-E12	Data Protection Compliance Statement	Shall contain evidence of how the Metering and Monitoring System installed complies with the organisation's data protection obligations in accordance with the applicable technical standard(s).

Evidence Item		Detailed description and requirements
CC-S4-E13	Data Security Risk Assessment	Shall contain an assessment of the risks to the system, including the methods reasonably available to threat actors to identify individuals, in the context of their nature, capability and objectives. Shall include the controls implemented to address these risks, demonstrating that such risks have been reduced to an acceptable level.
CC-S4-E14	Smart Metering System / AMI Specification Compliance Statement	Shall contain evidence of how the smart metering / advanced meter infrastructure (AMI) system installed has been specified in accordance with the applicable technical standard(s).

CC-S4-E15	Pressure safety system specification	Written description of the specification of the pressure safety system.
		Shall outline:
		• the items used (e.g. Safety Relief Devices);
		• setpoints of the items used;
		• their locations in relation to:
		  ○ sources of pressure (e.g. heat generation sources, pressurisation equipment);
		  ○ isolation points.

CC-S4-E16	Data flow diagram(s)	Diagrams illustrating the route of data flow from the Monitoring Point to the ARMS, including hierarchy of Monitoring Points.
CC-S4-E17	Change log	Log of all changes to the Technical Design.
CC-S4-E18	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;

Evidence Item		Detailed description and requirements
		• methodology for draining and disposing of contaminated water. Treatment/conditioning methodology detailing the: • method of water treatment/conditioning; • type of chemicals/biocides/inhibitors to be used (if applicable); • duration of treatment/conditioning.
CC-S4-E19	Pressure testing methodology	Methodology detailing how the Consumer Connection 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.
CC-S4-E20	Installation documentation with changes outlined	Updated installation drawings and schematics with changes to the design reflected on the documentation.
CC-S4-E21	Technical Parameters Schedule	Schedule which outlines all technical parameters in one location, with reference to applicable documents.
CC-S4-E22	As-built drawings and schematics	Final as-built drawings and schematics reflecting the exact installation of the Communal Connection. Any changes made during the installation that deviate from the Installation schematics and drawings shall be reflected.
CC-S4-E23	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.
CC-S4-E24	Updated documentation throughout Construction Phase	Updated revisions of all Consumer Connection documentation, including: • Consumer Connection drawings

Evidence Item		Detailed description and requirements
		• Consumer Connection schematic • System pressure assessment • Repair and replacement strategy • Water Quality Strategy • Water Quality Recording Programme • Metering and Monitoring Strategy • Monitoring Points Schedule • KPI Schedule • Data flows diagram

Table 6: Evidence Requirements for the Consumer Connection at Stage 4: Construction Design

5. Requirements for Stage 5: Installation

5.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 7 shall be fulfilled.

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
5.1.1.	The Consumer Connection, including the Metering and Monitoring System, shall be installed in accordance with the Assessed Construction Design.		CC-S5-E01
5.1.2.	The Consumer Connection, including the Metering and Monitoring System, shall be installed in accordance with the applicable technical standard(s).	TS1 5.12.1 TS1 5.12.2 TS1 5.14.4 TS1 5.14.5 TS1 5.14.6 TS1 5.16.1	CC-S5-E01
5.1.3.	Ancillary equipment shall be installed in accordance with the applicable technical standard(s).	TS1 5.15.1	CC-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.	TS1 5.16.7	CC-S5-E02
5.1.6.	The Consumer Connection 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	CC-S5- CC-S5-
5.1.7.	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	CC-S5-E03 CC-S5-E04

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
5.1.8.	The Consumer Connection shall be flushed in accordance with the applicable technical standard(s).	TS1 5.11.3 TS1 5.11.5 TS1 5.11.8	CC-S5- CC-S5-
5.1.9.	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	CC-S5- CC-S5-
5.1.10.	Consumer Connection insulation shall be installed in accordance with the Assessed Construction Design.		CC-S5-
5.1.11.	Consumer Connection insulation shall be installed in accordance with the applicable technical standard(s).	TS1 5.13.1 TS1 5.13.2 TS1 5.13.3 TS1 5.13.4	CC-S5-
5.1.12.	Quality assurance inspections of the installation of the Consumer Connection insulation shall be undertaken and documented prior to cladding or covering building finishes in accordance with the applicable technical standard(s).	TS1 5.13.5	CC-S5-

Table 7: Technical Requirements for the Consumer Connection at Stage 5: Installation

5.2. Performance Monitoring Requirements

The Metering and Monitoring System installation shall be undertaken in accordance with the Technical Requirements in Section 5.1.

5.3. Data Protection and Smart Metering Requirements

The applicable Data Protection and Smart Metering Requirements in Table 8 shall be fulfilled.

Data Protection and Smart Metering Requirement		Applicable technical standard(s)	Evidence Requirement(s)
5.3.1.	A smart metering system / advanced meter infrastructure (AMI) shall be installed in accordance with the applicable technical standard(s).	MMS 3.1	CC-S5-E09

Table 8: Data Protection and Smart Metering Requirements for the Consumer Connection at Stage 5: Installation

5.4. Key Failures

The applicable Key Failures listed in Table 9 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
5.4.1.	Consumer Connection plumbing incorrect. For example, network flow plumbed into HIU return connection and vice versa.	System not operating as per design, which could result in a reduction in heat transfer efficiency and increased return temperatures to the network.	CC-S5-E01 CC-S5-E02
5.4.2.	Ancillary equipment to aid with maintenance of system (including water quality maintenance) not installed as per the design and specification (e.g. vent and drain provision, strainers, isolation valves, gauges, test points).	Lack of maintainability of the Consumer Connection in operation. Air vents not installed at system high points could lead to air pockets forming at system high points. Drain cocks not installed at system low points which does not allow for safe drainage from system low points.	CC-S5-E01 CC-S5-E02
5.4.3.	Insufficient space and/or inaccessible location for equipment maintenance. For example, installing an HIU at high level.	Lack of maintainability and ability for replacement of the Consumer Connection in operation. Installing major equipment or valves at high-level could create a health and safety risk for operators during maintenance activities.	CC-S5-E01 CC-S5-E02
5.4.4.	Incorrect specification of Consumer Connection installed in specific location. For example, incorrect HIU plate size in site where plate size varies, or incorrect pressure rating on a network where the required pressure rating varies.	Insufficient plate heat exchanger size for heating/hot water delivery, which could result in lower hot water temperatures when all outlets are active. This could also result in a lower space heating output during peak operation. An insufficient pressure rating could result in damage to the Consumer Connection, leakages, and a health and safety risk to the Consumer.	CC-S5-E01 CC-S5-E02

Key Failure		Outcome to avoid	Evidence Requirement(s)
5.4.5.	Space heating pressure safety valves discharge not installed to drain via a tundish, or not installed to a drain at all.	Unable to detect when safety relief valve has been activated.	CC-S5-E01 CC-S5-E02
5.4.6.	Air not fully vented from Consumer Connection during pre-commissioning activities.	Air builds up in the plate heat exchanger(s) within the Consumer Connection, which leads to poorer heat transfer and reduced heat output and difficulties in commissioning. This could result in reduced Consumer Comfort.	CC-S5-
5.4.7.	Consumer Connection insulation not installed as per design specification, missing or damaged.	Increased heat losses as a result of the installation. This could result in the heat losses not achieving the KPI threshold.	CC-S5- CC-S5-
5.4.8.	Monitoring points not installed correctly, to enable complete accurate readings to be made. For example, temperature sensors not installed correctly, flow sensor installed on incorrect pipework and/or incorrect orientation, manufacturers requirements in relation to proximity to adjacent valves/pipework bends not followed, spool pieces not used during install.	Unable to measure or inaccurate performance data being measured.	CC-S5-E01 CC-S5-E02
5.4.9.	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.	CC-S5-E01 CC-S5-E02
5.4.10.	Not all required Monitoring Points are connected to the ARMS.	ARMS unable to extract the required data from all Monitoring Points, and therefore cannot record and store the necessary data to calculate KPIs.	CC-S5-E01 CC-S5-E02

Table 9: Key Failures for the Consumer Connection at Stage 5: Installation

5.5. Evidence Requirements

The applicable Evidence Items listed in Table 10 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
CC-S5-E01	Installation offered for inspection	The installation shall be offered following completion of the install for an inspection.
CC-S5-E02	Quality assurance inspection records	Shall include inspection records, photographs of the installed Consumer Connection, a snagging log with remedial actions undertaken to fix these, justification for non-compliances with requirements. Photographs shall include the internal and external installation of the Consumer Connection and shall be presented clearly with no blur.
CC-S5-E03	Pressure testing activities offered for witnessing	The pressure testing activities shall be offered for on-site witnessing.
CC-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.
CC-S5-E05	Water treatment/conditioning activities offered for witnessing	The water treatment/conditioning activities shall be offered for on-site witnessing.
CC-S5-E06	Water treatment records	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 during flushing, time flushing was commenced, duration system was flushed for, required flushing velocity, flushing velocity reached,

Evidence Item		Detailed description and requirements
		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. Treatment: type, date and duration of activities, type of chemicals/biocides/inhibitors used. Sampling: Date samples were taken, type of samples taken, number of samples taken, location of samples taken, value of each parameter of sampled water.
CC-S5-E07	Installation of insulation offered for inspection	The insulation installation shall be offered following completion of the install for an inspection.
CC-S5-E08	Quality assurance inspection records (insulation installation)	Shall include inspection records, photographs of the installed Consumer Connection, a snagging log with remedial actions undertaken to fix these, justification for non-compliances with requirements. Photographs shall be presented clearly with no blur.
CC-S5-E09	Smart Metering System / AMI Specification Compliance Statement	Shall contain evidence of how the smart metering / advanced meter infrastructure (AMI) system installed has been specified in accordance with the applicable technical standard(s).

Table 10: Evidence Requirements for the Consumer Connection at Stage 5: Installation

6. Requirements for Stage 6: Commissioning

6.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 11 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	CC-S6-E01
6.1.2.	Commissioning methodologies for the Consumer Connection, including the Metering and Monitoring 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 6.2.7 TS1 6.2.8 TS1 6.12.5 TS1 6.17.1 TS1 6.17.2	CC-S6-E02
6.1.3.	Prior to commissioning of the Consumer Connection, pre-commissioning activities shall be carried out on the Distribution Network connected to the Consumer Connection in accordance with the applicable technical standard(s).	TS1 6.2.2	CC-S6-E05 CC-S6-E06

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
6.1.4.	The Consumer Connection 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 Connection, outlining the design settings and final commissioned parameters for the Consumer Connection 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 Connections which are subject to pre-testing. *Note: these documents may be combined with the Consumer Heat System.*	TS1 6.2.1 TS1 6.2.3 TS1 6.2.4 TS1 6.2.7 TS1 6.2.8 TS1 6.2.9 TS1 6.2.10 TS1 6.2.11 TS1 6.2.17 TS1 6.12.5 TS1 6.17.6 TS1 6.17.7	CC-S6-E07 CC-S6-E10
6.1.5.	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	CC-S6-E04
6.1.6.	Prior to Acceptance Testing, a methodology and criteria shall be produced in accordance with the applicable technical standard(s).	TS1 6.2.14	CC-S6-E03

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
6.1.7.	Acceptance Testing shall be undertaken on 100 % of the Consumer Connections 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 Connection. *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	CC-S6-E08 CC-S6-E09
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	CC-S6-E16

Table 11: Technical Requirements for the Consumer Connection at Stage 6: Commissioning

6.2. Performance Monitoring Requirements

The applicable Performance Monitoring Requirements in Table 12 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 TS1 4.12.4	CC-S6-
6.2.2.	Commissioning checks shall be carried out on all Monitoring Points in accordance with the applicable technical standard(s). 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. The checks shall ensure that: • 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 • measurements taken at each Monitoring Point are correctly extracted, recorded, transformed, and reported by the ARMS.	TS1 4.12.2 TS1 6.12.1 TS1 6.12.2	CC-S6-

Table 12: Performance Monitoring Requirements for the Consumer Connection at Stage 6: Commissioning

6.3. Data Protection and Smart Metering Requirements

The applicable Data Protection and Smart Metering Requirements in Table 13 shall be fulfilled.

Data Protection and Smart Metering Requirement		Applicable technical standard(s)	Evidence Requirement(s)
6.3.1.	Prior to handover, the Metering and Monitoring System shall allow system operators to comply with their obligations of data protection by design and by default in accordance with the applicable technical standard(s).	MMS 2.2	CC-S6-E13
6.3.2.	Prior to handover, the Metering and Monitoring System shall allow system operators to comply with their obligations of secure data processing in accordance with the applicable technical standard(s).	MMS 2.3	CC-S6-E14
6.3.3.	The smart metering system / advanced meter infrastructure (AMI) shall be commissioned in accordance with the applicable technical standard(s).	MMS 3.1	CC-S6-E15

Table 13: Data Protection and Smart Metering Requirements for the Consumer Connection at Stage 6: Commissioning

6.4. Key Failures

The applicable Key Failures listed in Table 14 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
6.4.1.	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 Connection(s) and lack of competent persons to commission equipment, which could lead to the Consumer Connection not performing as the design intended, KPIs not being achieved and a risk of reduced consumer comfort.	CC-S6-E01
6.4.2.	Flushing bypasses left open during and after commissioning.	Flushing bypasses left open can result in increased system flowrates. This can result in elevated return temperatures due to the increased system flowrates.	CC-S6-E07 CC-S6-E09
6.4.3.	Strainers not checked and cleaned during commissioning.	Low flowrates from the network through the Consumer Connection, causing low space heating and DHW temperatures, which would reduce consumer comfort.	CC-S6-E07
6.4.4.	Incorrect domestic hot water temperature set point.	Increased return temperatures, risk of scaling and reduced consumer comfort due to high domestic hot water temperature. A high DHW set point could increase standby flowrates and therefore cause elevated return temperatures during standby operation.	CC-S6-E07 CC-S6-E09 CC-S6-E10
6.4.5.	Incorrect space heating temperature set point.	Set point too high: There is a risk of overheating in the consumer boundary. There is also a risk of damage to the flooring as a result of an increased underfloor heating flow temperature. This can also result in elevated return temperatures due to higher flow temperature.	CC-S6-E07 CC-S6-E09 CC-S6-E10

Key Failure		Outcome to avoid	Evidence Requirement(s)
		Set point too low: The design space heating output would not be achieved due to a low space heating flow rate. This would reduce consumer comfort.	
6.4.6.	Incorrect space heating pump setting based on system characteristics (indirect systems). For example, proportional pressure curve settings used on underfloor heating systems.	Incorrect setting may result in the following, for example: • The pump provides more differential pressure than required and unnecessarily increases the electricity consumption. • The pump provides insufficient differential pressure, which would result in the space heating output not being achieved at the furthest emitters. This would reduce consumer comfort.	CC-S6-E07 CC-S6-E09 CC-S6-E10
6.4.7.	Space heating differential pressure control not commissioned correctly, or not commissioned at all. (Where this can be commissioned - indirect systems).	Set point too high: Can result in excessive flow rate through the Consumer Connection, risking high return temperatures to the network. Set point too low: Can result in low flow rates, which risks lack of heat delivery and/or long heat up times.	CC-S6-E07 CC-S6-E09 CC-S6-E10
6.4.8.	Space heating differential pressure control not commissioned correctly, or not commissioned at all. (Where this can be commissioned - direct systems).	Incorrect commissioning of the differential pressure control on a direct system may result in, for example: • Excess flow rate through Consumer Heat System, which could cause elevated return temperatures and overheating. • Insufficient flow rate through Consumer Heat System, therefore the design space heating	CC-S6-E07 CC-S6-E09 CC-S6-E10

Key Failure		Outcome to avoid	Evidence Requirement(s)
		flow rate and power output cannot be achieved. This could reduce Consumer comfort. • Differential pressure ratings of items (for example, pressure independent TRVs) being exceeded.	
6.4.9.	Standby operation of Consumer Connection not commissioned correctly.	This could cause, for example: • High standby operation flowrates, causing increased return temperatures to the network and elevated heat losses, which could lead to KPI thresholds not being achieved. • Insufficient keep warm functionality provided to the Consumer Connection, resulting in long DHW delivery times.	CC-S6-E07 CC-S6-E09 CC-S6-E10
6.4.10.	Not all required Monitoring Points are connected to the ARMS.	ARMS unable to extract the required data from all Monitoring Points, and therefore cannot record and store the necessary data to calculate KPIs.	CC-S6-
6.4.11.	Incorrectly allocated meters (serial number of meter is allocated to the wrong meter).	Incorrectly allocated data to meter, resulting in inaccurate representation of Monitoring Point.	CC-S6-
6.4.12.	Monitoring points not producing reasonable and expected data.	Unable to accurately monitor performance and risks falsely being able to achieve or not achieve KPI thresholds.	CC-S6-
6.4.13.	Monitoring points not communicating with ARMS.	ARMS unable to extract, record and store data from Monitoring Point, and therefore KPIs cannot be calculated, and performance monitored.	CC-S6-

Key Failure		Outcome to avoid	Evidence Requirement(s)
6.4.14.	ARMS not operational and connected to all required Monitoring Points prior to acceptance test.	Unable to measure, extract, record, and store data during acceptance test, which prevents being able to calculate KPIs to demonstrate acceptable performance prior to handover to achieve Certification.	CC-S6-
6.4.15.	Insufficient and/or incorrect O&M documentation and handover to system operator (e.g. inaccurate setpoints, missing information from O&M manual).	Unclear system requirements to O&M contractor. System maintenance not carried out in accordance with system requirements.	CC-S6-E16
6.4.16.	Metering and Monitoring System documentation not included within the O&M manual. This includes all design documentation, updated to reflect any changes during construction.	Difficulty in understanding installed Metering and Monitoring System for future O&M operatives, risking the ability to be able to accurately measure performance and report on KPIs.	CC-S6- CC-S6-E16

Table 14: Key Failures for the Consumer Connection at Stage 6: Commissioning

6.5. Evidence Requirements

The applicable Evidence Items listed in Table 15 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
CC-S6-E01	Commissioning plan	A document outlining the intended programme for commissioning of the Consumer Connection(s). This shall include the critical path for commissioning of the Consumer Connection(s). 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.*
CC-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.
CC-S6-E03	Acceptance testing methodology	Methodology outlining the intended procedure for demonstrating the Consumer Connection performance and criteria for achieving performance.
CC-S6-E04	Training Register	Evidence of training for all persons carrying out Consumer Connection commissioning activities. This shall be specific to the equipment involved.
CC-S6-E05	Evidence of completion of pre-commissioning activities evidence	Evidence to demonstrate that the required pre-commissioning activities have been undertaken prior to commissioning of the Consumer Connection.
CC-S6-E06	Evidence of temperature and differential pressure at the Consumer Connection	Data to show that the temperature and differential pressure at the Consumer Connection intake are achieving the design criteria. Meter data shall be used for evidencing temperature at the Consumer Connection. Where electronic differential pressure reading is not available at the Consumer Connection, photographic evidence of manual measurement of differential pressure is acceptable.
CC-S6-E07	Consumer Connection Commissioning Certificates	Commissioning certificate for each individual Consumer Connection.

Evidence Item		Detailed description and requirements
		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 Heat System.*
CC-S6-E08	Consumer Connection offered for Acceptance Testing	Consumer Connection access shall be offered for Acceptance Testing.
CC-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.
CC-S6-E10	Commissioning Record Sheet	A document produced for each individual Consumer Connection 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 flow rate or flow rate setting for each emitter • Space heating pump setting (where applicable)
CC-S6-E11	Photographic evidence of labelled Monitoring Points	Photographic evidence shall be provided for each labelled Monitoring Point within the Consumer Connection. The photograph shall clearly show the on-site labelling which corresponds to the as-built Consumer Connection schematics and drawings.
CC-S6-E12	Monitoring Points Commissioning Record Sheet	Commissioning record evidencing check of each Monitoring Point.
CC-S6-E13	Data Protection Compliance Statement	Shall contain evidence of how the Metering and Monitoring System installed complies with the organisation's data protection obligations in accordance with the applicable technical standard(s).

Evidence Item		Detailed description and requirements
CC-S6-E14	Data Security Risk Assessment	Shall contain an assessment of the risks to the system, including the methods reasonably available to threat actors to identify individuals, in the context of their nature, capability and objectives. Shall include the controls implemented to address these risks, demonstrating that such risks have been reduced to an acceptable level.
CC-S6-E15	Smart Metering System / AMI Specification Compliance Statement	Shall contain evidence of how the smart metering / advanced meter infrastructure (AMI) system installed has been specified in accordance with the applicable technical standard(s).
CC-S6-E16	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 Consumer Connection going forward.

Table 15: Evidence Requirements for the Consumer Connection at Stage 6: Commissioning